Together Everyone Achieves More:

The effects of a communication based team building intervention on perceived communication, felt cohesion, and objective team performance

Master's Thesis Social Psychology

Department of Social Psychology, Faculty of Social and Behavioral Sciences

Tilburg University

Author Note:

Davy Rietveld, ANR: 276514

First supervisor: dr. M. Stel

Second supervisor: dr. M. van den Tooren

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Abstract

Team building is a well known way for organizations to improve the performance of their teams. Former research has been inconsistent about the effect of team building on a team's actual performance. This study demonstrates the effect of team building on both objective and subjective outcomes. The results of this study show that a communication based team building intervention does no significantly increase objective team performance, perceived frequency and quality of communication, and felt cohesion between team members. Secondly, the results demonstrate that an increase in perceived communication and felt cohesion does not lead to a significant increase in objective performance.

Nowadays team building is a widely used phenomenon in the business sector. Companies want their employees to work as efficient and productive as possible. For this reason it is essential that the teams, employees work in, are able to have a successful group process. This successful group process is thought to be developed and stimulated by team building activities. Even though team building is a widely used phenomenon, research is inconsistent and limited. Previous research showed inconsistent findings in the effectiveness of team building. For the business sector, however, it is important that their investment in team building has a certain return of investment. In other words this means that the business sector wants a team building to be effective in order to invest in it. A team building therefore needs to increase employee effectiveness or productiveness in order to be interesting enough to invest in for the business sector. This research will answer the question whether a communication based team building intervention increases the actual performance of teams.

Team

A large variety of definitions for team can be found in literature (Woodman & Sherwood, 1980; Hanson & Lubin, 1988; Tannenbaum, Beard & Salas, 1992). For the definition of team it is important that a clear distinction can be made between a group and a team. A definition that contains most components, of the team definitions used in literature, is: "A team is two or more individuals that need to interact interdependently and adaptively in order to attain a shared goal" (Salas, 1993; Klein et al., 2009). This definition states that two or more individuals need to have a shared goal, that these persons have to be interdependent, and that these persons need to interact, which means there has to be communication and an exchange of information.

According to Forsyth (2009) teams distinguish themselves from groups by having a clear division of roles and a shared responsibility for the outcomes.

Therefore, in the locally-developed definition of team, which will be used in this study, these two components were added to the already existing definition. The definition of team that will be used in this study is:" A group of at least two people who have a shared goal, are interdependent, have a shared responsibility, have a division of roles, and have a communication and information structure."

Team building

To enhance the functioning of teams, organizations use a variety of ways that increase team performance (Porras & Berg, 1978; Salas, 2008). A well-known way to enhance team functioning is team building (Porras & Berg, 1978; Klein et al., 2009).

Salaz, Rozell, Mullen and Driskell (1999) identified four key components of team building, which are supported and shared by various other definitions of team building. The first component of team building is goal setting, which emphasizes the development of both individual and group goals and planning the way to achieve these goals. The second component is interpersonal relations. This component underlines the development of communication skills, sharing emotions and reciprocal supportiveness. The third component is problem solving, which emphasizes identifying important problems and planning how to solve these problems. Finally, the last component is role clarification. This component emphasizes increased communication, among team members, about the roles in the team.

Next to these four components, Forsyth (2009) mentioned the importance of knowledge, skills and abilities for team performance. Teams with insufficient KSA's are often not able to succeed on the tasks they have to fulfill. Therefore it is important that team building provides teams with sufficient knowledge, skills and abilities to perform successfully.

Important factors that can contribute to successful performance are communication based KSA's (Forsyth, 2009). Team members require a lot of fine-tuned messaging and listening skills, in order to be effective communicators.

All four components of team building have one thing in common, they all require communication. The team building in the current study therefore focusses on the improvement of communication skills as good communication is essential to improve all four components. This leads to the following locally-developed team building definition: "Team building is an intervention which increases team outcomes by improving communication skills in order to make teams better able to set goals, improve their interpersonal relations, solve problems, and clarify their roles within the team.

Salaz, Rozell, Mullen and Driskell (1999), however, did not find any significant results of team building on performance as a function of goal setting, interpersonal relations, or problem solving. They did find role clarification to be a significant predictor of the effect of team building on team performance. Salaz, Rozell, Mullen and Driskell (1999) distinguished subjective and objective performance outcomes. A few years earlier, Tannenbaum, Beard and Salas (1992) mentioned that a major flaw in research on team building is the fact that most researches mainly focus on subjective performance measures. Subjective performance measures are perceptions, of team effectiveness, of the team members. Objective performance measures are measures of directly countable behaviors like costs, amount of products produced, and amount of time used to reach a certain goal (Salaz, Rozell, Mullen & Driskell, 1999). An increase in objective performance is the most interesting outcome for organizations as this could lead to the fact that the value of the team building intervention exceeds, or is at least as high as, the costs of investing in the team building. This is also known as the return of investment (Williams, Graham & Baker, 2003).

Only when the return of investment is large enough, it will be interesting for organization to invest in the team building intervention.

A well tested method to measure objective performance is the Marshmallow challenge which was developed in 2002 by Peter Skillman. After its development the Marshmallow challenge has been tested worldwide by Tom Wujec, an award winning innovator. The marshmallow challenge is a task which consists of two goals. First, teams have to build a tower, which is stable enough to hold a marshmallow on top of it, that is as high as possible. The second goal is to build a tower that is as cheap as possible. As materials for the tower cost money, the tower has to be built with as few materials as possible. Therefore material usage has to be efficient and materials waste has to be limited. Because a higher tower will always cost more materials to build, the number of materials used says something about the efficiency of the team. A more detailed description of the task will be given in the method section. According to Daoudy & Verstraeten (2013) teams with proper verbal communication are more likely to achieve a higher performance on the marshmallow challenge. The current study uses the Marshmallow challenge to test whether a communication based team building leads to an increase in objective performance. This led to the two following hypotheses:

Hypothesis 1a: Teams that receive a communication based team building intervention will build a higher tower.

Hypothesis 1b: Teams that receive a communication based team building intervention will build a tower with fewer materials.

Klein et al. (2009) made another distinction in outcomes of the team building intervention. According to Klein et al. (2009) the outcomes can be divided in cognitive outcomes, affective outcomes, improved team processes, and performance-related outcomes. Cognitive outcomes are outcomes on teamwork competencies and declarative knowledge.

Affective outcomes are outcomes on trust, cohesiveness, and team potency. Process outcomes are outcomes on communication and coordination. Finally, performance outcomes are outcomes on for example the amount of sales or productivity (Klein et al., 2009). Research showed that team building, including the earlier mentioned components, significantly increases cognitive, affective, process and performance-related outcomes. However, team building is most effective for affective and process outcomes. In contrast with the study conducted by Salaz, Rozell, Mullen and Driskell (1999), Klein et al. (2009) showed that all team building components have a significant effect on team outcomes. Goal setting and role clarification appear to have the most effect (Klein et al., 2009).

As process outcomes and affective outcomes are influenced most by team building, it can be concluded that both communication, which is a process outcome, and cohesion, which is an affective outcome, are important factors that are influenced by team building

Communication can be defined as an effective mechanism which translates, shares and integrates new information into processes (Hirst & Mann, 2004). Research showed that communication is significantly increased by team building (Klein et al., 2009). Additionally, good communication is known to lead to an increase in group performance (Stout, Cannon-Bowers, Salas & Milanovich, 1999; Snyder & Morris, 1984). According to Hirst and Mann (2004) task communication, which is defined as transmission of information, feedback, and the clarity of objectives, is the strongest and most consistent predictor of performance. The effects of team building on communication, and the effects of communication on group performance led to the following hypotheses.

Hypothesis 2a: A communication based team building intervention will lead to an increase in perceived communication between the team members.

Hypothesis 2b: Teams that will perceive more and a higher quality of communication between team members will build a higher tower.

Hypothesis 2c: Teams that will perceive more and a higher quality of communication between team members will use less material to build a tower.

Another important factor which is influenced by team building is cohesion. Cohesion can be defined as the processes that keep members, of both small and large groups, united and together in different ways and situations (Dion, 2000). In other words it is a sense of connectedness that causes team members to work together in order to reach a shared objective (Williams, Graham & Baker, 2003). Team building significantly increases cohesion (Klein et al., 2009; Stevens & Bloom, 2003; Williams, Graham & Baker, 2003). Research showed that cohesion is not only strongly correlated with performance at group level (Beal, Cohen, Burke & McLendon, 2003). It also showed that cohesion is the cause of performance at group level (Chang & Bordia, 2001). Williams, Graham and Baker (2003) even concluded that cohesive groups are more effective at achieving their goals that groups that are not cohesive. The effect of team building on cohesion, and the effect of cohesion on performance led to the following hypotheses.

Hypothesis 3a: A communication based team building intervention will lead to an increased feeling of cohesion between the team members.

Hypothesis 3b: Teams that feel more cohesive will build a higher tower.

Hypothesis 3c: Teams that feel more cohesive will build a tower with less materials.

The current study mainly focusses on improving communication. However, due to high positive correlation between communication and cohesion (Morrison & Zetlin, 1988; Rodick, Henggeler, & Hanson, 1986), cohesion will be measured as well.

Both communication and cohesion are measured as subjective constructs, being perceived communication and felt cohesion. By both using objective measures, like objective performance on the Marshmallow challenge, and subjective measure, like communication and cohesion, this research will answer the questions whether a communication based team building increases the actual performance of teams.

Method

Participants

183 students from Tilburg University (39 men, 144 women) participated in the study. All participants received either course credits or an amount of eight euro's as a reward for their participation. Participants were tested in groups of 3 participants. The group size was determined by the fact that participants were mainly recruited by a participant registration system at Tilburg University which only contained a limited amount of first year Psychology students. Prior research about the moderating effect of group size, in the relation between team building and its outcomes, is inconsistent. Klein (2009) found that the effects of team building are most likely to be found in large teams, which consist of 10 members or more. Salaz, Rozell, Mullen and Driskell (1999), on the other hand, found that the positive effects of team building are most likely to occur in small teams. Due to inconsistency in prior research, and the fact that the study could only continue when all participants would show up, the small group size of 3 participants was most ideal for the current study. Even though the group size was small, still a lot of dropouts occurred due to no-shows of enrolled participants, leading to incomplete groups.

Procedure

At the start of the experiment, participants were randomly assigned to either the control or the experimental condition.

Both conditions were identical, except for the communication based team building intervention which only participants in the experimental condition received. To compensate the time spend on the team building intervention, the first two activities were extended in the control condition to ensure that participants in both conditions took approximately one hour to complete the study. This way there were no differences, between the conditions, in the time participants spent together, which therefore cannot be a confounding variable. A flow of the procedure is graphically displayed in figure 1.

Figure 1
Flow of Participants Through the Study Procedure

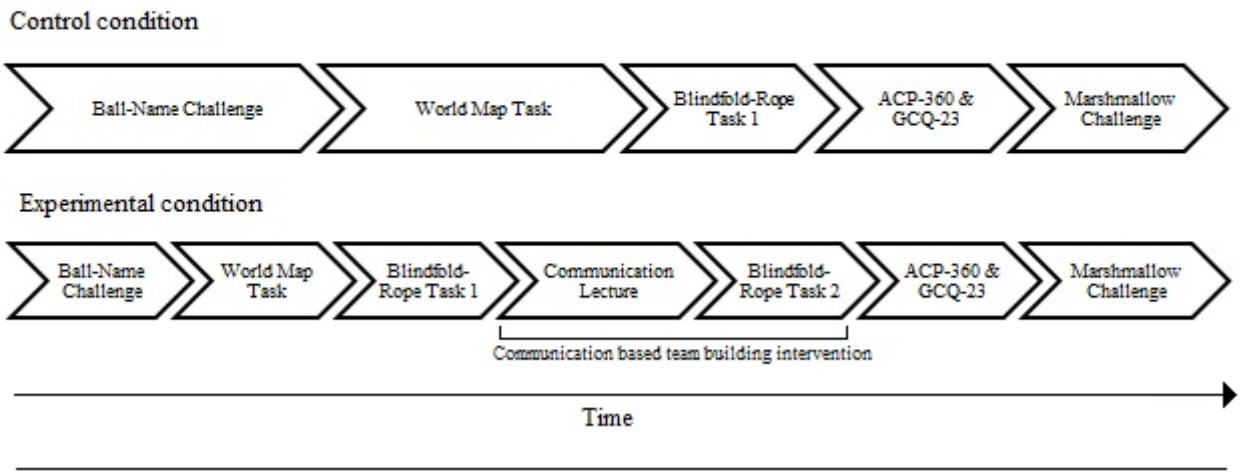

Figure 1: The flow of participants through the study procedure in which a distinction is made between the control and the experimental condition. The longer the step in the procedure is pictured in the figure, the longer this step took in the study procedure. Both conditions took an equal amount of time to finish the study.

After participants read and accepted the consent form, they were asked to take place in the middle of the room. The experimenter then asked them to imagine that a fictitious company hired the three of them as a team, and wants them to perform the following activities as effective as possible.

In order to transform the groups of three participants into an actual team, two introductory activities were used. First participants performed the ball-name challenge, after which they performed the world map task.

During the ball-name challenge, participants learned each other's names and personal characteristics such as interests and hobby's. The challenge contained two phases which were each other's opposites. During the first phases participants had to say their own name in combination with a characteristic that they identify themselves with. After that they had to throw a soft orange ball to one of the other participants who would follow the exact same procedure. Participants were free to use any personal characteristic they wanted. Participants were told to remember both the names and the characteristic of their fellow team members for the second phase of the ball-name challenge. In the experimental condition this was repeated three times and in the control condition this was repeated seven times. During the second phase of the ball-name challenge the participants had to mention the names of both participants and one characteristic of the last participant they mentioned. After that they had to throw the ball to the last mentioned participant who repeated this procedure. The characteristic had to be identical to the ones that were mentioned during the first phase. When a participant did not remember a characteristic they were allowed to ask their fellow team members for help. This procedure was repeated till all personal characteristics from the first phase were mentioned.

Next, participants performed the world map task. Participants were asked to imagine a map of the Netherlands on the floor on which the north, south, and location of Tilburg were pointed out by the experimenter. Participants had to answer where they were born, where they went to primary school and high school, and where they had their first job. Next to mentioning the specific place, participants had to walk to this location on the imaginary map. The experimenter noted that it did not matter whether the participants walked to the exact right place on the imaginary map. For the last two questions, the experimenter asked the participants to imagine the world map instead of the map of the Netherlands. Again both the direction of the north and the south were pointed out.

Finally participants were asked to answer, and walk to the locations, of the destination they had their best trip or holiday and the destination they would like to travel to. Both conditions were identical except for the fact that in the control condition this activity was extended, by asking participants to give some information about the answer they gave, to ensure participants in both conditions spent an equal amount of time together.

When the participants finished the introductory tasks, both conditions performed the first blindfold-rope task. The experimenter explained that verbal communication was required to successfully complete the task. Participants had to make a letter ‘T’ with a 5 meter long rope while being blindfolded. In total they had 5 minutes to complete this task. Participants were allowed to stop before the 5 minutes were over, but only when all team members agreed that they succeeded in making the required figure.

After the first blindfold-rope task the control condition continued to the questionnaires. The participants in the experimental condition continued with the communication base team building intervention. The experimenter asked whether they thought the pervious task was successful, and what they thought that could be improved. Next, the experimenter gave a short lecture about effective team communication including listening, summarizing and asking open questions. The participants were told that it was not only important to listen to what someone says, but that factors like posture, volume, and tone are at least as important. About summarizing the experimenter told that, even though it might feel unnatural, if verifies whether both people think along the same line. Finally, participants were told to ask open, instead of closed, questions in order to keep the conversation going.

After the communication lecture, participants in the experimental condition had to redo the blindfold-rope task.

The first blindfold-rope task was identical to the second blindfold-rope task. The only difference was that instead of the letter 'T', during the second blindfold-rope task, participants had to make a hourglass shape. Redoing the blindfold-rope task is a crucial aspect of learning in the intervention, as the techniques explained during the lecture, could be applied during the repetition of this task.

For the control condition after the first blind-fold-rope task and for the experimental condition after the second blind-fold-rope task, both conditions filled in a communication questionnaire and a cohesion questionnaire. All questionnaire were made in Qualtrics, an online survey tool.

The communication questionnaire was a Questionnaire adjusted from the ACP-360[1] (Lelliott, Williams, Mears, Andiappan, Owen, Reading, Coyle & Hunter, 2008). This questionnaire was used to measure the perceived frequency and quality of communication between the team members during the previous tasks, also known as subjective communication. The communication questionnaire consisted of 17 items that had to be answered on a 5-point Likert scale. The first part of the questionnaire consisted of 10 statements about all team members, of which no items were reversed. The second part of the communication questionnaire consisted of 7 statements about the individual participants, of which 2 items were reversed. An example of a question from the first part is: "The team members are open for receiving feedback". An example of a question from the second part is: "I regularly talk about topics that are irrelevant for completing the task".

[1] The Dutch version of the *communication questionnaire* that was used for this study can be found in Appendix A.

The cohesion questionnaire was a questionnaire adjusted from GCQ-23[2] (Trijsburg et al., 2004). This questionnaire was used to measure the felt cohesion between the team members, also known as subjective cohesion. The cohesion questionnaire consisted of 17 items that had to be answered on a 6-point Likert scale. Five items of this questionnaire were reversed. An example of a question from the cohesion questionnaire is: ”I feel accepted in this group”.

After filling in the questionnaire, both conditions performed the marshmallow challenge, as a means of measuring objective performance. The goals of this task was building a tower that was as high as possible, as cheap as possible, and able to hold the weight of a marshmallow on top of it. Both the height and the number of materials were measured as an indicator of objective performance, as they are both measurable outcomes of the process. The participants had a budget of €50.000,- to buy materials that cost €500,- a piece. The materials that could be bought were sticks of uncooked spaghetti, X centimeter long pieces of tape, and X centimeter long pieces of rope. Participants were dependent on each other, because every participant could only buy one type of material. When a piece of material was bought, all participants were allowed to build with it. Bought materials were allowed to be modified, for which scissors were present. The marshmallow, which participants received for free at the start of the challenge, had to remain in its original form. However, participants were allowed to stick sticks of spaghetti into the marshmallow. The time limit of the marshmallow challenge was 20 minutes, after which the height of the tower was determined by measuring the difference between the table and the top of the marshmallow. When all team members agreed on stopping before the time limit was over, the task ended as well.

[2] The Dutch version of the *cohesion questionnaire* that was used for this study can be found in Appendix B.

Towers that collapsed due to instability or towers that were not able to hold the weight of the marshmallow, were counted as 0 centimeters.

Finally, both conditions had to fill in a short demographic questionnaire and a question to check whether they knew what the study was about. After a brief explanation of the purpose of the study, all participant received either their course credits of the 8 euro's as a reward of their participation.

Results

First, the groups that gave a correct answer to the question: "What do you think the study is about", were filtered out. Only one participant gave a correct answer to this question, by explicitly mentioning the study was about team building. As filtering one participant out would lead to an incomplete team, the whole group was filtered out. For this reason a total of 3 participants were filtered out. In total 180 participants remained for the analysis of which 86 participants were in the control condition and 94 participants were in the experimental condition.

On the communication questionnaire and cohesion questionnaire an analysis was performed on the individual scores. The reason for this is that all participants had an individual score on both questionnaires. On the objective performance measures an analysis was performed on the group scores. All participants within the same team had an identical score on the objective performance measure. Therefore only 1 score per team was used in the analysis.

Height of the tower

The first objective performance measure on which an analysis was performed, is the height of the tower. Only one height measure was used for every single team.

Because all participants within the same team had identical scores on the height of the tower they built, no average score had to be computed for this analysis. There was no maximum height participants could score. A higher score indicates a tower that was higher in centimeters, indicating a better objective team performance. When a tower collapsed under the weight of the marshmallow or due to instability, the height of the tower was counted as 0 centimeters. An independent samples test was performed to analyze the difference between the two conditions. No significant differences were found between the control condition (M = 33,03; SD = 19,76) and the experimental condition (M = 28,29; SD = 15,68) on the height of the towers t(58) = 1,03, p =.31.

Number of materials

For the number of materials that were used to build the tower, the total amount of used materials was computed by adding the number of spaghetti sticks, the pieces of tape and the pieces of rope together. This way the score that was used in the analysis, represented the total amount of materials that each team used to build its tower. Again, the groups scores were used in the analysis, leading to the inclusion of only 1 score per group due to identical scores for participants within the same group. A higher score indicates that more materials were used to build the tower. Lower scores indicate more efficient use of materials and less waste of materials. An independent samples test was performed to analyze the differences between the control condition (M = 20,55; SD = 9,15) and the experimental condition (M = 21,32; SD = 16,15) , but no significant difference was found between both conditions t(58) = -0.23, p = .82.

Perceived communication

The first subjective measure on which an analysis was performed is perceived communication.

For each participants the scores on all questions of the communication questionnaire were totaled up and divided by the number of questions to create one communication questionnaire score for every participant. Higher scores on the communication questionnaire indicate a higher perceived frequency and quality of communication between team members. An independent samples test was performed to analyze the difference between the scores of the two conditions. No significant difference was found between the control (M = 4,41; SD = 0,44) and experimental condition (M = 4,17; SD = 0,44) on perceived frequency and quality of communication between team members t(178) = -0.45, p = .66.

The effect of an increase in communication on objective performance

Additionally, an analysis was performed on whether an increase in the perceived amount and quality of communication led to building a higher tower and using less materials to build this tower. For both effects a regression analysis was performed. The results showed no significant increase in the height of the towers β = .07, t(178) = 0,89, p=.34 , caused by an increase in perceived frequency and quality of communication. Next to that, no significant decrease in the numbers of used materials to build the tower was found β = –.09, t(178) = -1.21, p=.23 to be caused by an increase in perceived amount and quality of communication.

Felt Cohesion

For the analysis on the felt cohesion, for each participant the scores on all questions on the cohesion questionnaire were totaled up and divided by the amount of question so every participants had one mean cohesion questionnaire score. High scores on the cohesion questionnaire indicate that participants felt more cohesion between the team members. An independent samples test was performed to analyze the difference between both conditions. No significant difference was found between the control condition (M = 4,73; SD = 0,53) and the experimental condition (M = 4,77; SD = 0,52) on felt cohesion t(178) = -0.50, p = .62.

Effect of an increase of cohesion on objective performance

The final analysis was performed to test whether an increase in the cohesion, that was felt between the team members, led to building a higher tower and using less materials to build this tower. A regression analysis resulted in no significant increase in the height of the tower $\beta = .08$, $t(178) = 1.03$, $p=.30$, caused by an increase in felt cohesion between team members. For the number of materials that teams used, no significant decrease $\beta = -.01$, $t(178) = -.12$, $p=.91$, due to an increase of felt cohesion between the team member, was found as well.

Discussion

The current study was designed to examine the effect of a communication based team building intervention on objective team performance. More specifically, this study wanted to explore whether a communication based team building would increase the objective performance of a team. Additionally, it examined whether perceived communication and felt cohesion between the team members, increased as a result of the team building intervention. Where prior research mainly focused on subjective performance measure, this study is the first to have the main focus on objective performance.

We proposed that a communication based team building intervention would increase the objective performance of a team. More specifically, we proposed that teams, that received a communication based team building intervention, would build a higher tower and would use less materials to build their tower in the Marshmallow challenge (hypotheses 1a & 1b). The analysis resulted in no significant difference in height of tower between the team that did and the teams that did not receive the team building intervention. In other words, both condition built towers of the same height, despite the fact whether they received a team building intervention or not. The analysis for the number of used materials resulted in no significant difference between the conditions as well.

Both the teams that received a team building intervention and the teams that did not receive this intervention, used the same amount of materials to build their tower. This leads to the conclusion that the communication based team building intervention had no effect on both the efficiency of material usage and the waste of materials. In the end no significant effect was found for both the objective performance measures. Even though Salas, Rozell, Mullen and Driskel (1999) suggested the use of objective performance measures instead of only subjective performance measures, they only found a significant effect of team building on subjective performance. They did not find, consistent with the current study, an effect of team building on objective performance. Therefore it can be suggested that team building does not significantly influence the objective team performance. For the current study it is worth noting that the non-significance might be explained by the fact that participants in the control condition spent the same amount of time together, as participants in the experimental condition, due to extension of the introductory tasks. This extension might have had an effect comparable with the effect of the team building intervention, leading to equal outcomes on objective performance measures.

Furthermore, we proposed that a communication based team building intervention would increase the perceived frequency and quality of communication (hypothesis 2a). We also expected an increase in objective performance as a result of increased perceived communication (hypothesis 2b & 2c).

The analysis resulted in no significant increase in perceived communication caused by the team building intervention. In other words, despite whether they received a team building intervention or not, all participants perceived the same frequency and quality of communication. Prior research supports these findings. Salas, Rozell, Mullen and Driskell (1999) did not find a significant effect of team building on interpersonal relations.

In which interpersonal relations was defined as mutual supportiveness, communication and sharing of feelings. Research found that newly formed groups, like the teams in this study, encounter several communication problems (Finholt, Sproull,& Kiesler, 1990). In newly formed groups, group's members status and expertise might be ambiguous with respect to each other. Due to absence of a prior social structure, group members are forced to develop a new structure for information, including norms, a division of labor and rules for reporting progress towards the goals. Newly formed groups might also emphasize task completion instead of the development of frequent and qualitatively good communication, due to relatively short task goals (Finholt, Sproull,& Kiesler, 1990). Future research might therefore focus on team building in already existing teams, in order to rule out the influence of these communication problems.

The effect of perceived communication on the objective performance was not significant for both the height of the tower and the number of used materials. In other words this means that participants that perceived a higher frequency and a better quality of communication, did not build higher towers and did not use significantly less materials. Both results are the opposite of the expectation that better communication would lead to an increase in group performance (Stout, Cannon-Bowers, Salas & Milanovich, 1999; Snyder & Morris, 1984). A possible explanation for these results is information overload. Information overload occurs when the time for processing information is exceeded by the time an individual needs to perform interactions and internal calculations which are essential for processing the information (Schick, Gordon & Haka, 1990). An increase in frequency and quality of information can lead to an increase in performance until an optimal point of information has been reached. Past this optimal point, too much information will lead to a decrease in decision making performance (O'Reilly, 1980). A decrease in decision making performance could explain why no significant improvement was found on the objective performance measures.

However, more recent research did not find a clear relationship between information overload and the efficiency and quality of task performance (Kock, 2000). Whether information overload is the cause for these non-significant results remains inconclusive. We, however, are able to suggest that in the current study the increase in communication was either not large enough to significantly increase group performance, or that for both conditions the communication levels were around the optimal point and therefore did not increase significantly anymore. The last one seems highly unlikely, taken into account that current study focused on newly formed teams.

In addition, we proposed that a communication team building intervention would increase the cohesion felt by the team members (hypothesis 3a). We expected that this increase in cohesion would lead to an increase on the objective performance measures (hypotheses 3b & 3c).

The effect of a communication based team building intervention on the cohesion that was felt between team members was not significant. This means that participants who received a team building intervention did not feel more cohesive than participants who did not receive the intervention. Prior research showed that cohesiveness within teams improves when length of membership increases (Harrison, Price & Bell, 1998). When length of membership increases, the importance of surface-level factors, such as gender, age, and sex, decreases. On the other hand, the importance of deep-level factors, such as attitude, knowledge, and skills, increases (Harrison, Price & Bell, 1998). First of all the current study focused on newly formed groups. This means that the team members were not yet a member of the team prior to the study. Another important factor is the duration of the study. The study took only one hour to complete. Meaning that the length of membership was only one hour for each participant. Based on these two factors it can be concluded that the length of membership may have been too short for a significant increase in cohesion.

Prior research showed that cohesion is the cause of the increase of group performance (Chang & Bordia, 2001). The current study, however, did not find a significant increase in objective team performance caused by an increase in cohesion. Participants who felt more cohesion between their team members did not build higher towers, and did not use less materials, than participants who felt less cohesive. According to Carless and De Paola (2000) cohesion can be divided in task cohesion, the degree of commitment to the task, social cohesion, the degree to which members socially interact, and individual attraction to the group, the extent to which the group was seen as an attractive social group by every individual team member. The current study measures both social cohesion and individual attraction to the group. However, prior research found that only task cohesion is significantly related to the performance of a group (Carless & De Paola, 2000). Additionally, cohesive groups gain a special advantage when the main goal of a task is efficiency instead of successful completion of the task (Beal, Cohen, Burke & McLendon, 2003). Even though efficiency, in this study represented by the number of materials that were used to build the tower, was an important goal, the successful completion of the task, represented by the height of the tower and the tower's ability to hold the weight of a marshmallow, was far more important. Because the main goal of the current study was successful completion of the task, cohesion might not have influenced the objective performance measures. It is also worth noting that cohesion only positively influences performance behaviors, but does not influence the results or consequences of these behaviors (Beal, Cohen, Burke & McLendon, 2003). Therefore we are able to suggest that an increase in cohesion might have increased performance behaviors, which did not result in a significant increase in objective performance.

Limitations

It is worth noting some shortcomings of the current study. Some of these shortcomings might be taken into account in future research. The first shortcoming of this study is the standardization of the procedure. As four different researchers led the study procedures, it is difficult to determine how standardized the procedures were. Prior to the study all researchers tried to standardize the process as much as possible, by performing a few practice rounds. However, because different researchers led the groups, and different groups come up with different interactions and different questions, it is difficult to totally standardize the study procedure. Future research might try to fully standardize the procedure, so differences in the procedure cannot influence the results.

A second shortcoming is the fact that the communication based team building intervention might have been too short. In total every team participated in a one-time team building intervention that took one hour to complete. According to Salas, Rozell, Mullen & Driskell (1999) shorter team building intervention are more effective than longer team building interventions. However, it could be argued that the current team building intervention was simply too short. Next to that, Hanson and Lubin (1988) recommend that for team building to be successful, team members should accept that team building is not a one-time procedure but rather an ongoing process, and that team members should be committed to meet regularly. For this study, participants only performed a one-time team building intervention. This means that, for team building to be effective, it might be crucial to repeat the same process several times or to implement several team building meetings. Future research could take both the duration of the team building intervention and the number of team building meetings in account.

Conclusion

This study examined whether a communication based team building intervention had an effect on both objective and subjective team outcomes. Objective team outcomes were represented by objective performance on the Marshmallow challenge. Subjective team outcomes were represented by the perceived frequency and quality of communication, and felt cohesion between team members. For both subjective team outcomes, this study examined whether they had a positive effect on objective performance as well. The results showed no significant effect of a communication based team building intervention on the objective performance measures, perceived communication, and felt cohesion. Additionally, no significant effect of perceived communication and felt cohesion was found on objective performance.

Even though the effect of team building on team performance remains inconclusive, the current study shows that objective performance measures and subjective measures of communication and cohesion are not influenced by a team building intervention that focusses on the improvement of communication.

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Appendix A

The Dutch version of the communication questionnaires which were used in the study. Both questionnaire are based on the ACP-360 (Lelliott, Williams, Mears, Andiappan, Owen, Reading, Coyle & Hunter, 2008).

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

	Helemaal mee oneens	Mee oneens	Noch mee eens, noch mee oneens	Mee eens	Helemaal mee eens
De teamleden luisteren actief naar elkaar.					
De teamleden geven elkaar de gelegenheid om hun mening te uiten.					
De teamleden delen relevante informatie met elkaar met betrekking tot de taak.					
De teamleden communiceren duidelijk en helder naar elkaar.					
De teamleden staan open voor suggesties van alle leden.					
De teamleden maken beslissingen op basis van inbreng/informatie van alle teamleden.					
De teamleden zijn bereid om elkaar te confronteren met problemen of onduidelijkheden.					
De teamleden zijn in staat om consensus te bereiken over meningsverschillen.					
De teamleden staan open voor het krijgen van feedback.					
De teamleden dragen iets bij aan het groepsproces.					

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

	Helemaal mee oneens	Mee oneens	Noch mee eens, noch mee oneens	Mee eens	Helemaal mee eens
Ik luister actief naar mijn teamleden.					
Ik geef de teamleden de gelegenheid om hun mening te uiten.					
Ik praat veel over zaken die niets met de taak te maken hebben.					
Ik communiceer informatie helder en duidelijk naar mijn teamleden.					
Ik sta open voor suggestie van mijn teamleden.					
Ik sta niet open voor feedback van het team.					
Ik neem actief deel aan het groepsproces.					

Appendix B

The Dutch version of the cohesion questionnaire which was used in the study. The cohesion questionnaire was based on the GCQ-23 (Trijsburg et al., 2004).

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

	Erg mee oneens	Mee oneens	Een beetje mee oneens	Een beetje mee eens	Mee eens	Erg mee eens
Over het algemeen doet iedereen mee in deze groep	○	○	○	○	○	○
In een andere, soortgelijke, groep zouden er wat mij betreft dezelfde soort mensen in mogen zitten als nu	○	○	○	○	○	○
Ik voel me betrokken bij wat er in de groep gebeurt	○	○	○	○	○	○
Deelname aan deze groep levert mij weinig op (denk hierbij niet alleen aan eventuele proefpersoonuren of een gedelijke vergoeding)	○	○	○	○	○	○
Er zijn mensen in de groep die ik als persoon graag mag	○	○	○	○	○	○
De groep laat me koud	○	○	○	○	○	○
Ik probeer met groepsleden mee te denken als ze ergens niet uitkomen	○	○	○	○	○	○
Na deze bijeenkomst zou ik de mensen uit deze groep willen blijven ontmoeten	○	○	○	○	○	○
Ik voel me buiten de groep staan	○	○	○	○	○	○
Ik vind dit een prettige groep	○	○	○	○	○	○
Ik schiet maar weinig op met deze groep	○	○	○	○	○	○
Er zitten mensen in de groep met wie ik ook buiten deze bijeenkomst zou willen omgaan	○	○	○	○	○	○
In deze groep werken we goed samen	○	○	○	○	○	○
Ik voel me geaccepteerd door de groep	○	○	○	○	○	○
De groep vormt een eenheid, ook al zijn er individuele verschillen	○	○	○	○	○	○
Ik voel afstand tussen sommige groepsleden en mijzelf	○	○	○	○	○	○
De uitgevoerde activiteiten met deze groep bevorderen mijn persoonlijke ontwikkeling	○	○	○	○	○	○