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MEMBER FAMILIARITY AS A PREDICTOR OF TEAM ADAPTATION

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MEMBER FAMILIARITY AS A PREDICTOR OF TEAM ADAPTATION

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Abstract

This research investigated between-subjects effects of team member familiarity on team performance and adaptation with cognitive ability and task experience as covariates. Fifty-two two-person teams, comprised of members who were either familiar or unfamiliar with each other, participated in 10 trials of an interactive computer game. Midway through the trials, the nature of the task was changed substantially. Performance scores were recorded after each trial. It was observed that member familiarity was not significantly related with overall task performance but that cognitive ability and specific task experience were. Familiar team members experienced a significantly smaller post-change drop in performance when cognitive ability and task experience were controlled for. Familiarity, cognitive ability and task experience were not related to the post-change reacquisition of previous performance levels. Taken together, these results suggest the need for further investigation of the links between team composition, performance and adaptation among teams operating in dynamic situations.

Keywords: Member Familiarity, Team Composition, Team Performance, Team Adaptation

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Member Familiarity as a Predictor of Team Adaptation

In this current corporate environment characterized by widespread globalization, advancement of technology, frequent management changes, mergers and acquisitions, and other such competitive demands on a regular basis, the ability to adapt has become a key predictor of success as it provides a competitive advantage (Pulakos, Schmitt, Dorsey, Arad, Borman, & Hedge, 2002; Stagl, Burke, Salas, & Pierce, 2006). To this end, organizations are consistently attempting to select for and train workers and work teams to become more 'adaptable'. This has prompted considerable research interest in the last decade in defining adaptation at the individual level and relating it to organizationally relevant variables (Ilgen & Pulakos, 1999; Pulakos, Arad, Donovan, & Plamondon, 2000; Smith, Ford, & Kozlowski, 1997). Unfortunately, there has been little consensus on a widely accepted model of adaptation on an individual level, and much less so on the team level (Burke, Stagl, Salas, Pierce, & Kendall, 2006; Kozlowski, 1998).

This thesis summarizes literature relating to adaptation in the workplace at the individual and team level, with more emphasis on the latter. An attempt is made to synthesize current literature relating to the factors that influence the adaptability of teams in the workplace, including task experience and cognitive ability. Familiarity between members of teams is examined as a novel predictor that may influence team performance and adaptability of teams to changing situations in complex tasks in addition to cognitive ability and/or task experience.

Literature Review

Team effectiveness

Organizations are constantly striving to make work teams more 'effective'. As a measure to increase efficiency in organizations, teams often develop 'habitual routines' which serve to standardize and streamline team responses to the usual stimuli (Gersick & Hackman, 1990). However, effective teams are supposed to be those that can make adjustments to member roles and task routines when the situation changes in an unexpected manner (Argote & McGrath, 1993). Thus, if team effectiveness can be classified into its effectiveness in both static and dynamic environments, a team's adaptability is in fact its effectiveness in dynamic situations. This was also argued for by Coovert, Craiger and Cannon-Bowers (1996) (as cited in Marks, Zaccaro & Mathieu, 2000) who suggested that a team has to be both adaptive and dynamic to be effective. Hence, team adaptation is a key factor of team effectiveness, especially for teams that exist and operate in these dynamic conditions, such as surgical and flight crews, and police personnel and fire-fighting teams. Despite this, very limited research attention has focused specifically on team adaptability and its predictors (Campbell & Kuncel, 2001; LePine, 2003; Marks et. al, 2000).

Adaptability in workplace

Formation and utilization of work teams is one of the ways organizations make themselves more adaptable to changing situations (Burke et al., 2006; LePine, 2003). Teams, as a virtue of having multiple members, have a more varied skill set and different sets of expertise and can thus presumably adapt to changing situations more efficiently by accessing these as needed. As adaptability is a much sought after skill in the industry, the use of teams has increasingly become more common (LePine, 2003).

Team adaptability as a skill is even more crucial in the case of 'action teams' (Marks et al., 2000). 'Action teams' refer to those teams that are 'proactive' and interact with their environment extensively and face novel situations on a regular basis as a result of operating in dynamic environments (Marks et al., 2000). Hence, examples of action teams would be emergency teams such as firefighters and police crews. As these teams operate in dynamic situations, their adaptability is a key factor that determines their effectiveness. Due to the large variety of novel situations that such teams may face, however, it is impossible to simply train them for every possible eventuality. Besides, for such kinds of teams specifically, their ability to assess and adapt to situations can often mean the difference between life and death. Hence, organizations comprised of such teams seek ways to select for team members that are more 'adaptable' or try to train teams to be more 'adaptable'. Despite the organizational relevance of, and emerging interest in, team adaptability, the literature on this subject area remains very limited.

Team adaptation is different from other constructs such as team learning and team innovation, although learning and innovation may both be involved in the adaptation process (Burke et al., 2006). Adaptation by teams has been defined in multiple ways. An early paper by Cannon-Bowers, Tannenbaum, Salas, & Volpe (1995) defines it as 'the process by which a team is able to use information gathered from the task environment to adjust strategies through the use of compensatory behaviors and relocation of intra-team resources'. Team adaptation has also been defined as teams being able to 'derive and use new strategies and techniques for confronting novel elements in their environment' (Marks et al., 2000). An important adaptation strategy is 'role structure adaptation' defined as the 'reactive and unscripted adjustments in a team's system of member roles that contribute to team effectiveness' (LePine, 2003). This type of adaptation, is 'reactive' in that it is not spontaneous but is a response to a change in the environment, 'non-scripted' in that the strategy by which the team will adapt to a given situation is not pre-determined and it is an 'adjustment', which involves an action or a behavior thus making it distinct from just an increase in knowledge that occurs during 'learning' (LePine, 2003).

The ability to adjust to changing contexts and conditions in a workplace is a desirable skill in potential employees (Lang & Bliese, 2009; Pulakos et al., 2000). However, before attempting to hire 'adaptable' applicants or train existing employees to become more 'adaptable', it is imperative to determine the basic characteristics that comprise 'adaptable work performance' regardless of job and industry.

Pulakos et al. (2000) attempted to address this gap by utilizing subject matter experts to review critical incidents derived from multiple jobs and industries and conducted factor analyses to suggest an eight dimension model of adaptive work performance (Pulakos et al., 2000). These dimensions included handling emergencies or crisis situations, handling work stress, solving problems creatively, dealing with uncertain and unpredictable work conditions, learning work tasks, technologies and procedures, demonstrating interpersonal adaptability, demonstrating cultural adaptability and demonstrating physically oriented adaptability (Pulakos et al., 2000). A significant conclusion of this research was that adaptive performance is a construct with a number of variable dimensions that differ depending on the job and its specific task demands as well as the nature of the change (Pulakos et al., 2000).

This was followed by another study by Pulakos et al. (2002) which supported the eight dimension model and also investigated other predictors of adaptive performance such as cognitive ability, personality factors such as conscientiousness and openness to experience as well as past task experience (Pulakos et al., 2000; Pulakos et al., 2002), the results of which will be further discussed in a later section.

Burke et al. (2006) presented a detailed review of adaptive performance of teams and suggested a conceptual model for the same. The authors proposed a four-phase adaptive cycle which included the stages of situation assessment, plan formulation, plan execution and team learning (Burke et al., 2006). However, not much additional research has been carried out to expand upon or to further validate this model.

Task adaptation has commonly been studied using a 'task-change paradigm' (Lang & Bliese, 2009; LePine, 2003; LePine, 2005; LePine, Colquitt, & Erez, 2000). This paradigm involves presenting an individual or a team with a novel task such as a computer game that allows participants to engage either individually or interdependently (Lang & Bliese, 2009). The individuals or team engage in this task repeatedly over a number of trials when after a fixed number of trials, a certain feature of the task changes either without prior warning of the change or with only an unspecific warning without an extensive description of the nature of the change (Chen, Thomas, & Wallace, 2005; Lang

& Bliese, 2009; LePine, 2005). Performance and other outcome variables are observed before and after the change in the task to determine the level of loss of performance as well as the degree of improvement and the time needed for the participants to eventually adapt to the new task (Lang & Bliese, 2009). The change introduced may be characterized by a role change, a rule change or even a change in complexity of the task, each of which may be justifiably considered representative of the dynamic nature of the real world work environment (Chen et al., 2005; Kozlowski, Gully, Brown, Salas, Smith, & Nason, 2001; Lang & Bliese, 2009; LePine, 2005; Marks et. al, 2000).

Team adaptation to an unexpected change involves both 'transition adaptation' as well as 'reacquisition adaptation' (Lang & Bliese, 2009). Transition adaption refers to an individual or a team being able to minimize loss in performance level after an unexpected change while reacquisition adaptation refers to the ability of individual or team to re-attain a pre-change level of performance (Lang & Bliese, 2009).

Member Familiarity as a Predictor of Team Effectiveness

Member Familiarity refers to a 'group's history of interaction' (Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003) and this may potentially influence certain outcomes of the group's functioning. There are a number of work teams that spend a great deal of effort and resources keeping team members co-located and a part of the same team as much as possible, with a conviction that this may influence the general effectiveness of the team positively. This includes teams with critical outcomes such as police teams, firefighter teams as well as surgical crews. Hence, it would be interesting to empirically determine whether there is merit in keeping groups together over long periods of time to maximize familiarity between group members to positively influence group outcomes or whether this may in fact serve to impair certain outcomes of the group. As far as we have been able to determine, member familiarity among groups has been investigated as a predictor of team performance to a limited degree but has not been previously investigated as a predictor of team adaptation.

The literature concerning whether familiarity between the members of a group affects group outcomes positively or negatively is contradictory. Familiarity has been shown to improve performance on certain team tasks and lower it on other tasks, as discussed below. However, while interpreting these results, it should be taken into consideration that only a few empirical team studies deal with 'real' teams over time, and fewer still take member familiarity between team members into consideration, since it is usually non-existent in student groups, which are most commonly used in research (Harrison et al., 2003).

Familiarity has, in some studies, been shown to improve group performance, decision-making and productivity as well as reduce accidents (Goodman & Leyden, 1991; Harrison et al., 2003; Jehn & Shah, 1997; Shah & Jehn, 1993).

The Goodman and Leyden study (1991) was one of the first few articles studying familiarity, but it should be noted that in this article, familiarity has been not just defined as the particular knowledge of an individual about the members of one's team but also their familiarity with the 'machinery, physical environment, people, performance strategies, and jobs'. Hence, familiarity in this context is a combination of both task and member familiarity. In this study of 26 different crews of coal-workers, it was observed that lower levels of familiarity with the task, work conditions and group members led to lower productivity and a higher rate of accidents (Goodman & Leyden, 1991).

It is interesting to note that the studies mentioned used a variety of tasks to test these effects. For example, in the Jehn and Shah (1993) study, 'friends' performed significantly better than 'acquaintances' on both decision-making tasks as well as motor tasks such as model-building. Also, the 'friend' groups communicated more (both task-related and non-task related communication) than the 'acquaintance' groups, and the two groups also differed in the degree and type of conflict observed, which also seemed to lead to increased levels of performance by the 'friend' groups (Jehn & Shah, 1993). These results were replicated in a later study by the authors in which they also concluded that 'friend' groups displayed more group commitment and cooperation in addition to improved performance (Jehn & Shah, 1997).

Familiarity between team members has also been shown to increase the cohesiveness of a group (Harrison et al., 2003) and it is possible that through this indirect effect, it may improve the performance of a group. The Harrison et al. study (2003) had an interesting longitudinal experimental design which involved a comparison of the performance of previously familiar teams to that of teams that were formed in the laboratory but continued participating together over 3 weeks (the duration of the experiment) as well as with one-shot teams, which worked with each other in only one experimental session. It was observed that previously familiar teams had the greatest speed and quality of performance but continuing teams tended to acquire similar levels over time (Harrison et al., 2003). However, one-shot teams consistently had lower levels of performance.

In a small number of studies, familiarity has also been shown to lower performance and induce poorer decision making (Kim, 1997; Okhuysen, 2001). In the Kim (1997) study, teams that had experience with both the task and the team itself had a larger bias in terms of discussing commonly held information more often (as opposed to information held uniquely by one member). They also seemed to have lower levels of performance than teams with only task experience, or only team experience or neither in a decision-making task (Kim, 1997). The Okhuysen study (2001) showed that the imposition of formal interventions on familiar groups impeded their performance since it hindered pre-established communication patterns. This may indicate that familiar groups may have a harder time adapting to novel situations, especially if these affect their pre-established norms and communication patterns. Similarly, it has been hypothesized that familiarity may hinder performance when the team task is innovative as it will inhibit the generation of novel approaches to problems due to teams having developed habitual routines and established patterns of communication (Gersick & Hackman, 1990; Louis & Sutton, 1991).

It is also possible that both alternatives may be accurate, in that familiarity may affect performance either negatively or positively, and the effect of familiarity on group outcomes such as performance may in fact depend on the nature of the task (Harrison et al., 2003). The task we have chosen for this study is a novel task for all participants, and hence, no communication patterns or habitual routines have been pre-established. Hence, we expect the results from this project to be more consistent with the former studies, in that member familiarity could be beneficial to teams.

First, we aim to contribute to this debate regarding the effects of member familiarity by comparing the overall performance of both familiar and unfamiliar teams possessing a similar skill set using 'real' teams on a novel task. 'Real' teams in this context refers to those teams that exist in a natural environment and have not been created solely for the purpose of the experiment in the laboratory.

Hypothesis 1. Familiar teams will perform better overall than unfamiliar teams on a novel task.

Predictors of Adaptation

The study of predictors of individual and team adaptation is crucial for training, selection and performance assessment of individuals and teams of employees that are expected to be effective in dynamic situations (Lang & Bliese, 2009). However, very limited research has been conducted on predictors of individual adaptation in the workplace, and investigation regarding predictors at a team level is even more sparse.

Task Experience. Extensive individual training effectiveness literature overwhelmingly supports that training on similar tasks can increase performance and adaptation by increasing job knowledge, especially when there is a direct transfer of applicable knowledge, strategy or skills (Burke & Day, 1986; Goldstein, 1993; Goodman & Shah, 1992; Guzzo, Jette, & Katzell, 1985). A study by Littlepage, Robison and

Reddington (1997) also indicates that both experience with working on the task as well as working with the group itself can facilitate better performance, but the two types of experience might benefit groups in different ways.

Cognitive Ability. A study by LePine et al. in 2000 investigated a number of predictors of adaptation at the individual level including cognitive ability. With regards to cognitive ability, higher cognitive ability predicted performance differences both before the change in task as well as after the change to a significant degree in their study (LePine et al., 2000). This was consistent with existing research suggesting that individuals with an overall higher level of cognitive ability perform complex tasks better than those with lower cognitive ability (Hunter, 1986; Lang & Bliese, 2009).

Recently, however, Lang and Bliese (2009) presented results regarding cognitive ability that somewhat contradict these. Lang and Bliese (2009) explored general mental ability as one of the predictors of individual adaptation to unexpected change in the task context. According to their study, there exists a negative relationship between general mental ability and both transitional and reacquisition adaptation (Lang & Bliese, 2009). The authors explained this by suggesting that people with higher general mental ability may have learned more about the task in the same number of trials than people with lower general mental ability, and thus may have more to lose when the change occurs (Lang & Bliese, 2009). Alternatively, this pattern of results may exist due to people with higher general mental ability just being further along in their skill acquisition curve as proposed by Ackerman (1988) and having reached a stage of more automatic, routine performance behaviours , which may lead to a larger loss when the task changes (Ackerman, 1988; Lang & Bliese, 2009).

It should be noted, however, that in the Lang and Bliese (2009) study, the change was introduced at the same time for all individuals, regardless of level of cognitive ability. In keeping with their explanation regarding Ackerman's skill acquisition curve, it is possible that if the change in the task had been introduced when each individual had reached a certain level of performance rather than after a fixed number of trials, a different pattern of results may have been hypothetically observed. It is possible that if individuals with high and low levels of cognitive ability participated in a novel task over a number of trials, individuals with higher general mental ability would reach a certain level of performance in a fewer number of trials than individuals with lower levels of general mental ability. If the change was then introduced after equating individuals on their learning and consequent level of performance on the task, it may have been observed that individuals with higher general mental ability would in fact experience a smaller drop in performance post-change and recover quicker, and thus fare better in terms of transition and reacquisition adaptation. Thus, it is possible that this aspect of the Lang and Bliese (2009) study may have, in fact, led to the unexpected results observed.

Member Familiarity. Team adaptation, as discussed above, is an important factor that may influence team effectiveness. Hence, it is possible that just as familiarity affects performance in static situations, it may also affect the performance of the group in dynamic situations, such as during an unexpected change in the task. It is possible that the streamlined communication patterns in established groups lead to more effective interaction among the group members, which may in turn lead the team to both perform and adapt better. This may also occur due to familiar team members being more aware of the existing skill set of the group, something that may save valuable time while the team formulates a plan to adapt to a novel situation. This effect could be observed for both transition adaptation, by familiar teams facing a smaller loss in performance after the change, and also for reacquisition adaptation by enabling familiar groups to re-attain a pre-change level of performance quicker.

It is also possible, however, that familiarity among the group members may lead to development of habitual routines quicker, leading to more automatic behavior on the task sooner than that for unfamiliar teams, akin to the performance of members with higher general mental ability observed in the study by Lang and Bliese (2009) . This, in turn, may lead the familiar teams to face a greater loss in performance after the change is introduced and hence, face a greater difficulty in re-attaining previous levels of performance, thus being disadvantaged in terms of transition and reacquisition adaptation. In keeping with the discussion of the caveat in the Lang and Bliese (2009) study, member familiarity may be positively related to team adaptation, when the level of skill acquisition of each team is controlled for by introducing the change after an acceptable level of performance has been attained. Thus, the final hypothesis predicts a positive relationship between member familiarity and team adaptation. This would imply that teams with familiar members may experience a smaller loss in performance after the change is introduced, which is termed transition adaptation. Also, the familiar teams would recover their previous performance levels to a greater extent, which is called re-acquisition adaptation, as discussed earlier.

Hypothesis 2. Teams with familiar members will have higher levels of transition adaptation.

Hypothesis 3. Teams with familiar members will have higher levels of reacquisition adaptation.

Method

Participants

The participants for this study were recruited from voluntary signups through the Psychology Participant Pool. Participants were between 18-25 years of age and had no previous experience with the firefighting computer game that was used in the study. The total sample for this study included 104 individuals (n=52 same-sex teams) out of which 28 teams were roommate pairs whereas 24 teams were comprised of individuals that were unfamiliar with each other. The roommate pairs included 13 male and 15 female pairs while the non-roommate sample included 16 male pairs and 8 female pairs.

Familiar teams were comprised of participants that were asked to sign up for the experimental time slot along with their roommates. Unfamiliar teams were comprised of any pair of students of the same sex, unfamiliar with each other, who signed up for the same timeslot by voluntary recruitment through the Psychology Participant Pool. The unfamiliar teams were of the same sex and from similar age groups as the familiar teams so as to be directly comparable to the roommate sample. Participants were given course credit or nominal monetary compensation in exchange for their participation in the study.

Procedure

The entire study procedure took about 1.5 hour for each team. Participants were first provided with an information sheet (Appendix C) and asked to provide consent to participating in the study (Appendix D) after having been made aware of all the risks and benefits of participation. Each participant then took the Wonderlic Personnel Test – Revised (Wonderlic & Associates, 2002) which is a short test of general cognitive ability. After this, the participants in the unfamiliar teams were asked to introduce themselves to each other and were informed that they would be playing together as a team. Prior to beginning the game, a questionnaire was administered to participants to obtain information regarding the familiarity and affect between the members of the teams as well as their reported familiarity with computer usage and computer gaming (Appendices A & B).

All participants were given an explanation regarding the rules and functioning of the computer game Network Fire Chief (NFC) (Omodei, Taranto, & Wearing, 2006) and were allowed to practice on it for 2 minutes and any questions the participants may have had were answered. Participants were also given a non-specific warning that a change would occur at some point during the game. After this, the participants proceeded to play ten 5-minute trials of the NFC game.

A pictorial representation of the screen during an NFC Trial can be seen in Appendix F. Both the participants worked on the same map at any given time. However, they could independently scroll through and scan different parts of the map for fires that developed spontaneously at various points during the game. Participants had the use of two 'fire trucks' to put out the fires. These appliances were programmed to have real-world limitations such as their restricted speed as well as their capacity for water. These trucks could be dragged and moved on to each of the fires the participants decided to extinguish by the participant on Station 1, but only the participant on Station 2 could actually put out the fire by clicking on the fire truck once it had reached its intended destination. Hence, the NFC game was programmed such that extensive interdependence and communication was needed between members of the team in order to successfully complete the task.

Both participants could participate in scanning the entire map for fires. Participants were informed that each piece of property on the map including trees, houses and animals burnt at different rates and were also worth different points, which the participants lost if they did not manage to rescue the property in time. Participants could see the coordinates on the map as well as the elapsed time in addition to the wind direction, each of which could serve to inform their strategic decision making regarding what the best approach would be to minimize damage from the fires and to lose as few points as possible and achieve optimum performance levels.

The scenario was constructed in such a way that the fire spread in an identical fashion in each consecutive pre-change trial. This created the need for each team to recognize this pattern over multiple trials and for team members to communicate in order to ascertain the best strategy to deal with this spread and to prioritize what order to fight the fires, so as to minimize the damage by the fire. The NFC program provided a performance score at the end of each trial. This reflected the amount of property that was saved by the team. Performance of familiar and unfamiliar teams was then compared across the 10 trials.

In the sixth trial, the scenario was modified by the experimenter to constitute the 'change' in the task. Although the basic pattern of fires remained the same as the five pre-change trials, one of the team members discovered that they had a green screen that obscured the details of the map and they could not see the landscape anymore, but their team member noticed no difference in the layout of their screen. Each participant could, however, still could see the time elapsed, the wind direction as well as the coordinates on the screen. At this point, the teams needed to communicate to recognize this change and collectively decide how to respond to this change best in order to minimize the loss in performance and attempt to regain previous performance levels. Transition adaptation was measured as the drop in performance scores from Trial 5 to Trial 6, with a smaller drop indicating better adaptation. Reacquisition adaptation was operationalized as the subsequent rise in performance level from Trial 6 to Trial 10.

Measures

Cognitive Ability. Cognitive ability of both members of the team was individually measured by administration of the Wonderlic Personnel Test – Revised (Wonderlic, 2002). This short test of general cognitive ability was administered on paper. Each form consists of 50 questions and participants were required to work individually without the aid of calculators and dictionaries. Participants had 12 minutes to complete as many questions correctly as possible. Scores on the WPT-R have been shown to be strongly correlated with scores on other tests of cognitive ability such as Weschler Adult Intelligence Scale (WAIS) as well as the cognitive scale of the general Aptitude Test Battery (GATB) (Wonderlic, 2002).

Member Familiarity. As noted above, a short questionnaire was administered to all participants prior to beginning the experimental session which was created for the purposes of the study. Participants were advised to complete the questionnaire independently. This made it possible to examine the extent to which team members agreed with each other on queries regarding their duration and extent of familiarity with each other. This questionnaire included items that required participants to report their gender, extent and duration of familiarity with the other member of their team as well as their liking of the team member (if they were familiar with them) (Appendix A). Responses to the latter two questions were made on 5-point Likert-type scales with an additional option of indicating if the question was not applicable to them (N/A). Participants were asked to indicate their responses to the 'extent of familiarity' question on a scale ranging from whether they felt 'not at all familiar' to 'very familiar' with their team members. The options to indicate duration of familiarity ranged from 'less than six months' to 'over five years'. Affect was indicated on a scale from 'don't like' to 'like a lot'. This questionnaire took the participants no more than 2 minutes to complete.

Experience with Computer Use and Computer Gaming. Another questionnaire that was created for the purpose of the study asked participants to report their own experience and comfort with general computer use (such as email and word processing programs) as well as with computer gaming (Appendix B). This questionnaire attempted to get a measure of the 'task experience' of the participants. Responses were indicated by participants on a 5-point Likert-type scale that ranged from 'uncomfortable' to 'very comfortable' for computer use and from 'very inexperienced' to 'very experienced' for computer gaming.

Overview of Analyses

To test Hypothesis 1, a general linear modeling (GLM) repeated measures analysis of variance (ANOVA) was used to ascertain whether familiarity between the team members affected their performance across the 10 trials of the NFC game. In an additional GLM repeated measures analysis of covariance (ANCOVA), the teams' cognitive ability, experience with computer use, and with computer gaming were added to the model as covariates of member familiarity. These team-level variables can be operationalized in various ways using either the team means, variances, minimum or maximum levels of each (Barrick, Stewart, Neubert, & Mount, 1998). Since the teams used in this study are comprised of pairs of participants, these variables could not be operationalized using the variances. Operationalization using team minimums and maximums was carried out because it is possible that performance may be driven either by the team member high in cognitive ability or experience with computers or gaming, or may in fact be restricted by the 'weakest link', i.e. the member with the lower scores for these variables.

Hypotheses 2 and 3 were tested similarly. To ascertain whether familiarity affected transition adaptation, which is the post-change drop in performance (from Trial 5 to Trial 6), as well as re-acquisition adaptation, which the attempt to re-acquire previous performance levels (from Trial 6 to Trial 10), a GLM univariate ANOVA was used. These analyses were also repeated using the teams' mean, minimum and maximum levels of cognitive ability and experience with computer use and computer gaming as covariates. The results are discussed in detail below.

Results

All 'familiar' participant teams had known and lived with each other for at least a period of 6 months to a year, and all 'unfamiliar' team members had met for the first time during the experimental session. In addition, all familiar pairs expressed either above average or very strong positive affective emotions towards each other with approximately 92% of roommates individually endorsing the statement that they 'liked their roommate very much'. Hence, it was not possible to account for whether affect may possibly have been a factor affecting the performance or adaptation of familiar teams.

Agreement of each member of the roommate pairs regarding the extent and duration of their familiarity and positive affective feelings towards each other was high with correlations between responses on these questions ranging between 0.98-0.99.

In an exploratory analysis, gender was investigated as a possible factor that may possibly have influenced the performance scores of participants due to the computer game nature of this task in order to determine whether it should be controlled for. However, males and females did not seem to perform significantly different on the task used, and hence, gender was not added as one of factors that were used as covariates of member familiarity.

Preliminary Analyses

Means and standard deviations of the performance scores and of the variables of interest including the minimum, maximum and means of the teams' cognitive ability, as well as experience with computer use and computer gaming can be seen in Table 1. The correlations between performance scores across the 10 trials and the variables of interest including member familiarity, cognitive ability and experience with computer use and gaming are shown in Table 2[1]. The performance scores across the 10 trials were highly correlated with each other, which is to be expected as this study followed a repeated measures design.

Figure 1 represents the pattern of performance scores for both familiar and unfamiliar teams over the 10 trials. Consistent with the task protocol, team performance levels rose till the fifth trial after which the change in the task occurred. Performance levels dropped in Trial 6 due to this change, and teams were required to engage in transition adaptation to minimize performance loss. After the drop, performance levels rose again as teams adapted to the change, which is a representation of reacquisition adaptation. As seen in Figure 1, the patterns of performance and adaptation of familiar and unfamiliar teams do not seem to be very different from each other.

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[1] Note: Although familiarity was measured on a 5-point Likert-type scale, participant responses did not have enough variability to justify using the 5-point scale. That is, in most cases, participants either indicated being unfamiliar or very familiar with their team members. Also, correlations in Table 2 did not seem to differ in a meaningful way when responses on the entire range of the Likert scale were used as opposed to using a binary familiarity operationalization. Hence, for this table as well as for all additional analyses, familiarity was operationalized as a binary variable and team members were characterised as being either familiar or unfamiliar with each other.

Table 1

Means and Standard Deviations of Variables of Interest and of Performance Scores across Trials

	M	SD
Wonderlic		
Min	22.19	4.29
Max	27.12	4.60
Mean	24.65	3.91
Computer use		
Min	3.52	1.35
Max	4.52	0.75
Mean	4.02	0.94
Gaming		
Min	2.63	1.17
Max	3.87	0.97
Mean	3.25	0.96
Performance scores		
Trial 1 (T1)	94.27	1.63
Trial 2 (T2)	95.53	1.20
Trial 3 (T3)	96.08	1.50
Trial 4 (T4)	96.57	1.41
Trial 5 (T5)	97.28	1.55
Trial 6 (T6)	89.61	1.81
Trial 7 (T7)	91.71	2.11
Trial 8 (T8)	92.75	2.46
Trial 9 (T9)	93.73	2.93
Trial 10 (T10)	94.39	2.72
Drop	7.67	1.97
Rise	4.78	2.36

Note. Sample size(n)=52 teams. The range for scores are as follows: Wonderlic – between 0-50; Computer Use and Gaming – between 1-5 and Performance Scores – 0-100. 'Drop' refers to absolute drop in performance scores between Trial 5 to Trial 6 (post-change). 'Rise' refers to reacquisition of performance scores between Trial 6 to Trial 10.

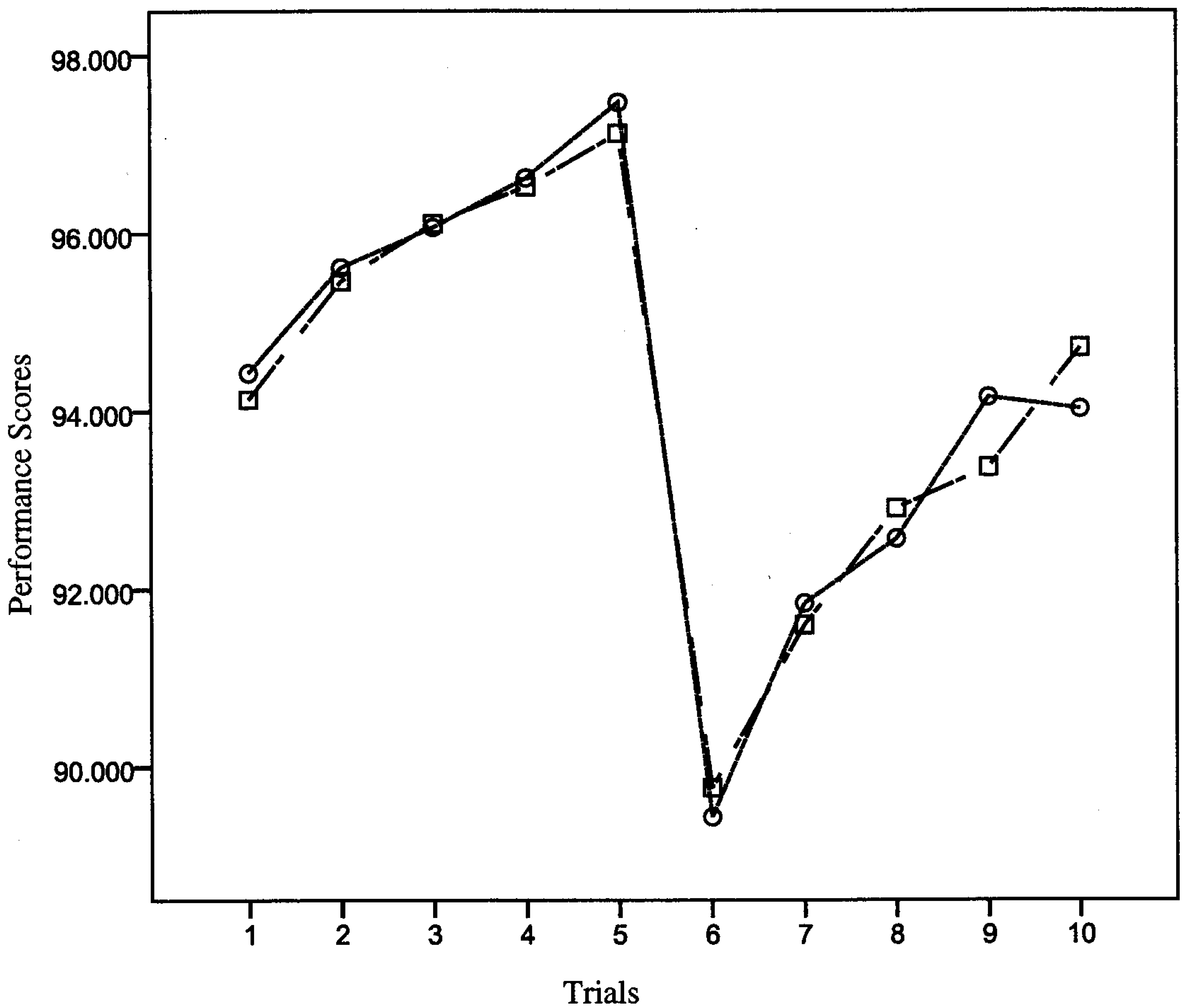
Table 2

Correlations between Variables of Interest and Performance Scores across Trials

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.Familiarity																					
Wonderlic																					
2.Min	.47																				
3.Max	.30	.55																			
4.Mean	.43	.87	.89																		
Computer use																					
5.Min	.56	.22	.15	.21																	
6.Max	.44	.35	.31	.37	.58																
7.Mean	.58	.29	.23	.30	.95	.81															
Gaming																					
8.Min	.01	.00	.15	.09	.36	.35	.40														
9.Max	-.17	-.07	.23	.10	.19	.34	.27	.61													
10.Mean	-.08	-.04	.21	.10	.31	.39	.38	.92	.88												
Trials																					
11. T1	-.09	.25	.22	.27	.08	.13	.11	.28	.23	.29											
12. T2	-.06	.12	.06	.11	.16	.30	.23	.44	.39	.46	.56										
13. T3	.01	.33	.31	.38	.15	.32	.23	.45	.40	.48	.62	.67									
14. T4	-.03	.30	.11	.23	.16	.31	.24	.37	.38	.41	.60	.54	.58								

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
15. T5	-.11	.24	.12	.20	.20	.33	.27	.30	.40	.39	.53	.67	.62	.60							
16. T6	.09	.39	.25	.38	-.22	.21	-.08	.15	.09	.14	.43	.39	.49	.33	.32						
17. T7	-.06	.20	.20	.23	-.03	.30	.10	.18	.13	.18	.38	.32	.41	.34	.37	.39					
18. T8	.07	.22	.12	.19	-.02	.23	.08	.23	.27	.28	.51	.49	.57	.53	.57	.58	.51				
19. T9	-.14	.23	.04	.15	.02	.21	.10	.36	.24	.34	.39	.21	.38	.37	.40	.52	.49	.60			
20. T10	.13	.21	.10	.18	.14	.31	.22	.27	.28	.30	.31	.35	.41	.48	.45	.52	.37	.76	.67		
21.Drop	-.17	-.17	-.14	-.17	.36	.06	.29	.10	.24	.18	.03	.17	.04	.17	.50	-.67	-.07	-.08	-.16	-.12	
22.Rise	.08	-.05	-.08	-.07	.33	.20	.32	.19	.26	.25	.03	.10	.10	.30	.28	-.17	.13	.43	.38	.76	.37

Note. Sample size(n) = 52 teams. The range for scores are as follows: Familiarity –1-5; Wonderlic – between 0-50; Computer Use and Gaming – between 1-5 and Performance Scores – 0-100. 'Drop' refers to absolute drop in performance scores between Trial 5 to Trial 6 (post-change). 'Rise' refers to reacquisition of performance scores between Trial 6 to Trial 10. T1 to T10 indicate Trial1 to Trial10.Values in the correlation table underlined once are significant at the 0.05 level, and those underlined twice are significant at the 0.01 level.



Note. Line with circular markers (○) indicates unfamiliar teams whereas line with square markers (□) indicates familiar teams

Figure 1. Performance Score over Trials for Roommates vs. Non-Roommates

Primary Analyses

Hypothesis 1. Hypothesis 1 was tested using a GLM repeated measures ANOVA, the results of which are shown in Table 3. The power achieved for this analysis was within acceptable limits at 0.81 when a small effect size (0.3) was assumed. This analysis allowed for the examination of the effects of member familiarity simultaneously across the 10 performance trials. It can be seen in Table 3 that familiarity alone did not have a significant effect on overall performance scores of the teams across the 10 trials ($p \leq 0.896$). Hence, Hypothesis 1 was not supported.

As discussed in an earlier section, cognitive ability and task experience have been shown in previous research studies to be good predictors of team performance. Keeping this in mind, an additional GLM repeated measures ANCOVA was performed in which familiarity between team members was considered a between-subjects factor and the cognitive ability and reported experience with general computer use and with computer gaming of the teams, operationalized using the team mean, minimums and maximum values of each of these three variables, were considered as covariates. As can be seen in Table 4, the mean Wonderlic scores ($p \leq 0.032$) and the team mean reported experience with computer gaming ($p \leq 0.019$) were significantly related to their performance scores. However, familiarity between team members and their comfort with general computer use did not seem to be significantly related to overall performance in this analysis as well.

Table 3

Tests of Between-Subjects Effects of Familiarity on Overall Performance

Source	df	F	Sig.	Partial Eta Squared	Observed Power
Intercept	1	222998.492	.000	1.000	1.000
Familiarity	1	.017	.896	.000	.052
Error	50				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 4

Tests of Between-Subjects Effects of Familiarity on Overall Performance using Teams' Means of Wonderlic scores, Mean Experience with Computer Use and Computer Gaming as Covariates

Source	df	F	Sig.	Partial Eta Squared	Observed Power
Intercept	1	3529.625	.000	.987	1.000
Mean Wonderlic score	1	4.896	.032	.094	.582
Mean experience with Computer Use	1	.075	.785	.002	.058
Mean experience with Computer Gaming	1	5.944	.019	.112	.666
Familiarity	1	.719	.401	.015	.132
Error	47				

Note. Sample size (n)=52 teams. Computed using alpha = .05

This analysis was also conducted using the minimum as well as the maximum operationalizations of the team cognitive ability, experience with computer use and computer gaming, as explained above. The results from these are shown in Tables 5 and 6. It is interesting to observe that although the same pattern of results as in Table 4 is also observed using the minimum values of cognitive ability and gaming experience for the group ($p \leq 0.003$ in both cases) (Table 5), this pattern is not maintained using the maximum values of these variables (Table 6). Using the maximum values, none of the variables seem to significantly affect performance scores. This is an interesting observation that will be further discussed in a later section.

Hypothesis 2. To assess Hypothesis 2, GLM Univariate ANOVA was used to examine the effects of familiarity on the drop in performance from Trial 5 to Trial 6, i.e. on transition adaptation. As can be seen in Table 7, member familiarity is not significantly related to the drop in performance from Trial 5 to Trial 6 (i.e. post change) ($p \leq 0.222$). Hence, Hypothesis 2 was not supported.

As mentioned above, it is important to account for the teams' cognitive ability and task experience including experience with computer use and computer gaming while testing for the effects of familiarity as these variables have been shown to be related to performance and may consequently also be related to team adaptation.

Table 5

Tests of Between-Subjects Effects of Familiarity on Overall Performance using teams' minimums of Wonderlic scores, minimum experience with Computer Use and Computer Gaming as covariates

Source	df	F	Sig.	Partial Eta Squared	Observed Power
Intercept	1	5760.497	.000	.992	1.000
Min Wonderlic scores	1	10.005	.003	.176	.872
Min experience with Computer use	1	.191	.664	.004	.071
Min experience with Computer Gaming	1	10.042	.003	.176	.874
Familiarity	1	1.237	.272	.026	.193
Error	47				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 6

Tests of Between-Subjects Effects of Familiarity on Overall Performance using teams' maximums of Wonderlic scores, maximum experience with Computer Use and Computer Gaming as covariates

Source	df	F	Sig.	Partial Eta Squared	Observed Power
Intercept	1	3432.348	.000	.986	1.000
Max Wonderlic	1	.444	.508	.009	.100
Max experience with Computer Use	1	3.891	.054	.076	.489
Max experience with Computer Gaming	1	1.825	.183	.037	.263
Familiarity	1	.894	.349	.019	.153
Error	47				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 7

Tests of Between-Subjects Effects of Familiarity on Performance Drop from Trial 5 to Trial 6 (post-change)

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		1	1.527	.222	.030	.228
Intercept		1	797.335	.000	.941	1.000
Familiarity	-.172	1	1.527	.222	.030	.228
Error		50				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Hence, GLM univariate analyses were conducted using familiarity as a between-subjects factor and the means (Table 8), minimums (Table 9) and maximums (Table 10) of cognitive ability, experience with computer use and gaming as covariates.

In Table 8, it can be observed that the familiarity between the individuals was in fact significantly related to the drop in performance level after the change was introduced. That is, unfamiliar teams experienced a greater drop in performance levels compared to familiar teams ($p \leq 0.009$). The drop in performance was also related to the mean degree of experience with computer usage ($p \leq 0.001$), but not with mean cognitive ability and gaming experience both of which were previously shown to be related to overall performance. When considering experience with computer use, the data indicate that the greater the degree of experience with using computers in general, the larger the drop in performance level after the change was introduced.

A similar pattern can be observed using the team minimum values of Wonderlic scores and experience with computer use and gaming as covariates in Table 9 in that the drop in performance levels between Trial 5 and Trial 6 (i.e. post-change) is significantly related with familiarity ($p \leq 0.001$) as well as with the team's minimum level of experience with computer use ($p \leq 0.00002$). As observed in Table 10, however, the team maximum values of all the variables of interest are not significantly related to the post-change drop in performance.

Table 8

Tests of Between-Subjects Effects of Member Familiarity on Performance Drop from Trial 5 to Trial 6 (post-change) using means of Wonderlic scores, mean experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	4.451	.004	.275	.914
Intercept		1	5.275	.026	.101	.614
Mean Wonderlic	-.144	1	1.068	.307	.022	.173
Mean experience with Computer Use	.640	1	12.927	.001	.216	.941
Mean experience with Computer Gaming	-.087	1	.347	.559	.007	.089
Familiarity	-.486	1	7.539	.009	.138	.767
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 9

Tests of Between-Subjects Effects of Member Familiarity on Performance Drop from Trial 5 to Trial 6 (post-change) using minimums of Wonderlic scores, minimum experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	6.729	.000	.364	.987
Intercept		1	11.153	.002	.192	.905
Min Wonderlic scores	-.064	1	.233	.631	.005	.076
Min experience with Computer Use	.752	1	23.305	.000	.331	.997
Min experience with Computer Gaming	-.166	1	1.663	.203	.034	.244
Familiarity	-.563	1	12.355	.001	.208	.931
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 10

Tests of Between-Subjects Effects of Member Familiarity on Performance Drop from Trial 5 to Trial 6 (post-change) using maximums of Wonderlic scores, maximum experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	1.383	.254	.105	.397
Intercept		1	9.389	.004	.166	.851
Max Wonderlic	-.182	1	1.444	.236	.030	.218
Max experience with Computer use	.095	1	.300	.587	.006	.084
Max experience with Computer Gaming	.226	1	1.926	.172	.039	.275
Familiarity	-.122	1	.503	.482	.011	.107
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Hypothesis 3. To test Hypothesis 3, a GLM Univariate analysis was conducted as well. This analysis was used to examine the effects of familiarity on the rise in performance from Trial 6 to Trial 10, which is also called reacquisition adaptation. As can be seen in Table 11, member familiarity was not significantly related to the rise in performance from Trial 6 to Trial 10 (i.e. post change) ($p \leq 0.589$). Hence, Hypothesis 3 was not supported.

As mentioned above, however, it is important to account for the teams' cognitive ability and task experience including experience with computer use and computer gaming before testing for the effects of familiarity as these variables have been shown to be related to performance and may also consequently be related to team adaptation. The rise in performance from Trial 6 to 10 (post-change) was used as the dependent variable to determine the effect of the familiarity using means (Table 10), minimums (Table 11) and maximums (Table 12) of the team levels of cognitive ability, experience with computer use and computer gaming as covariates.

It is interesting to observe that none of these variables seemed to be related to reacquisition adaptation in this sample when the means and the maximum levels of the covariates were used. When the minimum values were used, only the experience with computer use seemed to be related to reacquisition adaptation ($p \leq .040$), but the observed power for this result is not very high at .544.

Table 11

Tests of Between-Subjects Effects of Member Familiarity on Performance rise from Trial 6 to 10

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		1	.295	.589	.006	.083
Intercept		1	207.851	.000	.806	1.000
Familiarity	.077	1	.295	.589	.006	.083
Error		50				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 12

Tests of Between-Subjects Effects of Member Familiarity on Performance rise from Trial 6 to 10 using means of Wonderlic scores, mean experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	2.036	.105	.148	.565
Intercept		1	1.185	.282	.025	.187
Mean Wonderlic score	-.171	1	1.287	.262	.027	.199
Mean experience with Computer Use	.331	1	2.948	.093	.059	.391
Mean experience with Computer Gaming	.136	1	.726	.399	.015	.133
Familiarity	-.030	1	.024	.878	.001	.053
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 13

Tests of Between-Subjects Effects of Member Familiarity on Performance rise from Trial 6 to 10 using minimums of Wonderlic scores, minimum experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	1.805	.144	.133	.508
Intercept		1	2.046	.159	.042	.289
Min Wonderlic	-.083	1	.292	.591	.006	.083
Min experience with Computer Use	.384	1	4.464	.040	.087	.544
Min experience with Computer Gaming	.054	1	.130	.720	.003	.064
Familiarity	-.101	1	.289	.593	.006	.082
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Table 14

Tests of Between-Subjects Effects of Member Familiarity on Performance rise from Trial 6 to 10 using maximums of Wonderlic scores, maximum experience with Computer Use and Computer Gaming as covariates

Source	Beta	df	F	Sig.	Partial Eta Squared	Observed Power
Corrected Model		4	1.688	.169	.126	.478
Intercept		1	1.824	.183	.037	.263
Max Wonderlic	-.221	1	2.173	.147	.044	.303
Max experience with Computer use	.099	1	.330	.569	.007	.087
Max experience with Computer Gaming	.301	1	3.496	.068	.069	.449
Familiarity	.150	1	.779	.382	.016	.139
Error		47				
Total		52				
Corrected Total		51				

Note. Sample size (n)=52 teams. Computed using alpha = .05

Discussion

The overall goal of this study was to examine the role of team member familiarity in predicting how teams react and adapt to change. Thus far, very limited research has studied member familiarity as a predictor of team performance, and to our knowledge, this is the first empirical study that has attempted to determine whether familiarity affects not just the overall performance but also the degree of transition and reacquisition adaptation of teams to changing situations. Below, relevant results presented in the previous section will be discussed in terms of their implications and agreement with existing research. This will be followed by an overview of the limitations of this study and suggestions for future research as well as the potential practical implications of the results of this and other similar research.

An important contribution by this study to the research on team effectiveness was the finding that member familiarity did not appear to play a role in determining overall performance, but that cognitive ability and task experience did. Of course, there exists copious research evidence supporting that cognitive ability is a strong predictor of job performance across a variety of jobs (e.g. Hunter, 1986), and hence, it is not surprising that cognitive ability was a predictor of performance on the NFC task used in this study as well. It should also be noted, however, that to have a significant effect on performance, task experience had to be specific. That is, since the task used involved playing a computer game, experience with just general use of computers did not seem to contribute to better performance but specific experience with computer gaming did. This is consistent with the research by Goldstein (1993) who suggested that experience with a task is most effective in improving overall performance when there is a direct transference of skills learned to the task performed. There is additional evidence to support this finding in the individual and team training literature which suggests that training methods are most effective in improving performance when the delivery method is similar to the eventual task to be performed (e.g. Arthur, Bennett, Edens, & Bell, 2003). Hence, this result from the present study would lend further support to such theories indicating that to improve overall performance levels, individuals and teams should be trained in situations that are very similar and directly applicable to the eventual tasks they are expected to perform.

It is surprising, however, that member familiarity did not seem to affect overall performance on the task. It is possible that, since this was a novel task for all participants, and as the member familiarity among the familiar teams was not actually a function of participants having performed similar tasks before, the familiar teams may have had no performance advantage over the unfamiliar teams. Hence, in the case of this task, all teams may have been placed in equally "unfamiliar" situations.

It is also possible that any performance advantage that may have existed for familiar teams may have been negated by the interactions between members of the unfamiliar teams prior to the experimental session when they were asked to introduce themselves to each other. Literature on the accuracy of predictions of personality characteristics and anticipated behavior for teams with 'zero acquaintance', which in this case are the unfamiliar teams, suggests that individuals may actually form pretty accurate judgments in a very short time after being introduced to strangers (e.g. Levesque and Kenny, 1986). For this reason, it is possible that the performance advantage that may have existed for previously familiar teams may not have held any more.

The most interesting results of this study, however, are those for the post-change drop in performance. Although member familiarity did not seem to play a role in determining the overall levels of performance in this study, it was a significant predictor of the magnitude of drop in performance after the change was introduced, when the covariates of cognitive ability, and experience with computer use and gaming were taken into account. That is, familiar teams had significantly better transition adaptation (less of a performance drop) than unfamiliar teams after the change was introduced in Trial 5. Although there is limited literature relating to the predictors of adaptation, it has been suggested that pre-established teams may be better able to adapt to changing situations. This pattern of results may occur as these teams may have more optimal communication patterns and be aware of each other's skill sets and share mental models and may utilize these to make better decisions (Stout, Cannon-Bowers, Salas & Milanovich, 1999). These factors may thus serve to minimize performance drop for these teams post-change.

Other researchers, however, have suggested that pre-established teams may fall into behavioural routines as a form of habit, and any disruption to this routine would cause larger performance losses as compared to unfamiliar teams that would not have such pre-established habitual routines (Gersick & Hackman, 1990). As mentioned before, however, since the task used was novel for all participants, the results were expected to and did support the former line of research. That is, member familiarity was actually beneficial in minimizing performance drop after the change, and was related to higher levels of transition adaptation when the other factors were accounted for. It is possible that this finding may have been different if the participants were working on tasks that they had worked on before as a team and had pre-established habitual routines for.

It is also interesting that, apart from member familiarity, the only other factor that was a significant predictor of transition adaptation was experience with general computer use. Specifically, individuals with more experience working with computers on a daily basis had a larger drop in performance than individuals who had lesser experience. This finding is maintained with both operationalizations including the means and the minimums of the team experience with computer use were taken into account. It is not certain, however, why this occurs. It is possible that when the screen went green, participants with greater levels of experience with computers attributed this to a malfunction with the computer or the game, and used strategies to 'fix' it that may not have been beneficial in the context of the game. In contrast, participants with lesser experience with computer use may have recognized it as the 'change' in the game and thus attempted to use more game-specific and thus more productive strategies in adapting to it.

It is curious that the two factors that were significantly related with overall performance, that is, cognitive ability and experience with computer gaming, are not related to the post-change drop in performance and hence to the level of transition adaptation of the team. The direction of the parameter estimates, however, indicate that higher levels of cognitive ability and experience gaming may be related with lower levels of performance drop (although in the case of this study, not significantly), but this direction and pattern of results would somewhat support previous research regarding the effects of cognitive ability on adaptation by LePine et. al (2000) and not those by Lang and Bliese (2009).

In contrast, none of the variables observed including familiarity, cognitive ability, and experience with computer use and gaming seemed to have a significant effect on the rise in performance from Trial 6 to Trial 10 (except in the case of experience with computer use having a significant effect on the team's minimum level of computer use, though with low power). It is possible that these variables, in fact, do not affect the level of re-acquisition adaptation. It is more likely, however, that we did not observe the rise in performance across an adequate number of trials. This would be supported by the fact that most teams did not seem to re-acquire their pre-change peak levels of performance before the study ended. Hence, it is possible that if we had observed the participants across a few more trials post-change, we might have observed that some of these variables indeed have a significant effect on re-acquisition adaptation as well.

An interesting observation pertinent to teamwork research, unrelated to the hypotheses of this study, was that similar patterns of significance were maintained when the teams' means and minimum operationalizations of cognitive ability, experience with computer use and gaming were used as covariates but not for the maximum values, despite each group being formed of only two individuals. Although there are a number of studies that support using different operationalizations of team composition variables, the use of maximum or minimum levels is supported when the actions of any one individual in the team may have a significant effect on the performance of the whole team (Barrick et. al, 1998). It has been suggested that in problem solving situations, the inputs of the member with the highest levels (i.e. the "maximums") of a particular variable such as cognitive ability have shown to be significantly related to performance (as opposed to the teams' minimum levels for tasks such as an assembly line production) (Steiner, 1972). This is somewhat consistent with the findings of this study in that the NFC task used is more similar to an assembly line scenario than a decision making one. In the NFC task used (as in assembly lines), the task experience or cognitive ability of one particular member cannot compensate for another's. Instead, the team is limited by the skills and cognitive ability of the least proficient member. This finding supports the assertion that the NFC task required high levels of interdependence among team members.

It is also important to comment on the communication patterns of the familiar and unfamiliar teams observed as they worked on the NFC task in the lab. Although the communication processes were not formally recorded and coded, informal notes taken by the experimenter suggest that familiar participants may have interacted very differently from unfamiliar participants on the task. Familiar participants obviously seemed to have a greater degree of communication from the beginning of the experimental session whereas unfamiliar participants seemed to take some time to get comfortable with each other. The most significant observation regarding communication between the team members was in the way familiar team members relayed instructions to each other as compared to the unfamiliar team members. Most familiar teams expressed short, direct instructions such as mentioning coordinates with active fires as, "go to (26,44)", or simply as "(26,44)". In contrast, unfamiliar teams issued indirect and detailed suggestions such as, "There is a fire at (26,44), do you want to get that?". Hence, even if it is established that overall performance is no different between familiar and unfamiliar teams, such streamlined communication patterns in familiar teams may save precious time in case of an emergency for teams such as firefighters and police crews. In addition, familiar teams seemed to 'know' and 'anticipate' instructions from each other and often did not even have to wait until the end of an instruction from their team member to respond with something similar to, "Yes, got it". In layman terms, it almost seemed that members of familiar teams were looking at their separate computer screens 'with the same pair of eyes'. In addition, members of familiar teams seemed to be more likely to indicate to their partners if they were displeased with each other's actions and even to provide positive reinforcement and encouragement.

Limitations and Future Directions

The most predominant limitation of this study was the use of a small sample size. Although the level of power achieved for this study was acceptable, as mentioned above, a somewhat larger sample size might have helped to further clarify the pattern of results. Due to the interesting pattern of results, a number of questions have been raised by this study. Clearly, this field of research would benefit from additional empirical research studies using larger sample sizes.

Another limitation may lie in the way team familiarity was operationalized. It is possible that the interactions that comprise 'familiarity' for the roommate sample may in fact be slightly different from the familiarity achieved in work teams that work on specific tasks together. It is possible that the familiarity between roommates may primarily be on an interpersonal level as they may not know each other very well in a task context. For teams that are familiar with each other in a task context, however, the familiarity may be both interpersonal and task-related. Although in this study the primary hypothesis involved looking at the effects of just interpersonal familiarity on team performance and adaptation, it would be interesting to conduct a future study looking at the effects of familiarity on team adaptation and performance using teams that are in fact familiar with each other on both an interpersonal level and in a task context.

Also, though most roommate teams in the sample had known each other for longer than 6 months, the levels of familiarity attained between any two different pairs of roommates over the same time period of 6 months could be very different, depending on the frequency and quality of their interactions. Although in our sample the participants reported remarkably little variation in extent of familiarity with their roommates, being 'very familiar' with one's roommate may mean different things for different individuals, and hence there may in fact exist some variability in the extent of familiarity among roommates which may have affected the results of this study. In most previous studies that have observed member familiarity, however, or even most studies that have observed team processes over time, the degree of familiarity existing among the 'familiar' team members has been to an even lesser extent since most teams studied by researchers are created in the lab for experimental purposes. In that respect, the present study has an advantage in terms of comprising a sample of 'real' teams with 'familiar' team members that had actually known each other closely for at least 6 months to a year. In addition, the level of familiarity between members of the familiar teams used in this study is still considerably different from the level of familiarity between the members of the unfamiliar teams used.

Another limitation of this study may have been that the change was introduced at a set time point for all teams, regardless of their level of skill acquisition (Ackerman, 1988; Lang & Bliese, 2009). Hence, there is no way in the current study to determine if the teams had reached their peak performance before the change was introduced. It is possible that if the change was introduced after a few more trials, the peak level of performance achieved by the two participant groups may have been observed to be different. The same argument may be made for the re-acquisition adaptation phase (from Trial 6 to Trial 10) of the study. If the post-change phase of the study had a few more trials, we may have observed that some of the variables of interest may have indeed had an effect on the teams' reacquisition adaptation as well. This limitation may be accounted for in future studies by introducing the change only after team performance peaks and plateaus, and by continuing the post-change performance trials until the pre-change levels of performance are re-attained.

To our knowledge, this is one of the first few studies that have been conducted researching the effects of member familiarity on team performance and specifically on team adaptation. Considering the importance of adaptation in today's workplace, there is a need for much more research attention to be devoted to this area of research, studying different types of teams in the field performing tasks that require a varied skill set.

Qualitative research studies comparing communication patterns between unfamiliar and familiar teams would also provide an interesting insight into the effects of member familiarity. Also, further research that looks at the effects of member familiarity on not just team adaptation as a dependent variable but also on team innovation, is warranted.

Practical Implications

The results from this analysis and other such future research studying similar phenomenon will have potentially significant relevance to staffing and recruitment in team-based environments. If research consensus suggests that member familiarity does indeed positively predict team adaptation (and possible team performance), member familiarity may be encouraged by keeping team members together for extended periods of time. This would indicate that apart from selecting individuals for their cognitive ability and providing specific task experience, individuals that are expected to work as a team in dynamic situations should be encouraged to spend time with each other working on related and unrelated tasks so as to increase their familiarity with each other. This could potentially minimize their drop in performance when faced with dynamic situations. Further, it would suggest that turnover in high-functioning teams should be minimized and that teams that have become skilled at tackling a particular type of situation (such as police crews and firefighting teams) be kept together whenever possible despite the cost of doing so.

This conclusion, however, would vary if familiarity among team members is shown to impede innovation in teams that require creative decision making. Regardless, there is considerable room for further research attention to be directed at member familiarity and adaptation in teams before the results from such studies are applied by practitioners.

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APPENDIX A

Familiarity and Affect questionnaire

Participant ID: _______________

Gender: ____________________

2. Rate your familiarity with the person that you are participating in this experiment with as a part of your two-member team?

Not at all familiar	Somewhat unfamiliar	Familiar	Somewhat familiar	Very familiar

2. If you are familiar with the person, how long have you known them?

Less than 6 months	6 months to a year	1-2 years	2-5 years	More than 5 years

3. Rate your liking for the person that you are participating in this experiment with as a part of your two-member team (IF you are familiar with them)?

N/A	Dislike	Somewhat Dislike	Neither like nor dislike	Somewhat Like	Like a lot

APPENDIX B

Computer Usage and Gaming Experience questionnaire

2. Rate your comfort with Computer Usage

Very uncomfortable	Somewhat uncomfortable	Moderately comfortable	Somewhat more comfortable	Very comfortable

2. Rate your experience with Computer Gaming

Very inexperienced	Somewhat inexperienced	Average	Somewhat experienced	Very experienced

APPENDIX C

Letter of Information

Title of Study: Predictors of Team Adaptation

Researchers: Sheerin Thussu, Psychology, Graduate student

Dr. Natalie Allen, Professor, University of Western Ontario

You are invited to participate in a research study conducted by Sheerin Thussu and Dr. Natalie Allen from the Dept. of Psychology at The University of Western Ontario.

What is the purpose of the project?

The project is part of a broader program of research aimed at understanding what affects a team's ability to adapt to changing conditions.

What does participation in this project involve?

The project requires the participation of several pairs of students. Pairs will be asked to complete a short questionnaire and play a computer simulation game as a 2-member team. The research will take place at the Social Science Center. The total time commitment should not exceed 1.5 hours per participant. Participation is completely voluntary and informed consent will be obtained from each participant. Ethical approval will be obtained for all procedures prior to commencing data collection through the Psychology Research Ethics Board at The University of Western Ontario. Data collection is expected to be carried out between November 2009 and April 2010.

How will the data be kept private?

The data collected will be kept confidential, stored in a secure location and be accessible only to the primary researchers and in no circumstances will individual results be divulged. Data with be coded using a random numerical code so that performance on the game and questionnaire responses cannot be linked to any particular team.

What are the benefits of participating in this study?

You will be provided 1.5 credits to be applied towards a Psychology course. Apart from this, your participation will serve the scientific community and society by contributing to the knowledge of team processes and team effectiveness in real teams and would be greatly appreciated.

What if I want to stop the study?

Participation is voluntary. You may skip any questions you are uncomfortable with during the course of the study. You may also stop the study if you do not wish to continue without loss of credits and your data will not be included.

The Western Psychology Research Ethics Board has reviewed and approved this study. If you have questions about your rights as a research subject, you should contact the Director of the Office of Research Ethics at ethics@uwo.ca or 519-661-3036. With all other questions, please feel free to contact the primary researcher, Sheerin Thussu at sthussu@uwo.ca. For further information about The Teamwork Lab, please go to http://www.teamworklab.uwo.ca

APPENDIX D

Informed Consent From

Title of Study: Predictors of Team Adaptation

Researchers: Sheerin Thussu, Psychology, Graduate student
Dr. Natalie Allen, Professor, University of Western Ontario

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Participant name: ____________________ Experimenter name: ______________________

Participant signature: ________________ Experimenter signature: ___________________

Date: _________________________________

APPENDIX E

Debriefing Sheet

Title of Study: Predictors of Team Adaptation

Researchers: Sheerin Thussu, Psychology, Graduate student

Dr. Natalie Allen, Professor, University of Western Ontario

Thank you for your participation in this study. This project is part of a broader program of research aimed at understanding what affects a team's ability to adapt to changing conditions. This research project aims to examine the relationship between familiarity among members of teams and its influence on team and organizational performance by predicting the adaptability of teams to changing situations in complex tasks. This research also aims to determine whether familiarity among team members predicts team adaptation better than just cognitive ability.

We predict that teams composed of individuals familiar with each other can recognize and adapt to changes in complex situations better.

For more information see:

- Lang, J. W., & Bliese, P. D. (2009). General mental ability and two types of adaptation to unforeseen change: Applying discontinuous growth models to the task-change paradigm. *The Journal of Applied Psychology, 94*(2), 411-428.
- LePine, J. A. (2003). Team adaptation and post-change performance: Effects of team composition in terms of members' cognitive ability and personality. *Journal of Applied Psychology, 88*(1), 27-39.
- LePine, J. A. (2005). Adaptation of teams in response to unforeseen change: Effects of goal difficulty and team composition in terms of cognitive ability and goal orientation. *Journal of Applied Psychology, 90*(6), 1153-1166.
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The Western Psychology Research Ethics Board has reviewed and approved this study. If you have questions about your rights as a research subject, you should contact the Director of the Office of Research Ethics at ethics@uwo.ca or 519-661-3036. With all other questions, please feel free to contact the primary researcher, Sheerin Thussu at sthussu@uwo.ca. For further information about The Teamwork Lab, please go to http://www.teamworklab.uwo.ca.

APPENDIX F

Ethics Form

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Western

Use of Human Subjects - Ethics Approval Notice

Review Number	10 01 03	**Approval Date**	10 01 03
Principal Investigator	Natalie Allen/Sheerin Thussu	**End Date**	10 08 31
Protocol Title	Predictors of team adaptation		
Sponsor	n/a		

This is to notify you that The University of Western Ontario Department of Psychology Research Ethics Board (PREB) has granted expedited ethics approval to the above named research study on the date noted above.

The PREB is a sub-REB of The University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario. (See Office of Research Ethics web site: http://www.uwo.ca/research/ethics/)

This approval shall remain valid until end date noted above assuming timely and acceptable responses to the University's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the PREB except when necessary to eliminate immediate hazards to the subject or when the change(s) involve only logistical or administrative aspects of the study (e.g. change of research assistant, telephone number etc). Subjects must receive a copy of the information/consent documentation.

Investigators must promptly also report to the PREB:
a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely affect the safety of the subjects or the conduct of the study.

If these changes/adverse events require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information/consent documentation, and/or advertisement, must be submitted to the PREB for approval.

Members of the PREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the PREB.

Clive Seligman Ph.D.

Chair, Psychology Expedited Research Ethics Board (PREB)

The other members of the 2009-2010 PREB are: David Dozois, Bill Fisher, Riley Hinson and Steve Lupker

CC: UWO Office of Research Ethics

This is an official document. Please retain the original in your files

APPENDIX G

NFC Screenshot