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Time in teams: cognitions, conflict and team satisfaction

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Abstract

Purpose – The purpose of this paper is to provide more insight into team temporal constructs and team satisfaction, this study proposes and tests a multiple mediation model of shared temporal cognition (STC), temporal conflict (TC), action processes, and team satisfaction.

Design/methodology/approach – The authors test the theoretical model in a sample of 364 student teams (1,414 individuals) from universities in the USA, Switzerland, Germany, and Portugal. Participants completed questionnaires at three points in time.

Findings – Results indicated a direct, positive relationship between STC and team satisfaction and a direct, negative relationship between TC and team satisfaction. Action processes and TC partially and sequentially mediated the relationship between STC and team satisfaction over time.

Research limitations/implications – This study was restricted to self-report, to a student population, and to Western cultures. The study was not of an experimental nature which prevents making causal claims regarding relationships among variables.

Practical implications – These results demonstrate the need for teams to be conscious of time and its relationship to team interaction and satisfaction. The authors advise both team leaders and members to acknowledge the importance of STC.

Social implications – The need for temporal awareness and STC in collaborative endeavors, and the need to mindfully utilize action processes to minimize conflict and assist in the effective use of shared cognition is widely applicable from a societal perspective.

Originality/value – This study provides new theoretical and empirical insight into a multiple mediation model including STC, TC, action processes, and team satisfaction. The size and multi-cultural nature of the sample also enhance the generalizability of the findings.

Keywords Teams, Shared temporal cognition, Team processes, Temporal conflict

Paper type Research paper



The reliance on team-based outcomes in today's workplaces underscores the importance of understanding how such outcomes are generated (e.g. Mathieu *et al.*, 2008). Team satisfaction is one such outcome. Team satisfaction denotes the overall extent to which members are satisfied with the team's outcomes (e.g. Van Der Veegt *et al.*, 2001).

In teamwork research, researchers have identified the importance of shared cognitions, conflict, and team processes regarding team satisfaction (LePine *et al.*, 2008; Santos and Passos, 2013). Despite these findings, little is known about how these constructs relate to time; that is, team members' shared cognition about time, their conflict about time, and their team processes related to task-oriented actions over time. Yet, as time is a key dimension for shaping teamwork and experiences of the team (e.g. Arrow *et al.*, 2004; McGrath, 1991), we expect that insight may be gained by formulating and testing a model of these constructs and their relation to team satisfaction.

Prior research on time in teams informs our work. In particular, researchers have identified shared temporal cognition (STC) as the extent that team members share a common perspective about temporal approaches and behaviors (Gevers *et al.*, 2004, 2006). Gevers and Peeters (2009) have demonstrated a positive relationship between temporal consensus (a similar conceptualization to STC) and team satisfaction. Furthermore, temporal conflict (TC) can be described as disputes among members about time (e.g. Mohammed and Nadkarni, 2011; Orlikowski and Yates, 2002), and is related to the more general notion of process conflict. Finally, action processes involve cognitive, verbal, and behavioral activities among team members to organize and complete task work and to achieve goals (Marks *et al.*, 2001), and researchers have demonstrated positive relationships between action processes and satisfaction (LePine *et al.*, 2008).

Our study contributes to existing research in various important ways. First, this study provides theoretical and empirical insight into relationships between STC, TC, action processes, and satisfaction. This confirms and extends the foundational work of Gevers and colleagues in this area (e.g. Gevers *et al.*, 2004, 2006; Gevers and Peeters, 2009) and responds to recent calls for more insight into STC and TC (Mohammed *et al.*, 2012). In particular, our multiple mediation model develops and tests the mechanisms through which these constructs relate to each other. A second contribution of our study is the collection of data at key points along the project timeline identified as important by past research (e.g. Gersick, 1988); specifically, the mid-point and the end of team projects. Researchers (e.g. Bartel and Milliken, 2004) call for a better understanding of the association between temporal constructs like STC and TC and the eventual status of team outcomes measured at different points in a project timeline.

Finally, our study extends the literature through the characteristics of its sample. We include in our study teams from Portugal, Germany, Switzerland, and the USA. By including teams from these four countries, we may explore the differences and similarities in relationships among the study's constructs across teams from these national cultures. Also, our sample reflects a substantial size; namely, 364 teams (1,414 members). The size and multi-cultural nature of our sample enhances the generalizability of our findings and increases our knowledge about the extent to which these countries share common perspectives and outcomes with regards to these temporal relationships.

STC and team satisfaction

STC is a specific form of team cognition, which captures the collective understanding, awareness, and perceptions dispersed within teams (DeChurch and Mesmer-Magnus, 2010; Mohammed *et al.*, 2012). Researchers linked shared cognitions to teams' ability to adapt, to coordinate, and to reach consensus (Cannon-Bowers *et al.*, 1993; Gevers *et al.*, 2006). Past research shows teams with shared cognitions enjoy benefits like enhanced coordination of task activities and enhanced team performance (Mathieu *et al.*, 2000;

Rico *et al.*, 2008). Also, shared cognitions help support acceptance among members conducive to a more positive overall team experience (i.e. greater team satisfaction) (Santos and Passos, 2013; Standifer and Bluedorn, 2006). While noteworthy, these findings do not specifically address a shared understanding regarding temporal dynamics, which some consider an important (and often overlooked) factor of collective team experiences (McGrath, 1991; Mohammed *et al.*, 2012).

STC describes the extent to which team members share a common perspective about the “appropriate” temporal approach to team tasks (Gevers *et al.*, 2004, 2006). Teams can develop congruent mental representations of temporal factors such as the appropriate pacing of activities (McGrath, 1991). Diversity in teams may involve temporal perspectives about things like time orientation and deadlines (Waller *et al.*, 2001). STC need not translate to perfect alignment in beliefs or attitudes; rather, members should understand each other’s perspective and develop a common team perspective on key temporal ideas. Prior research provides initial insights that coordinative efforts are most effective when the temporal perspectives and behaviors of team members are aligned (Bartel and Milliken, 2004; Gevers and Peeters, 2009), and researchers have called for more work exploring the relationship between STC and team satisfaction (Bartel and Milliken, 2004).

Teams exhibiting STC improve their ability to accurately pace activities and to determine important temporal milestones (Standifer and Bluedorn, 2006). The enhanced effectiveness of coordination and sense of compatible behavioral patterns derived from STC increases the likelihood of satisfaction about the collective team experience. Prior research has shown that STC can positively relate to individual team members’ satisfaction (Gevers and Peeters, 2009), and we expect a similar relationship to team satisfaction. Earlier, we noted the call by past researchers to evaluate emergent states in teams (such as STC) and affective team outcomes at different points along the project timeline to better understand the associations between such constructs. As such, we consider the relative mid-point of a team’s project timeline an opportune period in which to measure STC. Gersick’s (1988) seminal work regards the mid-point of a team’s project lifecycle as an important benchmark; it represents to team members a point in time in which team norms, perspectives, etc., should be fairly established – that a “synchrony of member expectations” has been achieved (if it will be achieved at all). We therefore hypothesize a positive relationship between the extent to which teams exhibit STC by project mid-point and the degree of satisfaction reported at project end:

H1. A positive relationship exists between STC in teams by project mid-point and team satisfaction at project end.

TC and team satisfaction

In contrast to STC, we anticipate a negative relationship between TC and team satisfaction, in line with general conflict findings in previous research (De Dreu and Weingart, 2003; de Wit *et al.*, 2012; Santos and Passos, 2013).

Conflict researchers have delineated specific types of conflict, including relationship conflict, task conflict, and process conflict (Jehn, 1995, 1997). Process conflict relates to disagreements about how to carry out tasks, such as the distribution of responsibilities and the assignment of resources (Jehn, 1997; Jehn and Mannix, 2001; Passos and Caetano, 2005). Past studies link negative consequences with process conflict, especially when it occurs at high levels (Kellermanns and Eddleston, 2004; Standifer and Wall, 2010), and particularly as it relates to team satisfaction (de Wit *et al.*, 2012; Jehn, 1997; Passos and Caetano, 2005).

Even though the negative influence of process conflict has been well-demonstrated in past studies, there are certain types of process conflict that require additional examination. Researchers have suggested that time plays an important role in team conflict (Jehn and Mannix, 2001), but few studies have empirically assessed time-related conflict in relation to affective team outcomes. TC specifically concerns process-oriented disputes among members about time; issues such as the pacing and timing of task activities, the duration or cyclical nature of a task, or the identification of a temporal milestone (Mohammed and Nadkarni, 2011; Orlikowski and Yates, 2002). According to McGrath's Time, Interaction, and Performance (TIP) Theory, conflicts about "temporal interests" generate problems for subsequent coordination (McGrath, 1991).

As with STC, a project's mid-point represents an appropriate juncture to note the degree of TC present in teams. If a team reports experiencing TC by project mid-point, we expect ambiguity to increase over time with regard to temporal aspects of the project (Mohammed and Nadkarni, 2011). Subsequently, this disrupts coordinative efforts and increases the frustration of team members (McGrath, 1991; Mohammed and Nadkarni, 2011). By the end of the project, the degree of team satisfaction should reflect the cumulative effect of conflict-laden interactions:

H2. A negative relationship exists between TC in teams by project mid-point and team satisfaction at project end.

STC, TC, and team satisfaction

We also propose that TC partially mediates the relationship between STC and satisfaction. STC and TC are recognized in the extant literature as related to, but distinct from, one another. STC is a property of a team, dynamic in nature. TC concerns the extent to which a team experiences dysfunction during interactions regarding temporal matters (Marks *et al.*, 2001). We suggest that STC enables teams to interpret cues more accurately and to make decisions more compatibly (Cooke *et al.*, 2000; Wilson *et al.*, 2007). STC also supports a greater understanding of temporal elements inherent in effective teamwork (e.g. closed-loop communication and mutual trust) (Wilson *et al.*, 2007), which helps minimize the occurrence of TC.

The reasoning so far suggests that teams lacking STC will be more susceptible to TC. Past research supports the general assertion that teams without shared cognition are more likely to experience conflict (Jansen and Kristof-Brown, 2005). Specific to temporal aspects, the "conflict of temporal interests" described in McGrath's TIP research (McGrath, 1991) suggests that TC may arise as a result of differences in temporal perspectives, or low STC. Likewise, Waller *et al.* (2001) link dissimilar temporal understandings among team members to TC.

Based on these past results, we suggest that lower levels of STC relates to TC, which in turn relates to a lower level of team satisfaction. We maintain that low STC is positively related to TC because of heightened temporal biases that cause members to ignore/discount information from members with dissimilar temporal perspectives (Mohammed and Nadkarni, 2011). By project end, we expect TC to act as a mechanism that partially mediates the relationship between the lack of STC and less team satisfaction (Jansen and Kristof-Brown, 2005):

H3. TC within a team at project mid-point partially mediates the relationship between STC levels at project mid-point and team satisfaction at project end.

STC, action processes, and team satisfaction

Team action processes are a higher order categorization as delineated in Marks *et al.*'s (2001) hierarchical taxonomy. Marks *et al.* (2001) have conceptualized action processes as one of three higher order processes, including transition, action, and interpersonal processes. Action processes are of particular interest for the purpose of our study, as they comprise activities that relate to the way in which team members coordinate their task activities. For example, they comprise lower level activities relating to the synchronization, sequence, and timing of interdependent tasks (Ilgen *et al.*, 2005; Marks *et al.*, 2001). We therefore expect this type of higher order process category to be of key interest for understanding how STC manifests in actual team behavior.

Specifically, we propose that action processes partially mediate the relationship between STC and satisfaction. Researchers have made generalized assertions that shared cognition leads to better team process (Cannon-Bowers and Salas, 2001; Zalesny *et al.*, 1995). Gevers and Peeters (2009) include as a mediating variable "coordinated action," defining it as an emergent state. Their findings revealed that coordinated action partially mediated temporal consensus and team satisfaction. However, additional work is needed to explicitly and empirically examine shared cognitions about time and their relationship to action processes (cf. Ilgen *et al.*, 2005).

Action processes permit teams to make the most of STC. Based on their meta-analysis, Ilgen *et al.* (2005), make the following assertion: "high-quality team processes not only transmit the influence of members' contributions associated with task completion but also help to foster perceptions of a satisfying team experience. Stated more directly, process should have a positive influence on team outcomes such as satisfaction" (p. 276). Since action processes allow teams to successfully entrain activities (Marks *et al.*, 2001; Taggar and Haines, 2006; Van der Vegt and Van de Vliert, 2002), we expect that action processes will support the likelihood of team satisfaction:

- H4.* Action processes exhibited in a team by project mid-point partially mediate the relationship between STC levels at project mid-point and team satisfaction at project end.

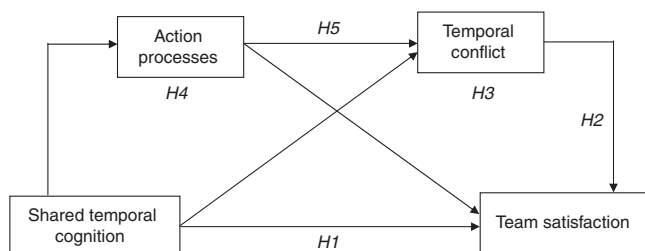
STC, TC, team processes, and team satisfaction

In the final hypothesis, we propose a multiple mediated model acknowledging the relationship between two mediating variables; namely, TC and action processes. Our conceptual model is presented in Figure 1.

Previously, Montoya-Weiss *et al.* (2001) observed a relationship between process structure (described as a "temporal coordination mechanism") and conflict management behavior. We propose that action processes will relate to lower levels of TC. Specifically, teams utilizing effective action processes will reduce uncertainty and improve coordinative efforts, thus allaying negative, conflict-causing emotions within members.

Incorporating this relationship into the overall model, teams exhibiting STC exhibit lower TC, and are better able to further minimize TC through the use of action processes. In addition, we expect these relationships to be related to team satisfaction. Overall, action processes and TC will act as a partially mediating conduit for the relationship between STC and satisfaction:

- H5.* Action processes and TC partially and sequentially mediate the relationship between STC and team satisfaction.



Notes: *H3* refers to the mediating effect of TC between STC and team satisfaction. *H4* refers to the mediating effect of action processes between STC and team satisfaction. *H5* refers to the sequential mediating effect of action processes and TC between STC and team satisfaction

Figure 1.
Conceptual model

Method

Sample and data collection

A total of 364 teams (1,414 individuals) participated in this study. We collected data from undergraduate and postgraduate students who studied at universities in the USA, Switzerland, Germany, and Portugal. Data were collected during the course of one semester. The methods used for collecting our data were highly similar across the different countries. Therefore, to keep our method description as clear as possible, we describe the general procedures. In Table I, more specific characteristics of the data collection procedure and sample are presented for each country.

	USA	Switzerland	Germany	Portugal
<i>n</i> Teams	108	73	56	127
<i>n</i> Individuals	382	271	180	581
Courses	26 sections of 12 business courses	1 course in business	13 business courses in two universities	Multiple universities with student teams of management courses
Study level	Upper-division undergraduate	Junior undergraduate	Upper-division undergraduate	Upper-division undergraduate and postgraduate
Total time period	16 weeks	12 weeks	17 weeks	5 weeks
Data collection	Weeks 2, 10, 16	Weeks 3, 8, 12	Weeks 2, 10, 16	Weeks 1, 3, 5
Minimum team size	3 members	4 members	3 members	3 members
Maximum team size	6 members	7 members	8 members	5 members
Mean team size	4.3 members	5.5 members	4.1 members	4.7 members
Females subjects (%)	46	42	64	33
Mean age	21.7	20.1	22.8	26.4

Table I.
Research methods
for the four countries

These student team projects represented a final project for the course, requiring substantive team member interaction. Students completed paper and pencil or online questionnaires at three different times over the course of the semester. Participation in the study was on a voluntary basis; however, in some courses, students were offered a small amount of extra credit for completing all three questionnaires. The basis for team formation varied between random, student-selected, and instructor-selected. The average team size ranged from 4.1 team members in Germany to 5.5 team members in Switzerland. The minimum team size was three team members in Germany, Portugal, and the USA. The maximum team size was eight team members in Germany. The average age of the team members ranged from 20 years in Switzerland to 26 years in Portugal.

Measurement timing

Little research is available to inform the choice regarding when constructs should be measured and which time lags are most appropriate (Ployhart and Vandenburg, 2010). With student teams, data are often collected at the beginning, middle, and end of the semester (e.g. Jehn and Mannix, 2001), but researchers have noted the issue of whether measurement is aligned correctly with the timing of various critical team processes (Mohammed *et al.*, 2009). We chose our measurement moments mindful not only of the nature of student projects, but also the way in which the mid-point is considered in the temporal literature (e.g. Gersick, 1988), and based on the consideration that STC, TC, and action processes need time to build within teams.

The first survey took place approximately two weeks into the semester and was used to collect individual demographic information. The second data collection period (Time 1) took place at the relative mid-point in the projects. For most teams, this collection occurred around the tenth week of the semester; for the Portuguese teams, it occurred in the third week of the five-week course. This survey was used to measure STC, TC, and action processes. While not the exact mid-point of the course itself, we felt the point at which we collected these data represented a more accurate mid-point for the projects, given that most did not start right at the beginning of the semester and given undergraduates' inclination to wait to begin team projects. The last data collection period (Time 2) measured team satisfaction at the end of the project (and the semester).

Measures

STC. We used a self-report four-item scale from Gevers *et al.* (2006) to measure STC. Subjects were asked to rate the extent to which they agree or disagree with statements such as: "In my group, we agree on how to allocate the time available" and "In my group, we have similar ideas about the time it takes to perform certain tasks." Respondents used a six-point Likert scale ranging from "strongly disagree" to "strongly agree" ($\alpha = 0.89$). As we used a dispersion model, we were interested in estimating the variability within each team (Chan, 1998). Therefore, we operationalized STC through the coefficient of variation – the ratio of the STC standard deviation to the STC mean. We recoded the values so that higher values of variation corresponded to higher values of STC and lower values of variation corresponded to lower values of STC.

TC. TC was measured through a modified three-item scale by Yang (2009) based on the original process conflict scale developed by Jehn (1995) and Shah and Jehn (1993). An example item reads: "To what extent do team members disagree about time allocation in your work team (how much time to spend on tasks)?" Respondents used

a six-point Likert scale ranging from “strongly disagree” to “strongly agree” ($\alpha = 0.86$). To obtain a team-level score for TC, we averaged team members’ responses (please see below the aggregation statistics justifying this decision).

Action processes. We used 13 items from the Mathieu and Marks’ (2006) Team Process Taxonomy Measure to test for the sub-dimensions of action processes. As delineated by the measure’s creators, these items are intended to be aggregated into the encompassing higher order variable of “action processes” using the mean of all items. Examples of these items include: “Let team members know when we have accomplished our goals” and “Coordinate our activities with one another.” Subjects indicated to what extent their team incorporated these sub-dimensions of action processes using a five-point Likert scale ranging from “not at all” to “very great extent,” as directed by the measure’s creators ($\alpha = 0.91$).

Team satisfaction. This construct was measured using an eight-item scale adapted from Hackman (1990). An example item is: “Generally speaking, I was very satisfied with the team.” Respondents used a six-point Likert scale ranging from “strongly disagree” to “strongly agree.” We then averaged individuals’ responses and aggregated them to the team level (cf. Simons and Peterson, 2000) ($\alpha = 0.92$).

Aggregation. The level of analysis of interest in this study was the team. Therefore, all individual team members’ responses were aggregated to the team level for further analysis. To justify aggregation, we computed $R_{wg(j)}$, designed for multiple-item scales, and intraclass correlation coefficients (ICC) (Bliese, 2000). For all measures, the $R_{wg(j)}$ values were in accordance with the required criteria (≥ 0.70), and ICC values suggest that there were significant differences across teams: TC ($R_{wg(j)} = 0.75$; ICC(1) = 0.13; ICC(2) = 0.41; $F_{(349, 1,116)} = 1.71$, $p < 0.01$), action processes ($R_{wg(j)} = 0.83$; ICC(1) = 0.61; ICC(2) = 0.88; $F_{(346, 1,008)} = 8.43$, $p < 0.01$), and team satisfaction ($R_{wg(j)} = 0.82$; ICC(1) = 0.44; ICC(2) = 0.79; $F_{(348, 1,091)} = 4.70$, $p < 0.01$). The ICC(1) values were large, which means that “a single rating from an individual is likely to provide a relatively reliable rating of the group mean” (Bliese, 2000, p. 356). As expected, ICC(2) values were higher than ICC(1). Based on these results, we considered it appropriate to aggregate individual answers to the team level (Bliese, 2000).

Confirmatory factor analysis. The hypothesized four-factor model was found to be adequate to the data: $\chi^2(344) = 1739.10$, $p < 0.01$; RMSEA = 0.06; CFI = 0.92; TLI = 0.91; SRMR = 0.05 (Bentler, 1995; Schreiber *et al.*, 2006). Thus, the results of the confirmatory factor analysis support the discriminant validity of the four key constructs.

Control variables. We included team size and the four countries as control variables in our analyses. Team size has been linked to team satisfaction and could potentially provide alternative explanations for our results. In addition, there is the potential for size to impact a team’s ability to establish and build upon shared cognition, and was measured through the number of team members. For the variable country, we transformed the categorical variable country (with four levels) into three dummy variables, using the USA as a baseline.

Results

The correlations, means, and standard deviations for all study variables are presented in Table II. As expected, we found significant positive correlations between STC, action processes ($r = 0.30$, $p < 0.01$), and team satisfaction ($r = 0.28$, $p < 0.01$). In addition, we found significant negative correlations between TC and STC ($r = -0.28$, $p < 0.01$), action processes ($r = -0.15$, $p < 0.01$), and team satisfaction ($r = -0.28$, $p < 0.01$). With regard to the control variable team size, we only found one significant

negative correlation between team size and team satisfaction ($r = -0.21, p < 0.01$). In Table III we present the correlations, means, and standard deviations for all study variables by country.

Hypotheses testing

To evaluate our mediation model, we used the statistical software Mplus (Muthén and Muthén, 1998). We conducted a path analysis with dependent variables, bootstrapped standard errors, indirect effects, and confidence intervals (CI). This was a saturated model (i.e. a model in which the number of free/estimated parameters equals the number of known values/data points, indicating that the model has zero degrees of freedom) (Byrne, 2012); as such, overall model fit information was not available. We resampled 5,000 times and examined for 95 percent CI. For the path analyses, team size was entered as a control variable and also the three country dummies were entered as control variables.

Figure 2 provides our conceptual model with the direct effects of the path analyses. Although control variables are not indicated in this figure, they were entered in the analyses and results indicated some significant effects. Regarding action processes, there was a significant effect of team size ($-0.13, p = 0.00$), and of country dummies for Germany ($-0.24, p = 0.00$) and Portugal ($1.94, p = 0.00$). For TC there was a significant effect of country dummies for Switzerland ($0.21, p = 0.02$) and Portugal ($0.79, p = 0.00$). For team satisfaction there was a significant effect of country dummies for Switzerland ($-0.88, p = 0.00$) and Germany ($-0.62, p = 0.00$). The results indicated that 70 percent of the variance was explained by action processes, 19 percent was explained by TC, and 76 percent was explained by team satisfaction.

Table IV provides the estimated parameters for indirect effects. Results indicated that STC was not significantly related with team satisfaction ($0.37, p = 0.07$, Cohen's $f^2 = 0.09$) and therefore *H1* was not supported. There was a significant and negative relationship between TC and team satisfaction ($-0.26, p = 0.00$, Cohen's $f^2 = 0.08$), supporting *H2*.

With regard to *H3*, the standardized parameter estimate showed that TC mediated significantly and positively the relationship between STC and team satisfaction (0.04 [CI = 0.02, 0.06], $p < 0.01$, Cohen's $f^2 = 0.16$). Thus, this hypothesis was supported. Similarly, our analyses revealed that action processes significantly and positively mediated the relationship between STC and team satisfaction (0.07 [CI = 0.04, 0.10], $p < 0.01$, Cohen's $f^2 = 1.43$). These results indicate support for *H4*.

Finally, with regard to *H5*, our findings suggested a significant multiple mediating result; specifically, both TC and action processes positively mediated the relationship between STC and satisfaction (0.01 [CI = 0.00, 0.02], $p < 0.01$, Cohen's $f^2 = 1.91$). As such, results supported this hypothesis.

Table II. Descriptive statistics and correlations among all team-level variables for all countries

	<i>M</i>	<i>SD</i>	1	2	3	4
1. Team size	4.54	0.99				
2. STC	-0.19	0.12	0.04			
3. Action processes	4.29	1.26	-0.08	0.30**		
4. TC	2.26	0.71	0.08	-0.28**	-0.15**	
5. Team satisfaction	4.91	1.00	-0.21**	0.28**	0.77**	-0.28**

Notes: $n = 364$ teams. ** $p < 0.01$

	USA				Switzerland				Germany				Portugal											
	M	SD	1	2	3	4	M	SD	1	2	3	4	M	SD	1	2	3	4						
1. Team size	4.27	0.80					5.45	0.69					3.54	1.18					4.58	0.70				
2. STC	-0.21	0.10	-0.07				-0.21	0.12	-0.01				-0.22	0.17	0.33*				-0.15	0.10	-0.15			
3. Action processes	3.68	0.45	-0.18	0.38**			3.43	0.39	-0.15	0.06			3.48	0.45	0.06	0.30			5.70	1.11	-0.20*	0.26*		
4. TC	2.11	0.54	0.14	-0.23*	-0.33**		2.38	0.58	-0.01	-0.25*	-0.45**		2.20	0.70	0.10	-0.41*	-0.49**		2.33	0.89	-0.04	-0.33**	-0.32**	
5. Team satisfaction	4.94	0.63	-0.04	0.33**	0.46**	-0.43**	3.85	0.55	-0.16	0.02	0.59**	-0.27*	4.20	0.57	-0.28	0.31	0.48**	-0.27	5.79	0.74	-0.08	0.30**	0.68**	-0.50**

Notes: $n = 364$ teams. ** $p < 0.01$; * $p < 0.05$

Table III.
Descriptive statistics
and correlations
among all team-level
variables by country

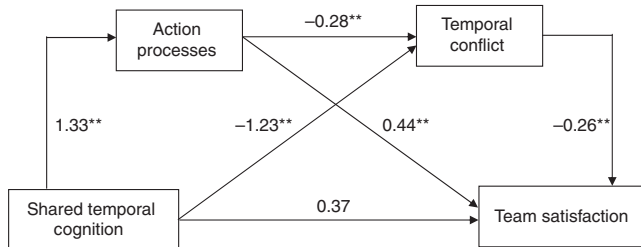
Post hoc analyses

Since the length of the team projects in Portugal were about half the duration of those in the other three countries (i.e. five weeks) we tested a *post hoc* model using only the data from Portugal to confirm whether there were differences in the results. One contrasting result was discovered; namely, the *post hoc* analyses did not provide evidence of a mediating effect for action processes upon the relationship between STC and team satisfaction (0.14 [CI = 0.03, 0.25], $p = 0.07$, Cohen's $f^2 = 0.01$). We will discuss these findings below.

Discussion

Researchers and practitioners are interested in understanding team experiences that generate team satisfaction, as an overall indicator of the quality of teamwork (Hackman, 2002). Our results provide insight into the ways temporal constructs and action processes relate to team satisfaction, and thereby make several contributions to the literature.

Overall, our findings indicate that STC and team satisfaction are indirectly related through the mechanisms of both TA and TC. However, our data did not indicate a significant direct relationship between STC and team satisfaction. Even so, these results support the argument for our subsequent hypotheses regarding indirect effects, and our general assertion that it is important to understand the mechanisms by which STC relates to team satisfaction. In contrast, we found support for a negative



Notes: Reported are the standardized parameter estimates.
** $p < 0.01$; * $p < 0.05$

Figure 2. Conceptual model with direct effects from path analysis

	Coefficient	<i>p</i> -value	SE	CI
<i>For all countries</i>				
STC→TC→Team satisfaction	0.04	0.00	0.01	0.02-0.06
STC→Action processes→Team satisfaction	0.07	0.00	0.02	0.04-0.10
STC→Action processes→TC→Team satisfaction	0.01	0.01	0.00	0.00-0.02
STC→Team satisfaction ^a	0.12	0.00	0.03	0.08-0.16
<i>For Portugal</i>				
STC→TC→Team satisfaction	0.09	0.04	0.03	0.02-0.16
STC→Action processes→Team satisfaction	0.14	0.07	0.04	0.03-0.25
STC→Action processes→TC→Team satisfaction	0.02	0.01	0.10	0.00-0.05
STC→Team satisfaction ^a	0.25	0.08	0.00	0.12-0.39

Notes: $n = 364$ teams. SE, standard error; CI, confidence interval at 95 percent. ^aIndirect effect of STC on team satisfaction through both mediators

Table IV. Estimated parameters for the hypotheses indirect effects, for all countries

relationship between TC and team satisfaction. This finding extends earlier research that demonstrated the negative results of conflict on various outcomes (e.g. De Dreu and Weingart, 2003; de Wit *et al.*, 2012; Standifer and Wall, 2010) by explicitly addressing the temporal aspects of this negative relationship. Specifically, TC is related to lower satisfaction as it fosters uncertainty and fuels misunderstandings about temporal aspects of the project and tasks being completed. In addition, it encourages negative attributions about the temporal attitudes/behaviors of fellow team members.

Next, our results indicate that TC partially mediates the relationship between STC and team satisfaction. Teams that lack STC are more likely to become embroiled in disagreements about time-related aspects leading to decreased satisfaction. As such, STC relates indirectly to team satisfaction.

Previous research suggests that shared cognition in general allows team members to coordinate actions, implement task activities, and modify plans more effectively (e.g. Mathieu *et al.*, 2000; Resick *et al.*, 2010). Our findings suggest that when teams are able to have STC, we may expect to see action processes (i.e. pacing of task activities) used and team satisfaction increased.

Furthermore, we found support for a multiple mediated model acknowledging a relationship between the mediating variables of action processes and TC. Teams utilizing action processes are more likely to work through and minimize TC more productively than teams who do not. By testing for multiple mediators, our study provides a richer understanding of these constructs' relationships.

Our *post hoc* analyses of the Portuguese teams revealed one contrasting and interesting result; unlike our findings for the entire sample, the mediating effect of action processes on the relationship between STC and team satisfaction was not significant for this data set. While our data do not permit us to make definitive claims, we believe this lack of a mediating effect may speak to the temporal, developmental nature of these constructs.

A team is not the same at the end of its duration as it was at its beginning. By noting the state of STC, TC, and the use of action processes at project mid-point, and then the degree of satisfaction reported by teams at project end, our study heeds the call of researchers to examine these variables' relationship at key temporal milestones in the project (Gersick, 1988). We found that when STC and TC manifest by a project's mid-point, there appears to be a subsequent alteration (positive or negative) in satisfaction. Furthermore, action processes at project mid-point appear to not only partially mediate between STC and satisfaction, but also negatively correlate to TC.

Finally, our teams represent four different national cultures, thereby extending our study beyond one nation's borders and demonstrating that our conceptualized model held similar across these cultures. This finding illustrates the need to further assess the cross-cultural generalizability of time-related research models.

Implications for future research, practice, and society

This study demonstrates ways in which temporal dynamics relate to team satisfaction within teams from four Western countries. However, future research would benefit greatly by extending the study into more diverse cultures. For this study, we believe it is not only interesting but theoretically important from both a research and societal perspective to distinguish commonalities among cultures and not just cultural differences. That said, testing the relationships among temporal elements, team processes, and team outcomes across divergent cultures would be worthwhile. The differing *post hoc* result in the Portuguese sample demonstrates the need for further

research into temporal cultural differences. The Portuguese teams worked together for five weeks, less than half the time as other countries' teams. Is this finding indicative of the Portuguese mindset or does it speak to the need for more time to allow STC to develop? A definitive answer to this question is beyond the scope of this study. However, we feel the results of this study intimate the latter possibility rather than the former.

Future studies could explore the relationships suggested by our findings using an experimental design in order to assess causality. Although such experimental designs may not be able to capture the relatively extensive time period that we used for our study, it would be highly informative to get insight into causality. In fact, future research could explore the possibility of reversed causality, in addition to the sequencing that we suggested, from the relationships we proposed, measuring constructs of interest at key points along the project timeline.

Next, our study considers the role of action processes in teamwork and its relationship with emergent states and outcomes. Future research could expand our model to incorporate other first-order team processes (e.g. transition and interpersonal). As LePine *et al.* (2008) suggest, one could also explore when to monitor which types of team processes more closely in order to facilitate their development.

In addition, future research could approach the constructs from our study at the individual, team member level. As is common in team research, our study aggregates satisfaction to the team level, because we were interested in outcomes at that team level. However, we can clearly see the relevance of assessing individual team members' satisfaction in relation to their experiences of temporal constructs.

Practically, our study reiterates the need for managers to acknowledge time's influence upon efforts to create effective, satisfied teams. Time is often treated as an invisible factor in teamwork instead of as a strategic element. Our study indicates the value of developing teams who acknowledge the importance of time and develop conscious, mutually derived STC. Furthermore, our results suggest team leaders should promote STC when synchronizing activities and providing temporal reminders (Mohammed and Nadkarni, 2011).

Finally, the relationships among STC, action processes, TC, and team satisfaction have implications that extend beyond student project teams. The need for temporal awareness and shared perspectives and the need to mindfully utilize action processes to minimize conflict are widely applicable from a societal perspective.

Limitations

We acknowledge the problems inherent in the use of self-report, subjective measures such as common method variance (Podsakoff *et al.*, 2003; Schmitt and Klimoski, 1991). However, researchers have found that inflated results from common method variance are not terribly prevalent in organizational research (Crompton and Wagner, 1994). It has also been noted that because common method variance is itself a main effect, it does not account for the intervening effects of processes found in this study (Mohammed and Angell, 2004). Even so, we minimized the risk of common method variance by using established, validated measures, and by measuring constructs of interest at different time moments (Podsakoff *et al.*, 2003). The use of student teams is also worth noting. Future testing of these hypotheses would benefit from the use of teams in a field context. Finally, we acknowledge our study is not of an experimental nature. This prevents our ability to make claims of causality among our variables.

Conclusion

Teams are composed of individuals with their own knowledge, experiences, and understandings. Time is intricately woven throughout a team's efforts and functioning. Teams who understand and integrate both points can maximize their results.

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