Linking teacher-student relationship quality and student group performance: A mediation model

Vicente González-Romá[1] · Ana Hernández[1] · Adoración Ferreres[1] · Rosario Zurriaga[1] · Jesús Yeves[2] ·
Pilar González-Navarro[1]

Abstract

We tested a mediation model of the influence of teacher-student relationship quality on student group performance in a higher-education context where a group-oriented learning approach is implemented. Specifically, we posit that the relationship between teacher-student relationship quality at the group level and group performance is mediated by positive affective group well-being and intragroup communication quality. Data were collected from 68 groups of students at four time points. The hypotheses involved in the proposed mediated model were tested by means of multiple regression. We controlled for group size and students' initial familiarity with the other group members. All the analyses were conducted at the group level by means of the PROCESS macro for SPSS. The results obtained showed that teacher-student relationship quality has an indirect positive influence on group performance, mediated by positive affective group well-being and within-group communication quality. These findings help to understand how and why teacher-student relationship quality is related to student group performance.

Keywords Teacher-student relationship quality · Collaborative learning · Group performance · Communication · Wellbeing

Introduction

Past research in higher education has shown that teacher-student relationship quality (TSRQ) is an important factor that influences motivational, attitudinal, social, and academic outcomes at the individual level, such as student

✉ Ana Hernández
  Ana.Hernandez@uv.es

  Vicente González-Romá
  Vicente.Glez-Roma@uv.es

  Adoración Ferreres
  Adoracion.Ferreres@uv.es

  Rosario Zurriaga
  Rosario.Zurriaga@uv.es

  Jesús Yeves
  jesus.yeves@udp.cl

  Pilar González-Navarro
  pilar.glez-navarro@uv.es

[1] IDOCAL, Facultad de Psicología, Universidad de Valencia, Av. Blasco Ibáñez, 21, 46010 Valencia, Spain

[2] Facultad de Psicología, Universidad Diego Portales, Vergara, 275, 8370076 Santiago, Chile

satisfaction, interest and commitment, and academic performance (Cornelius-White, 2007; Roorda et al., 2011; Thompson, 2001). These results were obtained in contexts where an individual learning approach (where the individual student and his/her learning process are the key factors) was implemented. However, in recent years, most higher education organizations have adopted a group-oriented learning approach (Bravo et al., 2016; Curşeu et al., 2018). This is the case of most European universities, where the implementation of the agreements of the European Higher Education Area (EHEA) has fostered the introduction of group-oriented teaching methods, such as collaborative learning. Collaborative learning is an educational approach that involves small groups of students working together to find solutions to problems, discuss concepts, create new products/services in simulated situations, or complete group assignments (Harney et al., 2012).

The role of the teacher in this new group-based learning context is critical for obtaining good learning results. A literature review of empirical studies conducted by Webb (2009) concluded that teachers who develop attitudes and skills congruent with collaborative learning (e.g., active, listening, constructive feedback, group commitment, and empathy) in

their students can increase group performance. However, few studies have investigated the influence of the TSRQ within this new group-based approach. Filling this gap is important for several reasons. First, as mentioned above, previous research on the influence of the TSRQ has been carried out at the individual level. Generalizing the results and conclusions drawn from this research to a group-based learning context could lead researchers to commit an atomistic fallacy (i.e., an erroneous inference about the relationship between two group-level variables based on the relationship observed between these variables operationalized at the individual level; Kozlowski & Klein, 2000). To avoid this problem, there is a need for studies carried out at the group level that examine the influence of the TSRQ. Second, in order to improve our understanding about how and why this variable influences the performance of student groups, there is a need for mediation studies carried out at the group level that help to identify the intervening variables (i.e., group states and processes) linking group TSRQ and group performance. From a practical perspective, understanding the mechanisms connecting these two variables can be useful for designing strategies to improve group performance by intervening in the identified predictors and mediators.

Therefore, the goal of this study is to test a mediational model of the influence of TSRQ on student group performance at the group level of analysis. Using Leader-Member Exchange (LMX) theory (Graen & Scandura, 1987) as our theoretical framework, we posit that the relationship between these two variables is mediated by positive affective group well-being and intragroup communication quality (see Fig. 1). We chose LMX theory for several reasons. First, it focuses on the quality of the leader-member relationship as a crucial factor in understanding relationship outcomes. Second, it has been used to investigate the antecedents of work group outcomes (e.g., Le Blanc & González-Romá, 2012). Third, leader-member and teacher-student relationships share important characteristics. Both relationships are characterized by a difference in formal power and status between the involved parties, and the two parties exchange important resources (e.g., information, knowledge, support) to attain their respective (learning/work) goals. Therefore,

LMX theory can be useful to investigate the outcomes associated with TSRQ in a group-oriented learning context.

We focused on positive affective group well-being and intragroup communication quality as two hypothetical mediators for the following reasons. First, research conducted in work organizations has shown that positive affective well-being is one of the outcomes of high-quality LMX relationships (Erdogan & Bauer, 2014). Thus, it is plausible to imagine that student groups' affective well-being is one of the direct outcomes of TSRQ, through which the influence of the latter can be transmitted to group processes and outcomes. Second, intragroup communication is a key group process for group performance because it serves as a support mechanism for other group processes, such as group members' coordination, decision making, problem solving, and group monitoring (Kozlowski & Ilgen, 2006). Thus, it is highly likely that the quality of intragroup communication in student groups predicts group performance (Curşeu et al., 2018).

Our study attempts to make several contributions to the literature. First, by adopting a group-level perspective, we show that TSRQ in a group learning context has a positive indirect influence on group performance. Thus, we extend previous individual-level research on the positive outcomes of TSRQ in higher education. Second, we identify some of the intervening variables that help to explain why TSRQ has a positive influence on group performance.

Theoretical Background

Leader-Member Exchange (LMX) theory posits that leaders develop specific types of relationships with each of their subordinates through a series of work-related exchanges (Graen & Scandura, 1987). The quality of these relationships reflects the extent to which leader and subordinate mutually exchange valuable resources. In high quality relationships, the parties involved exchange both material (i.e., means and tools) and non-material (i.e., emotional support) resources, beyond what is required by their formal relationship, and they generally show high levels of mutual respect, trust, support, and reciprocity (Graen & Uhl-Bien, 1995;
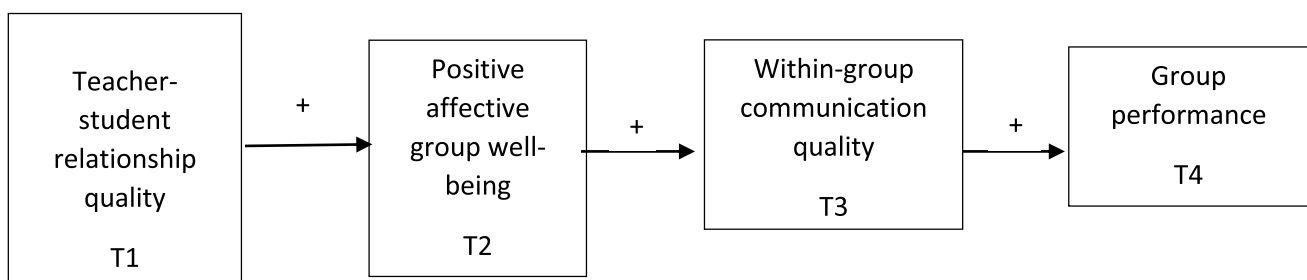

Fig. 1 The research model

González-Romá, 2016). Similarly, in high-quality teacher-student relationships, the parties involved exchange emotional support, acceptance, responsiveness, and involvement (Gavidia-Payne et al., 2015). In low quality relationships, exchanges are limited to those specified by the established formal relationship (e.g., the employment contract). A particular characteristic of LMX theory is that it proposes that the quality of the relationship between leaders and members plays a crucial role in understanding how leaders can influence their collaborators and teams (Dulebohn et al., 2012; Erdogan & Bauer, 2014). Empirical research conducted at the individual level supports this influence. The meta-analysis conducted by Dulebohn et al. (2012) showed that LMX quality was positively related to affective, attitudinal, and behavioral outcomes (e.g., affective commitment, job satisfaction, and job performance). At the group level, LMX quality has been operationalized by using central tendency statistics. The most desirable situation arises when leaders develop high quality relationships with all their collaborators (Graen & Uhl-Bien, 1995). Research conducted at the group level also shows that LMX quality is positively related to desirable group outcomes such as performance and affective commitment (Le Blanc & González-Romá, 2012; Liden et al., 2006).

Teacher-Student Relationship Quality and Positive Affective Group Well-Being

In the present study, groups' TSRQ is conceptualized as the level of TSRQ shared by group members. As mentioned above, teachers will try to develop high quality relationships with all group members because this is the situation that yields better outcomes (Graen & Uhl-Bien, 1995; Day & Schyns, 2010).

We posit that TSRQ is positively related to the positive affective well-being of student groups. Affective well-being can be conceptualized as the way people feel about themselves, and it can be operationalized by measuring positive moods (Diener, 1984; Luhmann et al., 2012). Compared to emotions, moods are weaker and more diffuse affective reactions whose effects are subtler and more pervasive (Forgas, 1992). In the present study, we operationalized affective well-being by measuring positive mood (González-Romá & Gamero, 2012; Gamero & González-Romá, 2020).

Group members tend to share their affective reactions and moods (Bartel & Saavedra, 2000; González-Romá et al., 2000). Several mechanisms may help to explain the emergence of group well-being from group members' moods. Some of these mechanisms are social interactions and influence, socialization processes, emotional comparison and emotional contagion, and mood regulation norms (see Kelly & Barsade, 2001, for a review). Through these processes, group members' moods are combined and

modeled to emerge at the group level as group well-being. Therefore, we conceptualized positive affective group well-being as group members' shared positive mood (Gamero & González-Romá, 2020).

Based on LMX theory, we argue that when a teacher has high quality relationships with the members of a given group, the latter will receive valuable resources such as emotional support, confidence, and trust from an important agent in the learning environment (Graen & Uhl-Bien, 1995). As a result, group members will feel valued, supported, and appreciated (Sparr & Sonnentag, 2008), and positive affective group well-being will be higher. Therefore, we hypothesize the following:

> Hypothesis 1: The quality of the teacher-student relationship will be positively related to the subsequent positive affective well-being of student groups.

Positive Affective Group Well-Being and Intragroup Communication Quality

Intragroup communication quality refers to the extent to which communication among group members is clear, effective, complete, fluent, and timely (González-Romá & Hernández, 2014b). The relationship between positive affective group well-being and intragroup communication quality can be based on Fredrickson's (1998) broaden-and-build theory. According to this theory, shared experiences of positive affect within a group strengthen the social relationships within the group. The underlying mechanism is as follows: positive affect fosters helping behavior among group members (Isen, 1987; George, 1990), which in turn produces gratitude in the receiver of help and the motivation to reciprocate (Fredrickson, 1998). The result of this process is a set of strengthened social relationships (Brown & Fredrickson, 2021). Within a group, these social relationships fostered by shared positive affect represent a valuable social resource that facilitates good communication within the group. Taking these arguments into account, we hypothesize the following:

> Hypothesis 2: Positive affective group well-being will be positively related to subsequent intragroup communication quality.

Intragroup Communication Quality and Group Performance

Communication is a key process in adequate group functioning in higher education contexts (Bravo et al., 2016). To perform well, carry out their activities, and achieve their goals, group members must effectively communicate with each other for many purposes, such as sharing information,

planning and coordinating actions, monitoring, and giving and receiving feedback. Thus, we expect intragroup communication quality to be positively related to group performance. Congruent with this idea, in a sample of groups composed of university students, Curşeu et al. (2018) found that a variable close to intragroup communication (quality of group discussions) was positively related to group performance. Moreover, a recent meta-analysis showed that team communication quality was positively related to team performance (Marlow et al., 2018). Therefore, we propose the following hypothesis:

> Hypothesis 3: Intragroup communication quality will be positively related to subsequent group performance.

Teacher-Student Relationship Quality and Group Performance: A Mediated Relationship

Based on the hypotheses presented above, we posit that the relationship between TRSQ and group performance is positive and indirect via positive affective group well-being and intragroup communication quality. This mediated relationship is consistent with models of group functioning, such as the input-processes-output model (McGrath, 1984) and the input-mediator-output-input model (Ilgen et al., 2005). In these models, group states (e.g., group well-being) and processes (e.g., communication) are expected to transmit the influence of group inputs (TSRQ) on group outcomes (group performance). Thus, we hypothesize the following:

> Hypothesis 4: Teacher-student relationship quality will show a positive indirect "effect" on group performance, mediated by positive affective group well-being and intragroup communication quality.

Method

Procedure

Students from different university degrees (psychology and physiotherapy) in a Spanish public university located in Valencia were enrolled in the study. The students were taught by three different teachers. We collected data at four different time points separated by a time lag of two weeks between consecutive time points. We implemented this time-lagged design to ensure that there would be congruence between the ordering of the study variables in our research model (Fig. 1) and the time point at which they were measured. Four collaborative learning activities were designed and implemented during the data collection period. These activities were developed and completed in the classroom while students were working in groups. Students belonging

to the same group had to interact with each other to achieve the common goals established in each activity and finish it. All the learning activities were rated low on difficulty by the instructors involved, provided that the students had attended the lessons. Within each class, we randomly assigned students to groups with an intended size of four members. We chose this size because in cooperative learning small groups of four to six peers are typically used (Palincsar & Herrenkohl, 2002), and by choosing a group size of four we could increase the number of groups per class. Seventy groups were formed. In some classes the total number of students was not divisible by four, and so some adjustments had to be made. Despite this, the average size of the groups was 4.16 members (SD = .74).

At Time 1 (T1), we measured the groups' TSRQ. At Time 2 (T2), we collected data on positive affective group well-being. At Time 3 (T3), we measured intragroup communication quality. And at Time 4 (T4), we collected data on group performance. Students voluntarily responded to the questionnaires at the end of the corresponding class. Data were collected using electronic tablets. Participation was completely voluntary, the answers were anonymous, confidentiality was guaranteed, and the sample did not receive any type of compensation.

Participants

A total of 291 undergraduate students participated in the study. The average age was 21.1 years (SD = 4.7) and most were women (63.7%). Regarding subjects' studies, 42.3% were studying Psychology, and 57.8% were studying Physiotherapy. Sixty-eight groups gave responses at the four time points.

Measures

Because the study was performed at the group level of analysis and data were collected at the individual level, individual data were aggregated at the group level by averaging the individual scores. To determine whether aggregation was justified, first we estimated within-group agreement by computing the Average Deviation Index -ADI- (see Burke & Dunlap, 2002), that provides estimates of interrater agreement in the metric of the original response scale. Burke and Dunlap (2002) derived and justified a practical upper-limit criterion of c/6 (where c is the number of response categories in the response scale) for interpreting ADI values.

Second, we also carried out a one-way analysis of variance (ANOVA) to ascertain whether there was statistically significant discrimination between the study variables at the group level. Moreover, we computed the intra-class correlation coefficient [ICC (1)] to estimate the proportion of

total variance that corresponds to between-group variance. Below, we report the values obtained for the study measures.

Teacher-Student Relationship Quality (TSRQ) Collected at T1, it was measured with four items from the Leader-Member-Exchange scale (Scandura & Graen, 1984), although the referent was changed from the leader to the teacher (e.g. "To what extent does your teacher understand your problems and needs?"; "To what extent does your teacher recognize your potential?"). Three out of the four items (numbers 2, 3, and 5 on the original scale) were selected because in a psychometric analysis conducted by González-Romá and Hernández (2014b) using Item Response Theory methods, they were the most informative and reliable items. The fourth item ("How would you characterize your relationship with your teacher"?) was included because it yielded an overall assessment of the teacher-student relationship. Items were responded to on a 4-point Likert scale ranging from 1 (depending on the item, either "Not at all", "Nothing", or "Strongly disagree") to 4 (depending on the item, either "Absolutely", A lot", or "Strongly agree"). The average ADI obtained (.24, SD = .15) was lower than the upper-limit criterion of c/6 (c/6 = .67, where c = 4), showing that within-group agreement was satisfactory. Moreover, we also carried out a one-way analysis of variance (ANOVA) to ascertain whether there was statistically significant between-groups discrimination in the average TSRQ. The results obtained, $F_{(67, 190)} = 2.70$, $p < .01$, showed that there was a significant degree of between-groups differentiation. The ICC(1) value obtained was .31. These results supported the validity of the aggregate TSRQ scores (Chan, 1998). Cronbach's alpha for the aggregated scores was .87.

Positive Affective Group Well-Being It was measured at T2 by aggregating the individual responses on the positive mood dimension of the Reduced Affective Wellbeing Scale (RAWS, Kampf et al., 2020). The RAWS is a reduced version of the scale developed by Segura and González-Romá (2003). Students reported to what extent working with their group members had made them feel cheerful, enthusiastic, and optimistic. Responses ranged from 1. "Not at all" to 5. "Very much". Within-group agreement was satisfactory (average ADI = 0.44, SD = .28, c/6 = .83). The one-way ANOVA result, $F_{(68, 163)} = 1.56$, $p < .05$, showed an adequate between-groups discrimination of positive affective group well-being. The ICC(1) value obtained was .14. These results supported the validity of the aggregate group well-being scores (Chan, 1998). Cronbach's alpha for the aggregated scores was .93.

Within-Group Communication Quality It was measured at T3 with a 5-item scale (see González-Romá & Hernández, 2014a). Students reported the extent to which

communication among group members was clear, effective, complete, fluent, and timely. The response scale ranged from 1. "Not at all" to 5. "Very much". Within-group agreement was satisfactory (average ADI = .35, SD = .20, c/6 = .83). The one-way ANOVA result [$F_{(68, 170)} = 1.68$, $p < .01$], suggested an adequate between-groups differentiation of intragroup communication quality. The ICC(1) value obtained was .16. These results supported the validity of the corresponding aggregated scores (Chan, 1998). Cronbach's alpha for the aggregated scores was .91.

Group Performance Collected at T4, it was measured with a 3-item scale developed for the study. Students rated the quality of the work produced by the group, the amount of work produced by the group, and the general performance of the group. Items were responded to by using a 5-point response scale ranging from 1. "Very low" to 5. "Very high". Within-group agreement was satisfactory (average ADI = .36, SD = .26, c/6 = .83). The one-way ANOVA result, $F_{(68, 173)} = 1.42$, $p < .05$, showed an adequate between-groups discrimination of group performance. The ICC(1) value obtained was .11. These results supported the validity of the aggregated group well-being scores (Chan, 1998). Cronbach's alpha for the aggregated scores was .93.

To evaluate the quality of the scales used, we conducted a confirmatory factor analysis. Due to sample size restrictions at the group level, the analysis was carried out with individual responses. Specifically, we analyzed the polychoric correlations by using Robust Weighted Least Square estimation methods. Results showed that the expected four-factor model showed satisfactory goodness-of-fit ($\chi^2 = 91.44$, df = 71, p > .05; Tucker-Lewis index (TLI) = .998, comparative fit index (CFI) = .998 and root-mean-square error of approximation (RMSEA) = .03), whereas a one-factor model did not ($\chi^2 = 1464.75$, df = 77, p > .05; TLI = .853, CFI = .875 and RMSEA = .25). For the four-factor solution, items showed completely standardized factor loadings that ranged between .71 and .97. All of them were statistically significant ($p < .01$). In addition, the correlations among the latent variables ranged from .06 for TSRQ and intra-group communication quality ($p > .05$) to .47 for intra-group communication quality and group performance ($p < .01$).

Control Variables Group size and students' initial familiarity with the other group members were considered as control variables because these variables can influence group members' well-being (Gamero et al., 2009) and group processes (Curral et al., 2001). To measure students' initial familiarity, subjects indicated the number of students in the group with whom they had previously worked. Then, students' responses were aggregated at the group level.

Analysis

All the analyses were conducted at the group level. Hypotheses H1 to H3, related to the proposed mediated model, and H4, focusing on the significance of the indirect effect, were tested using multiple regression. For this purpose, the PROCESS macro for SPSS, proposed by Hayes (2015), was used. Specifically, we estimated three regression models by using PROCESS. In the first model, positive affective group well-being measured at T2 was regressed on TSRQ measured at T1 (yielding an estimate of coefficient *a*). In the second model, intragroup communication quality measured at T3 was regressed on positive affective group well-being measured at T2, controlling for TSRQ at T1 (yielding an estimate of coefficient *b*). Finally, in the third model, group performance measured at T4 was regressed on intragroup communication quality at T3, controlling for both TSRQ at T1 and positive affective group well-being at T2 (yielding an estimate of coefficient *c*). In all cases, group size and students' initial familiarity with the other students in the group were also introduced as control variables.

Finally, PROCESS also allows researchers to test for the significance of the hypothesized indirect effect by means of bootstrapping. In our case, the indirect effect is estimated by using the product of the involved coefficients: $a \cdot b \cdot c$. Taking into account that the product of regression coefficients does not follow a normal distribution, bootstrapping has been recommended, out of a number of procedures, because it shows a good ratio between statistical power and type I error (Hayes, 2009; MacKinnon, 2008). In this study, 20,000 samples were bootstrapped to obtain bias-corrected bootstrap confidence intervals.

Because data were collected from two different degrees (Psychology and Physiotherapy), and three different teachers were involved, we used Box's M to test whether data gathered from the two bachelor degrees (Psychology and Physiotherapy) and from students who had different teachers could be combined and analyzed together. Box's M tests the null hypothesis that the covariance matrix for the study variables is equal across the groups of interest. According to the results, this null hypothesis could not be rejected for

the two degrees ($M = 18.21$; $p > .05$) or the three teachers involved ($M = 27.18$; $p > .05$). Therefore, the data collected were combined and analyzed together.

Results

The means and standard deviations of the study variables, along with the correlations among the variables and their reliabilities, are displayed in Table 1.

Regarding the regression analyses carried out to test the study hypotheses, results provided empirical support for Hypotheses 1 to 3 (see Table 2). Specifically, after controlling for group size and students' familiarity, we observed the following: *a)* group TSRQ at Time 1 was positively related

Table 2 Summary of regression equations

Equation	B	SE	R^2
1. DV: Positive affective group well-being (T2)			.10#
Group size (T1)	−.03	.09	
Students' familiarity with group members (T1)	.15	.14	
Group TSRQ (T1)	.43*	.18	
2. DV: Within-group communication quality (T3)			.09
Group size (T1)	.01	.07	
Students' familiarity with group members (T1)	−.18	.11	
Group TSRQ (T1)	−.01	.15	
Positive affective group well-being (T2)	.20*	.10	
4. DV: Perceived group performance (T4)			.27**
Group size (T1)	.05	.06	
Students' familiarity with group members (T1)	−.03	.10	
Group TSRQ (T1)	.01	.13	
Positive affective group well-being (T2)	.20*	.09	
Within-group communication quality (T3)	.38**	.11	

#$p < .10$; * $p < .05$; ** $p < .01$; TSRQ: Teacher-student relationship quality. SE: Standard Errors; Regression coefficients are unstandardized

Table 1 Descriptive statistics and correlation matrix of the study variables aggregated at the team level

	Mean	SD	1	2	3	4	5	6
1. Group size (T1)	4.16	.74	–					
2. Students' familiarity (T1)	.60	.48	−.03	–				
3. Group TSRQ (T1)	2.80	.35	.01	.07	(.87)			
4. Positive affective group well-being (T2)	3.74	.55	−.07	.21#	.30*	(.93)		
5. Within-group communication quality (T3)	4.22	.47	.09	−.18	.11	.27*	(.91)	
6. Group perceived performance (T4)	4.05	.44	.13	−.11	.12	.34**	.55**	(.93)

#$p < .10$; * $p < .05$; ** $p < .01$. TSRQ: Teacher-student relationship quality. Cronbach's alpha coefficients for aggregated scores are provided between brackets

to positive affective group well-being at Time 2 ($B = .43$, $p < .05$); b) positive affective group well-being at Time 2 was positively related to intragroup communication quality at Time 3 ($B = .20$, $p < .05$); and c) intragroup communication quality at Time 3 was positively related to group performance at time 4 ($B = .38$, $p < .01$). In the last regression model, the results showed that 27% of the variance in group performance was accounted for by the predictors considered.

The bootstrapped indirect effect of TSRQ on group performance via positive affective group well-being and intragroup communication quality was .034, with a 95% confidence interval ranging from .003 to .120. Thus, because this interval did not include zero, we concluded that the indirect effect was statistically significant. This result rendered support for Hypothesis 4.

Additionally, results also showed that positive affective group well-being at T2 had a significant relationship with group performance at T4 ($B = .20$, $p < .05$). In this case, the indirect effect of TSRQ on group performance via positive affective group well-being was .086, with a 95% confidence interval ranging from .011 to .224.

Discussion

The goal of this study was to test a mediational model of the influence of TSRQ on student group performance in a higher education context where a group-oriented learning approach is implemented. The results obtained showed that, as expected, TSRQ has an indirect positive influence on group performance, mediated by positive affective group well-being and within-group communication quality. Briefly, TSRQ was positively related to positive affective group well-being, which in turn was positively related to within-group communication quality, which in turn was positively related to group performance. These results have a number of theoretical and practical implications that we discuss in the following sections.

Theoretical Implications

Our study helps uncover one of the mechanisms through which TSRQ promotes student group performance in a higher-education context. Our theoretical rationale and the results obtained point out that when group members have a high-quality relationship with their teacher, they will receive valuable resources from him/her, such as information, guidance, emotional support, confidence, and trust (Gavidia-Payne et al., 2015; Graen & Uhl-Bien, 1995). This exchange will make group members feel valued, supported, and appreciated (Sparr & Sonnentag, 2008), and positive affective group well-being will increase. According to Fredrickson's (1998) broaden-and-build theory, shared

experiences of positive affect within student groups foster social relationships within the group, thus facilitating high quality communication among group members. The specific underlying mechanism operating is that shared positive affect fosters helping behavior among group members (Isen, 1987; George, 1990), which in turn triggers motivation to reciprocate within the group (Fredrickson, 1998). The result of this multidirectional process is a set of strengthened social relationships that facilitate high quality communication within the group. Finally, in order to achieve high performance, group members must effectively communicate with each other to conduct different important activities such as sharing information, planning and coordinating actions, monitoring, and providing and receiving feedback. Therefore, communication is a key process in group functioning and performance (Bravo et al., 2016; Salas et al., 2005), and groups with high quality communication tend to perform better. This sequence of relationships, for which we obtained empirical support, offers a more fine-grained view of why TSRQ is related to student group performance. In doing so, our study adds new knowledge to the literature.

In addition, our study extends previous research conducted at the individual level of analysis (for meta-analyses, see Cornelius-White, 2007; and Roorda et al., 2011) and shows that TSRQ is an important factor in fostering group performance in higher-education contexts where a group-oriented learning approach is implemented. Together, previous results obtained at the individual level and the current findings obtained at the group level of analysis suggest that the influence of TSRQ on performance is generalizable to the individual and group levels. Future studies should test this relationship at these two levels simultaneously through homologous multilevel models (Kozlowski & Klein, 2000).

Finally, as expected, TSRQ did not show a direct relationship with group performance, but positive affective group well-being did. This last relationship was not hypothesized. The direct relationship between positive affective group well-being and group performance can be explained by the influence of positive affect on motivation (George & Brief, 1996). Positive affect influences goal setting. Subjects with positive affect see themselves as more capable and set higher performance goals than subjects with negative affect (George & Brief, 1996). Positive affect also affects goal achievement evaluation. Subjects with positive affect may see themselves as making more progress toward a goal than subjects with negative affect and, based on these judgments, set higher goal levels for themselves (George & Brief, 1996). Thus, subjects with positive affect have higher levels of motivation and, therefore, persist longer and make more effort on the tasks they are engaged in. When group members share their levels of high positive affect, the motivational mechanisms mentioned above will operate across all group members at the group level, yielding greater initial effort and persistence

on group tasks, which in turn will enhance group performance (González-Romá & Gamero, 2012).

Practical Implications

Considering that the introduction of group-oriented teaching methods, such as collaborative learning, is gaining popularity in higher-education institutions (Zhang & Cui, 2018), the findings reported in this study have important practical implications. Focusing on university teachers, it is important to highlight that developing high quality relationships with students working and learning in groups can not only improve their shared affective well-being, but also enhance the performance of student groups. Therefore, training university teachers who work in group-oriented environments to develop high quality relationships with members of student groups is a promising route. Previous research in organizational settings has shown that managers can be trained to develop high quality relationships with their collaborators, and that this training is effective in improving performance (Graen & Novak, 1982). According to this research, talking to group members about their concerns, doubts, and expectations, practicing active listening with them, and avoiding imposing the teacher's opinion can be useful ways to improve the quality of the teacher-student relationship.

Within-group communication quality showed a notable influence on group performance. Based on this finding, we suggest that teachers could help student groups to improve the quality of their communication processes by means of short training workshops. In these workshops, teachers could plan different activities to develop a number of communication skills, such as active listening, using questions to clarify others' ideas, giving feedback, and reflecting on group goals and performance. Because this training would be perceived as a valuable resource by students, it could also contribute to enhancing the quality of the teacher-student relationship.

Limitations and Strengths

Our study has a number of limitations that must be kept in mind. First, all the data were collected from the same source: students working in groups. This fact might have inflated the observed relationships among the variables due to common-source bias. However, in order to minimize this concern, and according to Podsakoff et al.'s (2003) recommendations, we temporally separated the measurement of the study variables. Second, related to the previous point, group performance was measured by using group members' subjective ratings. It would have been desirable to measure this variable with objective or external ratings. However, the fact that different teachers and subject degrees were involved meant that it was not possible to obtain homogeneous and comparable performance scores across teachers and subject degrees. Collecting students' performance ratings by using a common performance scale gave us a means to overcome the aforementioned differences. Third, the sample analyzed was composed of a small number of student groups (68), which reduced the power of our statistical tests. However, the expected relationships and indirect mediation "effect" were observed, suggesting that the study results are robust. Fourth, we measured teacher-student relationship quality (TSRQ) only at Time 1. However, it is likely that this variable changed over time throughout our study, and that this change influenced the change in the other study variables. In order to account for these changes and their relationships, future studies should measure the study variables at all the measurement points considered.

These limitations notwithstanding, our study also shows several strengths. First, the variables included in our research model were measured at four different time points, taking into account the hypothesized causal order. This means that there was congruence between this causal ordering and the time point when the variables were measured. This characteristic of our study design allowed us to overcome some limitations of cross-sectional research. Second, by testing a complex, three-path mediational model involving two mediators, we were able to offer a more-fine grained view of the investigated relationship.

Conclusion

In sum, in the present study we showed that by developing high quality relationships with student groups, university teachers can improve groups' affective well-being and enhance group performance. We hope our study contributes to stimulating group-level research on the antecedents of group outcomes in higher-education contexts where group-learning approaches are implemented.

Data Availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval This study was carried out in accordance with the ethical guidelines of the Declaration of Helsinki, and according to the guidelines set by the Ethics Committee of the University of Valencia. According to these guidelines, approval of the Committee of Ethics is not necessary to carry out an opinion survey about different topics, such as professional issues, satisfaction with certain matters, etc. (see https://

Consent to Participate Verbal consent was obtained before collecting the data.

Consent to Publish It was not requested since all the data is anonymized and the submission does not include any images or data that may identify the participants.

Conflict of Interest We have no conflict of interest to declare.

References

Bartel, C. A., & Saavedra, R. (2000). The collective construction of work group moods. *Administrative Science Quarterly, 45*(2), 197–231. https://doi.org/10.2307/2667070

Bravo, R., Lucia-Palacios, L., & Martin, M. J. (2016). Processes and outcomes in student teamwork. An empirical study in a marketing subject. *Studies in Higher Education, 41*(2), 302–320. https://doi.org/10.1080/03075079.2014.926319

Brown, C. L., & Fredrickson, B. L. (2021). Characteristics and consequences of co-experienced positive affect: Understanding the origins of social skills, social bonds, and caring, healthy communities. *Current Opinion in Behavioral Sciences, 39*, 58–63. https://doi.org/10.1016/j.cobeha.2021.02.002

Burke, M. J., & Dunlap, W. P. (2002). Estimating interrater agreement with the average deviation index: A user's guide. *Organizational Research Methods, 5*(2), 159–172. https://doi.org/10.1177/1094428102005002002

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology, 83*(2), 234.246.

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research, 77*(1), 113–143. https://doi.org/10.3102/003465430298563

Curral, L. A., Forrester, R. H., Dawson, J. F., & West, M. A. (2001). It's what you do and the way that you do it: Team task, team size, and innovation-related group processes. *European Journal of Work and Organizational Psychology, 10*(2), 187–204. https://doi.org/10.1080/13594320143000627

Curşeu, P. L., Chappin, M. M., & Jansen, R. J. (2018). Gender diversity and motivation in collaborative learning groups: The mediating role of group discussion quality. *Social Psychology of Education, 21*(2), 289–302.

Day, D. V., & Schyns, B. (2010). The importance of agreement and consensus in leadership research: Introduction to the special issue.

European Journal of Work and Organizational Psychology, 19(3), 253–258. https://doi.org/10.1080/13594320903448766

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542–575.

Dulebohn, J. H., Bommer, W. H., Liden, R. C., Brouer, R. L., & Ferris, G. R. (2012). A meta-analysis of antecedents and consequences of leader-member exchange: Integrating the past with an eye toward the future. *Journal of Management, 38*(6), 1715–1759. https://doi.org/10.1177/0149206311415280

Erdogan, B., & Bauer, T. N. (2014). Leader-member exchange (LMX) theory: The relational approach to leadership. In D. Day (Ed.), *The Oxford handbook of leadership and organizations* (pp. 407–433). Oxford Library of Psychology.

Forgas, J. P. (1992). Affect in social judgments and decisions: A multi-process model. *Advances in Experimental Social Psychology, 25*, 227–275. https://doi.org/10.1016/S0065-2601(08)60285-3

Fredrickson, B. L. (1998). What good are positive emotions? *Review of General Psychology, 2*(3), 300–319. https://doi.org/10.1037/1089-2680.2.3.300

Gamero, N., & González-Romá, V. (2020). Affective climates in teams. In L. Yang, R. Cropanzano, C. S. Daus, & V. Martínez-Tur (Eds.), *The Cambridge handbook of workplace affect* (pp. 244–256). Cambridge University Press. https://doi.org/10.1017/9781108573887.019

Gamero, N., Zornoza, A., Peiró, J. M., & Picazo, C. (2009). Roles of participation and feedback in group potency. *Psychological Reports, 105*(1), 293–313. https://doi.org/10.2466/PR0.105.1.293-313

Gavidia-Payne, S., Denny, B., Davis, K., Francis, A., & Jackson, M. (2015). Children's self-concept: Parental school engagement and student–teacher relationships in rural and urban Australia. *Social Psychology of Education, 18*(1), 121–136. https://doi.org/10.1007/s11218-014-9277-3

George, J. M. (1990). Personality, affect, and behavior in groups. *Journal of Applied Psychology, 75*(2), 107–116. https://doi.org/10.1037/0021-9010.75.2.107

George, J. M., & Brief, A. P. (1996). Motivational agendas in the workplace: The effects of feelings on focus of attention and work motivation. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior: An annual series of analytical essays and critical reviews* (Vol. 18, pp. 75–109). Elsevier Science/JAI Press.

González-Romá, V. (2016). Leader-member exchange and organizational culture and climate. In T. Bauer & B. Erdogan (Eds.), *The Oxford handbook of leader-member exchange* (pp. 311–331). Oxford University Press.

González-Romá, V., & Gamero, N. (2012). Does positive team mood mediate the relationship between team climate and team performance? *Psicothema, 24*(1), 94–99.

González-Romá, V. & Hernández, A. (2014a). *Proposing a shortened version of Scandura & Graen's (1984) Leader-Member-Exchange scale: information function and validity* [Poster presentation]. 9th Conference of the international Test Comission (ITC). San Sebastian, Spain.

González-Romá, V., & Hernández, A. (2014b). Climate uniformity: Its influence on team communication quality, task conflict, and team performance. *The Journal of Applied Psychology, 99*(6), 1042–1058. https://doi.org/10.1037/a0037868

González-Romá, V., Peiró, J. M., Subirats, M., & Mañas, M. A. (2000). The validity of affective work team climates. In M. Vartiainen, F. Avallone, & N. Anderson (Eds.), *Innovative theories, tools, and practices in work and organizational psychology* (pp. 97–109). Hogrefe & Huber Publishers.

Graen, G. B., & Novak, M. A. (1982). The effects of leader-member exchange and job design on productivity and satisfaction: Testing a dual attachment model. *Organizational Behavior and*

Human Performance, 30(1), 109–131. https://doi.org/10.1016/0030-5073(82)90236-7

Graen, G. B., & Scandura, T. A. (1987). Toward a psychology of dyadic organizing. In L. L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior* (Vol. 9, pp. 175–208). JAI.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The Leadership Quarterly, 6*(2), 219–247. https://doi.org/10.1016/1048-9843(95)90036-5

Harney, O., Hogan, M. J., & Broome, B. J. (2012). Collaborative learning: The effects of trust and open and closed dynamics on consensus and efficacy. *Social Psychology of Education, 15*(4), 517–532. https://doi.org/10.1007/s11218-012-9202-6

Hayes, A. F. (2009). Beyond baron and kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*(4), 408–420. https://doi.org/10.1007/s11218-012-9202-6

Hayes, A. F. (2015). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517–543. https://doi.org/10.1146/annurev.psych.56.091103.070250

Isen, A. M. (1987). Positive affect, cognitive processes, and social behavior. In L. Berkowitz (Ed.), *Advances in experimental social psychology. Vol. 20 (pp. 203–253)*. Academic Press. https://doi.org/10.1016/S0065-2601(08)60415-3

Kampf, P., Hernández, A., & González-Romá, V. (2020). An ultra-short measure of positive and negative affect: The reduced affective well-being scale (RAWS). *Revista Psicologia: Organizações & Trabalho/Psychology: Organizations and Work Journal, 20*, 1257–1266. https://doi.org/10.17652/rpot/2020.4.10

Kelly, J. R., & Barsade, S. G. (2001). Mood and emotions in small groups and work teams. *Organizational Behavior and Human Decision Processes, 86*(1), 99–130. https://doi.org/10.1006/obhd.2001.2974

Kozlowski, S. W. J., & Ilgen, D. R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7*(3), 77–124. https://doi.org/10.1111/j.1529-1006.2006.00030.x

Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). Jossey-Bass.

Le Blanc, P. M., & González-Romá, V. (2012). A team level investigation of the relationship between leader–member exchange (LMX) differentiation, and commitment and performance. *The Leadership Quarterly, 23*(3), 534–544. https://doi.org/10.1016/j.leaqua.2011.12.006

Liden, R. C., Erdogan, B., Wayne, S. J., & Sparrowe, R. T. (2006). Leader-member exchange, differentiation, and task interdependence: Implications for individual and group performance. *Journal of Organizational Behavior, 27*(6), 723–746. https://doi.org/10.1002/job.409

Luhmann, M., Hofmann, W., Eid, M., & Lucas, R. E. (2012). Subjective well-being and adaptation to life events: A meta-analysis. *Journal of Personality and Social Psychology, 102*(3), 592–615. https://doi.org/10.1037/a0025948

MacKinnon, D. (2008). *Introduction to statistical mediation analysis*. Routledge. https://doi.org/10.4324/9780203809556

Marlow, S. L., Lacerenza, C. N., Paoletti, J., Burke, C. S., & Salas, E. (2018). Does team communication represent a one-size-fits-all approach?: A meta-analysis of team communication and performance. *Organizational Behavior and Human Decision Processes, 144*, 145–170. https://doi.org/10.1016/j.obhdp.2017.08.001

McGrath, J. E. (1984). *Groups: Interaction and performance*. Prentice-Hall.

Palincsar, A. S., & Herrenkohl, L. R. (2002). Designing collaborative learning contexts. *Theory Into Practice, 41*(1), 26–32. https://doi.org/10.1207/s15430421tip4101_5

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.

Roorda, D. L., Koomen, H. M., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher–student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research, 81*(4), 493–529. https://doi.org/10.3102/0034654311421793

Salas, E., Sims, D. E., & Burke, C. S. (2005). Is there a "big five" in teamwork? *Small Group Research, 36*(5), 555–599. https://doi.org/10.1177/1046496405277134

Scandura, T. A., & Graen, G. B. (1984). Moderating effects of initial leader-member exchange status on the effects of a leadership intervention. *Journal of Applied Psychology, 69*(3), 428–436. https://doi.org/10.1037/0021-9010.69.3.428

Segura, S. L., & González-Romá, V. (2003). How do respondents construe ambiguous response formats of affect items? *Journal of Personality and Social Psychology, 85*(5), 956–968. https://doi.org/10.1037/0022-3514.85.5.956

Sparr, J. L., & Sonnentag, S. (2008). Fairness perceptions of supervisor feedback, LMX, and employee well-being at work. *European Journal of Work and Organizational Psychology, 17*(2), 198–225. https://doi.org/10.1080/13594320701743590

Thompson, M. D. (2001). Informal student-faculty interaction: Its relationship to educational gains in science and mathematics among community college students. *Community College Review, 29*(1), 35–57. https://doi.org/10.1177/009155210102900103

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology, 79*(1), 1–28. https://doi.org/10.1348/000709908X380772

Zhang, J., & Cui, Q. (2018). Collaborative learning in higher nursing education: A systematic review. *Journal of Professional Nursing, 34*(5), 378–388. https://doi.org/10.1016/j.profnurs.2018.07.007