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Performance and affects in group problem-solving

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ABSTRACT

This experimental study compared college students' performance (individual vs. group) in a virtual game of bridge building for a train passage. We tested the superiority of group performance and power activation of affective states in the quality of task performance and conflict perception. The study (N = 114) evaluated performance in groups (n = 60) and individuals (n = 54) by two criteria: an overall score (score and advancement in the game stages) and the problem-solving process. In both conditions, before and after the game, conflict perception was low, with positive affective states predominating. Groups performed better and reported greater use of problem-solving stages. There was no evidence of affective states as a mediator between experimental condition and the variables performance and conflict perception.

Desempeño y afectos en la solución de problemas en grupo

Palabras clave:
Afectos
Desempeño grupal
Percepción de conflictos
Equipos

RESUMEN

Este estudio experimental comparó el desempeño de individuos y grupos en un juego virtual de construcción de puentes para el pasaje de un tren. Se puso a prueba la superioridad del desempeño grupal y el poder de activación de los estados afectivos en la calidad de la ejecución de la tarea y de la percepción de conflictos. El estudio (N = 114) evaluó el desempeño en la condición de grupo (n = 60)e individual (n = 54) mediante dos criterios: una puntuación general (puntuación y avance en las fases del juego) y un proceso de resolución de problemas. En ambas condiciones antes y después del juego, la percepción de conflictos fue baja, predominando los estados afectivos positivos. Los grupos presentaron mejor desempeño y relataron que había una mayor utilización de etapas en la resolución de problemas. No se encontró un papel mediador de los estados afectivos entre la condición experimental y el desempeño y la percepción de conflictos.

Groups are considered more effective in decision making and task performance than isolated individuals, the argument being that the former leverage material resources and make better use of individuals' skills and knowledge. However, in group interaction situations, conflict, frustration, and stress cannot be completely avoided, which can hinder group performance (Hackman, 1987).

In the organizational context, work teams are widely used, which has promoted studies to better understand how they function (Guzzo & Shea, 1992). However, many questions still remain open, such as the effectiveness of team performance, increasing the demand for studies involving more variables (Puente-Palacios & Borba, 2009).

The affective states experienced in the interactions and the conflict perception related to working in groups contribute to understanding the functioning and performance of teams. Nair (2008) stressed the prominence of studies on the structure, causes, and consequences of affective experiences arising from work situations, but the role of the emotions in conflicts remains undefined. Thus, this study aimed to examine, in an experimental design, the

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effect of undertaking a task (problem-solving) as a group[1], in terms of its performance and its impact on affective states and on conflict perception. The questions guiding the study were: (1) Does working on the task in a group lead to better performance than if done individually? (2) Does the problem-solving process explain the better performance? (3) Does conflict perception affect performance in the game when played by a group? (4) Does the affective experience (positive or negative) in accomplishing the task have an impact on performance and conflict perception when working in a group?

Groups and Performance

A group is differentiated from an aggregate of people by the existence of interaction, interdependence, and mutual influence among its members, governed by a set of shared norms of conduct (Forsyth, 1990; Mead, 2008). Furthermore, a group has a reason to exist, which can be instrumental – to perform a task or achieve a goal – common in organizational contexts, or affiliative, which involves identification with the values and ideals of the group, providing pleasure, prestige, and self-esteem in various social contexts.

In Delamater's (1974) perspective, groups are characterized by the performance of individual roles (formal or informal) and by the existence of emotional ties, which unite members through identification and adherence to internal norms and through mutual attractiveness. Once the group is formed, there must be a compelling reason for people to desire to remain in it – group cohesion. Some factors contributing to increasing this cohesion are: (1) intragroup attractiveness; (2) regular physical proximity among group members, creating a sense of belonging; (3) adherence to group norms, which increases in-group identification; and (4) satisfaction with the group. Identification with the group, therefore, indicates that there is a social identity that promotes loyalty and works as a social glue that makes the group more attractive and stable (Van Vugt & Hart, 2004).

When considering a task carried out by a group, two aspects are very important: performance and effectiveness. Though related, they are different, because performance is related to the quality and quantity of work accomplished, the cost and time spent in its execution, including efficiency (means or processes) and efficacy (actual result) factors within the organization (Grote, 2003). Effectiveness concerns the impact of the performance results at the micro level – improving the quality of individuals' work – and at the macro level – improving the products and results in the organization (Coelho Jr., 2009).

Studies on group performance often explain the gains and losses by the situation and by the processes that differentially affect motivation and resource coordination (Kerr & Tindale, 2004). Increased motivation provides better results for the group when compared to individual performance. For example, individuals can increase their efforts in a task to make up for a supposed poor performance by others – the effect of social compensation (Karau & Williams, 1997). This can occur because members individually consider their performance crucial to the outcome, perceive themselves in competition with others, and respond to feedback from their own performance. Furthermore, loss of motivation can trigger social loafing (a decrease in individual effort due to the social presence of other persons), which has deleterious effects on performance (Latané, Williams, & Harkins, 1979). The nature of the task (routine and tiring) seems to have an important role in the emergence of this phenomenon.

[1] Although there are differences between the concepts of group and team regarding aspects such as autonomy, responsibility for the goals, and type of efforts targeted (Greenberg & Baron, 1995), the terms team and group will be used interchangeably.

Team performance can be evaluated by results and also by the way the group members cope with the challenges of solving the task. To solve a problem, Sternberg (2000) suggests that the individual initiates a mental process with seven stages: (1) identification of the problem, the goal being to lay out the obstacles, objectives, and available resources; (2) representation of the problem, which entails defining the problem in a manner that makes it possible to understand and solve it; (3) identification of problem-solving strategy: analysis, convergent and divergent thinking; (4) strategic organization of information toward implementing the chosen alternative; (5) resource allocation to get the solution; (6) process monitoring, assessing the proximity to the task objective; and (7) evaluation of the solution taken. The cyclical nature of this model predicts that whenever there are changes in the problem resolution, the process is restarted with a new configuration until a permanent solution is found. Rarely, we solve problems by following an optimal solution sequence, with the possibility of steps coming and going, changing their order, or even skipping or adding steps.

Affective States

The apparent ease in understanding what an emotion is contrasts with the difficulty in defining it conceptually. Such difficulties have led scholars either to consider it a broader process that involves different aspects: physiological (bodily reactions and neurophysiologic pathways), social and interpersonal (learned through social and cultural norms), cognitive (subjective experience of perception and evaluation), and behavioral (action tendencies, emotional, facial, and gestural expressions), or to define it through a differentiation from other emotional events, such as affect, feeling, mood, and temperament.

The framework of affect proposed by Gray and Watson (2001) is based on the analysis of three characteristics: duration, object, and state. Emotion would be a state of short duration (a few seconds) and focused on a specific object. Mood would be a diffuse affective state, that is, not directed toward a specific object and lasting from minutes to days, thus of long duration. Temperament would be tied to personal characteristics manifested in various situations, lasting months to years, and thus being a more permanent state. Affect would be a broader category, encompassing emotion, mood, and temperament.

Affects have a valence (positive or negative) and an activation level (intensity) in which they are expressed. This characterization is tied to the explanatory model of affects and their possible dimensions, the circumplex model (Russell, 1980), which postulates that affective state descriptors can be systematically arranged around the perimeter of a circle where the horizontal (pleasure - displeasure) and the vertical (excitation - lethargy) dimensions would represent, respectively, the affective valence and its activation levels. Therefore, understanding affect dynamics involves the examination of the different classes of emotions resulting from the combinations between possible valences and activation levels of emotions.

Several studies were able to report affective influences on the processes and results of teams (e.g., Bodtker & Jameson, 2001; Jones & Bodtker, 2001; Nair, 2008; Sy, Côté, & Saavedra, 2005). Staw and Barsade (1993) found that people with a high activation of positive dispositional affects achieved better performance in tasks related to decision-making and interpersonal relationships. Tanghe, Wisse and Van der Flier (2010), in studying trust and cooperation in teams, concluded that the display of affective states (high activation) provoked cooperative behavior in individuals who had low trust in the other members.

By using the term emotion with distinct meanings, this study will employ the term *affective states* to refer to the emotions

experienced in problem-solving. Affective state shall be understood as the immediate response of the individual in preparation for an action in relation to an internal or external stimulus, composed of biological, social, and subjective dimensions. Perception and subjective evaluation of the emotional situation will be considered in this process.

Conflict Perception

In-group interactions and social influences trigger cooperative behavior or disputes. Interpersonal conflict in groups is characterized mainly by incompatibilities between individuals' goals, values, and needs (Martins & Puente-Palacios, 2010). Conflicts are not exclusively situations of disagreement, and can occur in situations of cooperation (Jehn, 1997).

The expert literature addresses conflict from various perspectives. Guetzkow and Gyr (1954), and later Blake and Mouton (1976), argued that conflicts can pertain to relationships (people) and tasks (production). The former involve emotions and the latter are more cognitive, as what is at stake are arguments about the execution of tasks. The style of dealing with conflict is the most important aspect for Rahim (1986). Brett (1984) qualifies conflict by its source (internal or external to the group).

Beginning with the proposition by Guetzkow and Gyr (1954), it was assumed that task and relationship conflicts were independent. However, later studies demonstrated a positive correlation between them, arousing curiosity about their relation. The study by Choi and Cho (2011) on the causal link between the two conflicts concluded that relationship conflict leads to task conflict when mediated by negative affects of the group; task conflict, however, predicts a subsequent relationship conflict only when there are low levels of trust among group members.

Another research line explores affective experiences in conflicts, assuming there is no conflict in the absence of emotion (Jones, 2000). Bodtker and Jameson (2001) add that one is aware of conflict only when one recognizes that someone else reacts emotionally to something. Evidence shows that the triggers of conflicts and emotions are the same, occurring when people perceive incompatible goals or interference from others, with emotional intensity indicating the valence of the conflict (Bodtker & Jameson, 2001; Jones & Bodtker, 2001; Nair, 2008). Therefore, conflict would be immersed in a context of emotional intensity that can vary and influence the selection of conflict behaviors. This seems to suggest the existence of a conflict-triggering emotional intensity threshold.

The Present Research

In order to formulate the hypotheses of this study, we began with several assumptions. The first was that the process of performing a task activates a self-assessment of individual performance, triggering positive and negative affective states, particularly intense when the task is performed in a group, through the mutual influence among the members (Forsyth, 1990; Mead, 2008). Thus, it is expected that the experience of a satisfactory performance can activate more intense positive states as well as negative states of lesser magnitude, especially in performing group tasks. So the following hypotheses were formulated:

Hypothesis 1. There will be differences in affective states (positive and negative) after the completion of the task.
Hypothesis 1a. Positive affective states in the group condition will be higher than in the individual condition, finding higher group performance.
Hypothesis 1b. Negative affective states in the group condition will be less intense than in the individual condition, finding higher group performance.

The second assumption of this study was that the interactive process in the group is experienced ambivalently (agreements and disagreements), triggering cyclical processes of conflict, which indicates that new experiences of group work can change the perception of internal conflicts. Considering the above, it is proposed that:

Hypothesis 2. Only conflict perception in the group condition will undergo changes after the completion of the task.

For problems in which there is one answer seen as correct, evidence indicates that group performance is better than individual performance, as groups make use of more complex strategies that allow the identification and adoption of correct solutions, the recognition and rejection of incorrect solutions, and the effective processing of information (Laughlin, Hatch, Silver, & Boh, 2006). This greater effectiveness for groups seems to have been possible through the sharing and integration of information. Therefore, better performance is expected from groups in terms of process and outcome, which led to the following propositions:

Hypothesis 3. The task done by a group will present superior performance when compared to it being done individually.

Hypothesis 4. The process of problem-solving will present a higher general score in the group than in the individual condition.

Studies indicate relationships between low team performance and high levels of conflict, contrary to what happens for lower levels of conflict (Jehn, 1997; Jehn & Chatman, 2000). Thus, the following hypotheses were formulated:

Hypothesis 5. In the group task, conflict perception will exert a direct impact on performance.
Hypothesis 5a. Higher conflict perception will contribute to lower performance.
Hypothesis 5b. Lower conflict perception will contribute to higher performance.

The following hypothesis begins with the presumed existence of an affective influence on the processes and outcomes of groups and individuals. Staw and Barsade (1993) and Tanghe et al. (2010) clearly showed the role of the intensity of affects, verifying, respectively, relations between high activation of affects and performance (tasks related to decision-making and interpersonal relationships), and increased cooperation in low trusting individuals. Thus, it makes sense to assume that for both experimental conditions:

Hypothesis 6. The affective states (positive and negative) will exert a mediating effect between the experimental condition and performance.

Evidence shows that conflicts are intertwined with emotions (Jehn, 1997; Nair, 2008), affecting the functioning and performance of groups. Presumably, then, there is affective mediation in conflict perception based on the experience (satisfying or not) of accomplishing the task. In the group condition, the experience depends heavily on interaction with others, while the individual task is focused on personal competence to accomplish the task. Thus, it is assumed that the concrete experience of carrying out the task in a group will have an impact on conflict perception, differing from those who take on the task individually and who will base their

perception of team conflicts on their previous experiences. Thus, the final hypothesis formulated is:

Hypothesis 7. The affective states (positive and negative) will exert a mediating effect between the experimental condition and the conflict perception on teamwork.

Method

Participants

The sample used in the study consisted of 114 undergraduate and graduate students at public and private institutions in the city of Salvador, Bahia (Brazil). Of this total, 60 were allocated to the group condition and 54 to the individual condition; 61% were female, the mean age was 24 years, and 83% had yet to complete their higher education, predominantly in the social and humanities areas (65%),with 48% majoring in psychology. Convenience sampling was the selection method employed. In each session, four or five participants were allocated into the two experimental conditions. All participants gave their formal authorization for participation by a Statement of Free and Informed Consent.

Design, Procedures, and Measures

This is an experimental study in which the independent variable was the modality of accomplishing the task proposed (individual vs. group). Individual condition is the control group since it is aimed to assess the group condition. The dependent variables were the affective states, performance in the game (task), and the conflict perception related to teamwork. The experiment consisted of completing a task based on the computer game *X-Construction Lite*, whose goal was to build bridges with a specific structure to allow the passage of a train, without collapsing[2]. The game features nine stages, progressively increasing the level of difficulty. Upon completing a phase, a score is generated based on the quality of the bridge built.

A pre-test was run with a group of four participants, in the group condition, which allowed for an adjustment of the instructions and the time to perform the task. Before performing the task, the level of relationship among group participants was identified. Only those who indicated the options *have never seen*, *know by sight*, and *have conversed a few times*, were allocated to the group condition. The experiment was divided into three stages. In the first, the following instruments were applied:

Positive and Negative Affects Scale (Diener & Emmons, 1984). Comprises nine adjectives (α = .89 for positive affects and α = .84 for negative ones), four being positive (happy, joyful, pleased, and enjoyment), and five negative (depressed, worried, frustrated, angry, and unhappy). Gouveia et al. (2003) added the adjective "optimistic" to balance the total of adjectives for each type of affect (α = .81 for positive affects and α = .78 for negative ones). The instrument assesses how much the participant has experienced each of these emotions on a seven-point scale ranging from 1 (*not at all*) to 7 (*extremely so*).

Teamwork Conflict Perception Scale (Jehn, 1994; Martins, Guimarães, & Oliveira, 2006). Consisting of eight questions (α = .87) that consider four items for each type of conflict (task and relationship), and use a Likert scale ranging from 1 (*not at all*) to 4 (*very much*).

In the second stage, the instructions were provided and the task was performed in 25 minutes. At the last stage, participants responded to the same instruments as in the first stage, and to the following task-solution performance measures, plus sociodemographic data:

Performance result measures. Two indicators were created. The first was a result of the combination of the game stage reached and its corresponding score. Performance was ranked, ordering the scores from lowest to highest in each phase, which resulted in 56 scores. The highest score was awarded a total of 1,000 points, and a rough gradation of 18 points was established between the scores. The second indicator rated performance into three groups, based on these points, considering a relatively evenly distributed frequency: low (18-411 points), medium (412-786 points), and high (787-1,000 points).

Performance process measures. Two measures were developed. The first was developed based on the seven stages of the problem-solving process (Sternberg, 2000). The second measure involved the perception of the individual in relation to the task, to his/her performance, and to that of the team; the latter being only for participants of the group condition. The items were answered on a Likert scale ranging from 1 (*not at all*) to 4 (*very much*).

The average duration of the sessions was 50 minutes. All instruments were completed using the EFS-Survey software (Enterprise Feedback Suite, Globalpark). For statistical analysis, SPSS software package, version 18.0, was used. The research was conducted in June and October of 2012, totaling 23 sessions (group = 13 and individual = 10). The survey was taken at the Social Cognition Laboratory of a federal public institution of higher education in Salvador, Bahia.

Results

Affective States

Analysis of affective states identified pronounced asymmetries and curtoses for the depressed, angry, and unhappy states. This result guided the decision to consider only the frustrated and worried states for negative affects. Aiming to keep a balance between positive and negative affects, only the satisfied and optimistic positive states were retained, as better counterpoints to the negative affective states considered.

On comparing affective states before and after the task, significant differences were identified for positive affects, $t_{(113)}$ = 2.335, p < .05, r = .21, and negative ones, $t_{(113)}$ = 8.26, p < .001, r = .61, although only the latter showed a large effect, accounting for 38% of the total variance. Before the experiment, the positive affective states in the individual (M = 4.57, SD = 1.20) and in the group (M = 4.78, SD = 1.30) condition did not differ, $t_{(112)}$ = -.856, p = .39, as was expected. After the task, a significant difference was obtained, with a medium effect size, $t_{(112)}$ = -3.651, p < .05, r = .33, in which those who performed the task in a group (M = 4.83, SD = 1.50) experienced more intense positive affective states compared to those who performed individually (M = 3.84, SD = 1.37).

Similarly, it was found that the negative affective states of participants in the individual condition (M = 3.53, SD = 1.28) and in groups (M = 3.27, SD = 1.24) did not differ before the task, $t_{(112)}$ = 1.094, p = .28, but differed afterwards, $t_{(95,714)}$ = -3.462, p < .05, r = .33, with a medium effect size. Accordingly, participants who performed the task individually (M = 2.79, SD = 1.25) had higher negative affects scores in relation to those in the group condition (M = 2.08, SD = .90). Thus, the following hypotheses were corroborated: hypothesis 1, which predicted differences between the affective states before and after the task, hypothesis 1a and hypothesis 1b, which postulated that the participants in the group

[2] The game offers pieces in the shape of beams that are available on the screen for the participant to select in order to build the bridge. The quality of the bridge depends on how the beams are arranged and support the passage of a train.

condition would show higher positive affect and lower negative affect scores in relation to those in the individual condition, with the group's performance being higher.

Conflict Perception

We evaluated the dimensionality of conflict perception, regarding group work, using principal axis analysis with oblique rotation, which revealed, in the moments before and after the task, respectively, a two-factor solution (Friedman, Tidd, Currall, & Tsai, 2000; Jehn, 1994, 1997) and a one-factor solution (De Dreu & Weingart, 2003; Martins & Puente-Palacios, 2010). The two-factor solution classifies the conflicts in terms of tasks and relationships. To allow for comparability before and after the task, the one-factor solution was chosen. The explained variance in post-task teamwork conflict perception was 52.8%. The factor loadings of the items ranged from .57 to .86.

The comparison of the conflict perception, between the experimental conditions, showed that both cases differed before, $t_{(112)}$ = 3.008, p < .05, r = .27, and after, $t_{(110.53)}$ = 3.863, p < .05, r = .34, the task. Before the task, participants in the group condition (M = 2.40, SD = .50) had a lower perception of team conflicts when compared to those in the individual condition (M = 2.68, SD = .47). After the task, these results held, both for individuals (M = 2.67, SD = .46) and for groups (M = 2.29, SD = .58), which was clearly expected only for those who performed the task individually. These findings corroborate in part the second hypothesis of the study, which predicted differences in conflict perception, after the task, only for participants in the group condition.

Performance

The first indicator of the performance result measurement was general performance, calculated based on the game level and the score achieved. This indicator showed a significant difference, with a large effect, between the experimental conditions, $t_{(101.525)}$ = -6.672, p < .05, r = .55, in which the average score in the team condition (M = 724.43, SD = 232.58) was 84% higher than in the individual condition (M = 393.48, SD = 290.15), corroborating hypothesis 3.

The second indicator of the performance result ranked performance into three categories (31% low, 37% medium, and 32% high), balancing the frequency distribution (simulating a normal distribution). On comparing the expected frequency with the one observed, a significant difference was verified for both individual performance (χ^2 = 18.11, p < .05) and for that of the group (χ^2 = 21.7, p < .05). Fig. 1 shows the better performance of the participants in the team condition. The participants appear to be aware of this result, as there was a significant difference in the perception of satisfaction with performance, with a large effect, $t_{(107.852)}$ = -6.861, p < .001, r = .55, when comparing the individual condition (M = 1.81, SD = .65) with that of the team (M = 2.80, SD = .88), considering the scale of 1 (*none*) through 4 (*very much*).

Regarding the problem-solving process, there was no significant difference, $t_{(112)}$ = −1.202, p = .23, between groups (M = 2.70, SD = .53) and individuals (M = 2.58, SD = .50) in the overall score, which did not corroborate Hypothesis 4. Only the items related to the identification of strategies, $t_{(112)}$ = -1.714, p < .05, r = .16, and information sharing, $t_{(112)}$ = -5.119, p < .001, r = .44, showed significant differences, with small and medium effects respectively.

Correlations analyses between the perception of the process, satisfaction with performance, and the result itself revealed, in the individual condition, a correlation only between the identification of strategies stage and satisfaction with performance; in the group condition, satisfaction was significantly correlated with all of the process items, except the one relating to planning. The correlation between performance (result) and the resolution process showed

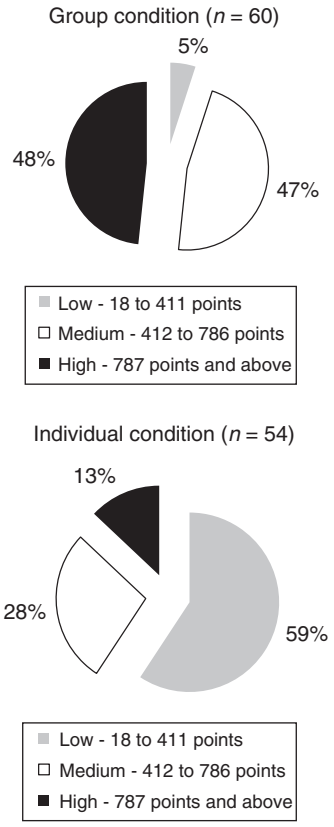

Figure 1. Performance in the task by experimental condition.

that organizing information was the only stage with a positive correlation for both experimental conditions, which makes sense given the nature of the task, requiring a very clear visual *gestalt.* Those results are reported in Table 1.

Upon controlling the effect of the problem-solving process evaluation in the relation between satisfaction and performance, the reduction was lower in the group condition than in the individual condition. Indeed, in the latter case, more correlations were found between performance and the stages of the resolution process than in the group condition.

In the task evaluation, the items: like the task, $t_{(89.234)}$ = -2.508, p < .001, r = .26, satisfaction with performance, $t_{(107.842)}$ = -6.861, p < .001, r = .55, and holding attention during the game, $t_{(96.223)}$ = -2.254, p < .001, r = .22, were favorable to groups. Although only satisfaction presented a large effect, the results indicated an alignment between the items. In the group condition, the task was assessed as quite pleasurable (83%), consistent with the low post-task conflict perception, as team performance was related to the interaction among its members (88%).

Relating Affective States, Conflict Perception and Performance

In analyzing how much the conflict perception, developed during the task, affected group performance, no correlation was found between the constructs (r = .003, p = .49), precluding regression analysis (hypotheses 5, 5a and 5b). Path analysis was used to test the mediational role of affective states between the experimental condition (individual vs. group) and performance (Hypothesis 6). The required absence of multicollinearity was addressed by the correlations between the criterion variable, performance, and the predictor variables: experimental condition (r = .54, p < .001), positive affects (r = .38, p < .001), and negative affects (r = -.31, p < .001), and by the analysis of standardized residuals that placed less

Table 1
Correlations of Problem-solving Process Stages with Satisfaction and Performance.

Stages	Performance		Satisfaction with performance	
	Team	Individual	Team	Individual
Clear definition of the problem			.35*	
Identification of strategies		.40*	.56*	.28*
Analysis of efficacy of alternatives			.28*	
Organizing information	.28*	.27*	.48*	
Prioritization of time for planning				
Sharing of information and skills			.54*	
Monitoring the solution process			.46*	
General assessment		.33*	.59*	

* $p<.0.05$

Table 2
Predictors of Performance in the Task.

	B	*SE B*	*β*
Model 1			
(Constant)	393.48	35.57	
Experimental condition	330.95	49.04	.54*
Model 2			
(Constant)	222.63	72.78	
Experimental condition	286.98	50.51	.47*
Positive affects	44.45	16.65	.22*

* $p < .001$

than 5% of the cases outside the range of ±2; casewise diagnostics (Centered Leverage Value, Cook's Distance, and Mahalanobis Distance) suggested the absence of undue influence on the model. The assumptions of homoscedasticity and linearity were addressed by observing the graph of the standardized predicted values *versus* the standardized residuals from the regression.

As a first step in the path analysis, we tested whether experimental condition would exert an influence on the affects experienced. We performed a simple linear regression for each of the affects, using the *enter* method, where the experimental condition explained 11% of the variance of the positive affects, $R = .36$, adjusted $R^2 = .11$, $F_{(1,112)} = 13.332$, $p < .001$, and 9% of the negative affects, $R = .32$, adjusted $R^2 = .09$, $F_{(1,112)} = 12.390$, $p < .05$. Then, we performed a multiple regression analysis between the predictor and criterion variables, opting for the stepwise regression model. The Durbin-Watson statistic was 1.35, an acceptable value, indicating the independence of errors.

The results showed that the experimental condition explained 28% (adjusted R^2) of the variation in performance, a value that rose to 32% when the model aggregated positive affects and excluded negative ones. The association between criterion and explanatory variables was moderate ($R = .58$). Table 2 shows the standardized regression coefficients, which indicated that the experimental condition contributed more (47%) to performance than did positive affects (22%). In view of these results, *H*6 was rejected.

We also evaluated, using path analysis, the mediational role of the affective states in the relationship between the experimental condition and conflict perception (Hypothesis 7). Similarly, there was a lack of multicollinearity between the variables, and of undue influence in the model. Conflict perception correlated negatively with experimental condition($r = -0.34$, $p < .001$) and with positive affects ($r = -.17$, $p < .05$), and positively with negative affects ($r = .19$, $p < .05$).

The first stage of the path analysis (to test if the experimental condition has an impact on each of the affects) was already done in Hypothesis 6. The next step was the multiple regression analysis between the predictor and criterion variables, choosing again the stepwise model. Experimental condition was the only predictor, explaining 11% (adjusted R^2) of the variation in conflict perception, reflecting the weak association between the variables ($R = .34$). The standardized regression coefficient indicated that the experimental condition contributed 34% to conflict perception. The exclusion of positive and negative affects from the model does not corroborate the mediation relationship (Hypothesis 7).

Discussion, Limitations, and Future Directions

Consistent with the hypotheses of this study, group performance was superior to the individual's, and was related more to positive than to negative affective states, indicating a more positive perception by these participants about their own performance. Group performance, however, did not translate into a better problem-solving process, when compared to the individual condition. In fact, there was a greater number of correlations between the problem-solving stages and performance in the individual condition. This result-process dichotomy suggests that the problem-solving stages can contribute heterogeneously to performance. The only stage that was correlated to performance for the two experimental conditions was that of organizing information, which may indicate that it has a key role in problem-solving. Although the study sample was comprised of college students, this work group is a regular methodological practice in universities, which allows finding evidence on the performance of teams in general.

As expected, the task had the capacity to activate affective states, but in a lower intensity than predicted, which may have been influenced by the artificial condition in performing the task (no direct consequences for the participants); a real situation might have a greater potential to induce emotions of higher intensity (Marston, Hart, Hileman, & Faunce, 1984). The disjunctive character of the task (Steiner, cited by Mcgrath, 1984) may have led the group to choose its most skilled member(s) to execute the task (social loafing), reducing the motivation and the mobilization of affective states of the other participants. The lack of task interdependence may also have contributed to a lower emotional intensity. The irrelevance of the tasks to participants' personal goals also minimized the direct impact of the interdependence of results on the affects experienced. When the task was chosen for this study, it was supposed that the attraction of computer games would be enough to trigger a strong emotional activation, minimizing effects of artificiality and the design of the task, which actually did not occur.

It is believed that the moderate emotional activation affected conflict perception, which remained unchanged in the group condition. The results seen here corroborate previous studies (Bodtker & Jameson, 2001; Jones & Bodtker, 2001; Nair, 2008), which suggest that emotional ambience is associated with the maintenance of conflict, since the triggers of both are the same. According to Forsyth (2000), it is, in particular, conflict or intergroup competition that prepares the ground for the emergence and intensification of negative emotions. Competition was not part of the task design and,

in the case of conflict, the group dynamic did not change the initial perception, which was already low. Furthermore, the fact that the group interaction was only to perform a single task may also have been an influence, since groups whose relationships have no continuity tend toward a lower susceptibility in the onset of conflicts (Jehn & Mannix, 2001).

The levels of affective state activation and conflict perception evaluated post-task did not allow us to prove the impact of conflict perception on performance and the mediation of affective states in the relationships between the experimental condition and these variables. To overcome the main limitation of the study, the activation of affective states, we suggest the use of priming and manipulation checks to assess the effective induction of the affective states.

We can point out several directions for future studies. There is an identified need to analyze the effects of dispositional affects in the evaluation of performance beyond the momentary states considered in this study. This line of research is based on the argument that an individual's characteristics can have an influence on behaviors and outcomes over time. Moreover, it is necessary to explore whether dispositional affects would be triggers of more transient affective states that would have impacts on performance (Staw & Barsade, 1993).

Research that seeks to understand the complex role of the emotions in the moment of conflict, and in its resolution afterwards, will expand the knowledge about the intricate relations between the constructs. We propose, additionally, investigating the role of the positive emotions, addressing management (regulation) and the expression of affective experience. Finally, the use of complementary methods, such as observation, could provide additional objectivity in assessments of emotions in teams or organizations (Huy, 1999).

In closing, we suggest two questions for future studies: What is the role of each of the problem-solving process stages in the effective performance of the group? Could emotional intensity be activated more in longitudinal studies that consider the performance of several tasks, in order to better test its mediation in group performance? These are just a few possibilities for transforming the hypotheses presented here on research questions even more complex and relevant.

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Conflict of Interest

The authors of this article declare no conflict of interest.

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