

Running head: TEAM DEVELOPMENT

Team Development: Definition, Measurement and Relationships with Team Effectiveness

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## Team Development: Definition, Measurement and Relationships with Team Effectiveness

**Abstract**

This article describes the development and validation of a theory-based measure of team development. Drawing on three independent samples, including multisource and two-wave data, we found support for the scale's theoretical multidimensionality. Convergent and discriminant validity was established, and criterion-related validity was determined through the scale's relation with three facets of team effectiveness: viability, extra-role performance and reputation. We conclude that the 29-item measure is valid and reliable for the assessment of team development. Theoretically, we shed light on the dimensionality of team development and extend the available knowledge on its nomological network. Practical implications for enhancing team effectiveness via team development are discussed.

**Keywords:** team development, measurement, team effectiveness, team processes, team emergent states

The idea that teams are dynamic entities developing over time is well documented and empirically supported (Chang, Bordia, & Duck, 2003; Garfield & Dennis, 2013; Mathieu & Rapp, 2009; Miller, 2003; Morgan, Salas, & Glickman, 1993; Oliveira, Miguez, & Lourenço, 2005; Smith, 2001; Tuckman & Jensen, 1977; Wheelan, Davidson, & Tilin, 2003). During team development, team processes, emergent states and even characteristics such as knowledge sharing and cohesion change (Chang, Duck, & Bordia, 2006; Kuipers & Stoker, 2009). These changes can be described by fairly distinct stages of team development (Chang et al., 2006; Miller, 2003; Wheelan, 2005). Teams at a given development stage tend to reveal a common pattern of actions and behaviors related to tasks and relationships, and a similar level of effectiveness (Agazarian & Gantt, 2003; Garfield & Dennis, 2013; Smith, 2001; Wheelan, 2005). Teams functioning at the higher stages of development tend to be more productive and to have healthier and more satisfied members (Jacobsson, Rydbo, & Börresen, 2014; Kuipers & Stoker, 2009; Wheelan & Hochberger, 1996).

Although researchers generally agree that teams develop over time and that team development is important for effectiveness, several conceptual and methodological challenges remain. First, there are hundreds of team development models and still no consensus regarding the definition and measurement of team development (Kozlowski, 2015). Definitions vary in terms of context specificity, population generalizability and normativity of development patterns (Chang et al., 2006), limiting the consistency of the team development construct across studies. Second, because research on team development has been mainly focused on the development process in itself, only scant research has looked at issues of effectiveness and relationships between team development and related constructs (Ericksen & Dyer, 2004; Mannix & Jehn, 2004). As such, there is still limited knowledge on the nomological network of team development. Third, existing measures of team development, such as the Group Development Questionnaire (Wheelan & Hochberger, 1996)

and the Group Development Assessment (Jones & Bearley, 2001), have several shortcomings, such as low reliabilities (below .60), inconsistent empirical support for the expected number of development stages, difficulties in disentangling task and interpersonal dimensions of each team development stage, and little evidence of construct validity (Ito & Brotheridge, 2008; Wheelan & Hochberger, 1996). Testing a comprehensive nomological network for team development requires valid and reliable measures of team development.

The purpose of this article is to provide an integrative definition of this construct so as to guide future research and thereby also to develop a valid and reliable measure of team development. Drawing on current integrative approaches to team development, we define team development as the changes in team processes and emergent states that occur over time and can be described by discrete developmental stages (Chang et al., 2006; Garfield & Dennis, 2013; Smith, 2001; Wheelan, 2005). Second, we develop a theory-based multidimensional measure of team development consisting of 29 items, which can be administered to teams, team leaders and single team members. Following the recommendations of the literature on scale development (e.g., DeVellis, 2017; Ferris, Brown, Berry, & Lian, 2008; Furr, 2011; Hinkin, 1995, 1998), we perform an extensive array of tests to validate this measure. Finally, we conclude with implications for the use of this measure in research on team development.

This article contributes to the literature on teams in several ways. First, in keeping with an integrated approach to team development, it establishes a definition of team development that considers not only the developmental stages but also the task and interpersonal dimensions of each stage. It is theoretically accepted that separating task and interpersonal dimensions of team development, processes and emergent states is important, and that each dimension explains unique variance in different facets of team effectiveness (Carless & De Paola, 2000; Marks, Mathieu, & Zaccaro, 2001; Smith, 2001). Nonetheless, there is no team

development measure that captures this distinction validly and reliably. Second, using data from three major samples and two countries, we answer calls for empirical research addressing the description of team development stages. As argued by Kozlowski (2015, p. 279), “there are many theories of team development. However, good, large sample, diverse team descriptive research is lacking.” Moreover, a reliable and valid tool for use in empirical research is lacking. In this article we aim to provide such a tool. Third, considering the need to broaden the nomological network of team development (Ericksen & Dyer, 2004; Mannix & Jehn, 2004), we extend available knowledge on its relationships with other constructs. In the section on convergent and discriminant validity, we theorize and examine relationships with team processes and emergent states that are expected to define each developmental stage. In criterion-related validity analyses, we look at issues of team effectiveness.

### **Team Development**

Teams are dynamic entities of two or more interdependent individuals who work together toward common goals (Kozlowski & Bell, 2003). Although several development models are available to explain the changes that occur over time in teams, most of them can be subsumed under two main approaches (Chang et al., 2003; Garfield & Dennis, 2013; Seers & Woodruff, 1997): the integrated stage approach and the punctuated equilibrium approach. The integrated stage approach by and large focuses on micro issues such as the temporal changes in team processes and emergent states that occur along both task and interpersonal-related dimensions, whereas the punctuated equilibrium approach tends to look at more macro issues such as time awareness, and pacing and task activities (Bonebright, 2010; Chang et al., 2003). Because some teams may follow both models, researchers should focus on either model to explain team development, depending on the unit of analysis under scrutiny (Chang et al., 2003). In addition, the integrated stage approach describes the development of all types of teams, whereas the punctuated equilibrium approach is

particularly focused on project teams with a limited time span (Chang et al., 2003, 2006).

Because we are interested in developing a measure that captures changes in configurations of team processes and emergent states, and that can be used with any type of team, we draw upon the integrated stage approach.

Based on this approach, we define team development as the changes in team processes and emergent states that occur over time in a team. These can be usefully described as shifts between well-defined developmental stages (Chang et al., 2006; Garfield & Dennis, 2013; Smith, 2001). Over time, teams go through a series of stages as members seek to change their interaction and action patterns (team processes) and their cognitive, motivational and affective states (emergent states; Marks et al., 2001; Mathieu & Rapp, 2009). Stages of development can therefore be viewed as configurations of team processes and emergent states that occur frequently and represent “attractors” in complex dynamics of change over time. From this perspective, the term “development” does not necessarily imply improvement over time, although many teams do evolve towards more efficient processes as they mature.

Each stage of team development encompasses both task and interpersonal dimensions (Jones & Bearley, 2001; Morgan et al., 1993; Wheelan, 2005). Whereas the task dimension reflects the processes and emergent states that occur as team members work together toward common goals, the interpersonal dimension reflects the processes and emergent states focused on the management of interpersonal relationships (Marks et al., 2001; Morgan et al., 1993). Although teams tend to reveal a dominant stage at any time point, they may also reveal characteristics of other stages to some extent (Agazarian & Gantt, 2003; Ito & Brotheridge, 2008; Smith, 2001). Although teams tend to reveal task and interpersonal dimensions characteristic of a single stage, they may also reveal dimensions characteristic of different stages at any one point in time (Ito & Brotheridge, 2008; Jones & Bearley, 2001). Accordingly, the developmental approach of team processes and emergent states suggests

that teams can move through the dimensions and stages at differential rates (e.g., a team can be at Stage 3 in the task dimension, but at Stage 4 in the interpersonal dimension).

Our definition of team development departs from the existing ones in two main ways. First, existing definitions tend to focus each developmental stage on specific processes and/or emergent states. For example, while Tuckman (1965) proposes that teams on stage 3 focus on issues of cohesion, Wheelan (2005) indicates that teams at stage 3 deal with issues of trust. On the one hand, these narrow definitions contributed to a detailed knowledge of the nomological network of unique processes and emergent states. On the other hand, they also contributed to the fragmentation of the available knowledge on team development and to the literature's inability to offer practical recommendations to team leaders. The importance of defining and measuring team development at a broader level of conceptual abstraction, including complex configurations of team processes and emergent states at each stage, speaks to meta-analytic evidence indicating that unique processes and emergent states are highly correlated, forming two global factors that capture the overall quality of task and interpersonal-related aspects (e.g., LePine, Piccolo, Jackson, Mathieu, & Saul, 2008; Smith, 2001). Second, disentangling task and interpersonal dimensions of each stage is of key importance for theoretical and applied purposes. Previous research found that task and interpersonal dimensions of the same construct frequently have different relationships with criteria, are subject to different contextual influences and require different forms of intervention (Beal, Cohen, Burke, & McLendon, 2003; Buzaglo & Wheelan, 1999; Ito & Brotheridge, 2008; Jehn, Greer, Levine, & Szulanski, 2008). As such, it is important to conceptualize and evaluate not only the team's development stage, but also the task and interpersonal dimensions of each stage.

Although there are different conceptualizations on which configuration or unique processes and emergent states define each stage, researchers who compared different stage

models found striking underlying conceptual similarities regarding the number of stages (four), the dimensions that each stage encompasses (task and interpersonal), and the likelihood of developed teams to be more effective than teams in early stages of development (e.g., Bonebright, 2010; Garfield & Dennis, 2013; Ito & Brotheridge, 2008; Kozlowski & Igen, 2006; Kuipers & Stoker, 2009; Miller, 2003; Oliveira et al., 2005; Smith, 2001; Tuckman & Jensen, 1977; Wheelan, 2005). Building on the current definition of team development and on these similarities, the stages of team development (1 to 4) can be labeled as: dependency, counterdependency, work restructuring and performing with regard to the task dimension; and inclusion, fight, interpersonal restructuring and functional interaction with regard to the interpersonal dimension. In the following paragraphs we describe the prototypical characteristics of each stage and dimension of team development that should represent complex configurations of team processes and emergent states. A more detailed list of the theoretical sources from which these descriptions derive is in the Appendix.

Starting with the task dimension of stage 1, team members try to understand the boundaries of the task and their role in the team and expected contribution to task accomplishment (Furst, Reeves, Rosen, & Blackburn, 2004; Morgan et al., 1993). Because members feel insecure about their role in the team, they tend to rely on leaders' instructions and to passively accept their decisions regarding work (Wheelan, 2005). With regard to the interpersonal dimension of the first stage, team members try to get to know each other, experiencing a mix of anxiety and excitement (Tuckman & Jensen, 1977; Smith, 2001). However, their interactions tend to be cautious and superficial because they do not know exactly what to expect from others and are still learning what they can and cannot express (Agazarian & Gantt, 2003).

Turning to the task dimension of stage 2, team members question and challenge the leader's competence and the distribution of work (Jones & Bearly, 2001; Tuckman & Jensen,

1977). Attempts to define rules and goals cause tension and task conflict between team members and between members and the leader (Wheelan, 2005). At the interpersonal level, team members affirm and fight for their individuality by accentuating individual differences and establishing alliances with members perceived as similar (Agazarian & Gantt, 2003). A hostile climate emerges, with team members often clashing with one another and experiencing negative emotions (Furst et al., 2004; Morgan et al., 1993; Smith, 2001).

In stage 3, teams begin to communicate more openly, to renegotiate roles and resolve differences constructively, to establish collectively norms for the team, and to discuss and find more efficient ways to achieve objectives (Jacobsson et al., 2014; Wheelan, 2005). Regarding the task dimension, teams direct more energy and effort toward the assigned work, by establishing a structure to support team goals, discussing different perspectives about the task and integrating the contributions of each member (Bonebright, 2010; Garfield & Dennis, 2013; Hare, 1973). At the interpersonal level, team members begin to accept others' idiosyncrasies, collectively establish norms clarifying which behaviors are acceptable and unacceptable, and build interactions based on trust (Kuipers & Stoker, 2009; Hare, 1973).

At the task dimension of stage 4, members' efforts and energy are truly channeled into the task (Jacobsson et al., 2014; Kozlowski & Ilgen, 2006). Team members search for new ways of solving work problems and use the competencies of each member to enhance the effectiveness of the team (Smith, 2001). They reflect on their decisions and on previously established rules and roles and adjust these if needed in order to improve (Wheelan, 2005). At the interpersonal level, there is a friendly environment of trust, openness and interdependence that benefits the team and all its members (Tuckman & Jensen, 1977; Wheelan, 2005).

Lastly, for temporary teams, there is a termination stage, when the team disbands. Following others' recommendations (e.g., Wheelan & Hochberger, 1996), we did not measure this stage to keep the instrument focused only on ongoing teams.

## The Present Study

To create a reliable and valid measure of team development (the Team Development Questionnaire, TDQ), we followed the recommended steps for scale development and validation (DeVellis, 2017; Furr, 2011; Hinkin, 1998) and subjected the scale to an extensive array of tests. In Phase 1, we generated an initial pool of potential items, and then reduced and refined these to end up with a 29-item scale capturing the eight theoretical dimensions of team development. In Phase 2, we evaluated psychometric properties of the measure: (a) dimensionality, by means of confirmatory factor analyses; (b) reliabilities; (c) measurement invariance; (d) temporal stability; and (e) aggregation to the team level. In Phase 3, we examined convergent and discriminant validity with regard to a total of 18 variables. In Phase 4, we assessed criterion validity with regard to three facets of team effectiveness: viability, extra-role performance, and reputation. To ensure generalizability, we replicated and cross-validated the results reported in Phases 2 through 4 using three complementary samples (single team members, team leaders and aggregated data from multiple team members) from the US and Portugal, including a variety of occupations and organizations.

Because team development is a time-dependent phenomenon, we validated our measure using two complementary approaches: the differential approach and the temporal approach (Roe, Gockel, & Meyer, 2012). According to the differential approach, teams differ with regard to their developmental stages, processes and emergent states. Using this variance-driven approach, we undertook three types of analyses. First, we evaluated how items group together to form dimensions and how different developmental dimensions are interrelated (see the psychometric properties section). Second, we evaluated how each dimension of team development relates to similar and dissimilar constructs (see the convergent and discriminant validity section). Third, we evaluated the extent to which each developmental dimension explains variance in team effectiveness (see the criterion validity section).

In contrast, the temporal approach is focused on how team development unfolds over time and on how these changes relate to other variables. Using this approach, we investigated whether changes in team development over one month influence related constructs (convergent and discriminant validity) and team effectiveness (criterion validity). In keeping with the suggestions of Li and Roe (2012), analyses based on the differential approach were performed using data from all the samples, whereas analyses based on the temporal approach relied on data from a two-wave sample.

We collected data from three independent samples. In samples 1 and 2, using the key informant methodology (Kumar, Stern, & Anderson, 1993), either a single team member (Sample 1) or the team leader (Sample 2) completed the questionnaire. In Sample 3, at least two members of each team completed the questionnaire and data were aggregated to the team level. These three samples complement each other in several ways. First, the use of two diverse samples (Samples 1 and 3) supports the generalization of findings to different organizations and occupations in Portugal and the USA. Second, the use of a homogeneous sample (call center team leaders; Sample 2) helps to validate the TDQ in a specific work context. Third, sampling diverse teams encompassing different stages of development ensures adequate variance between groups, required to conduct validation analyses based on the differential approach. Also, the use of a two-wave design (Sample 1) allowed validation analyses using the temporal approach. Fourth, collecting data from single team members (Sample 1), team leaders (Sample 2) and at least two team members (aggregated, Sample 3) helps to evaluate the TDQ in different research designs (in contrast to previous research, which generally relied only on key informants or data aggregated across multiple team members). Team leaders are able to evaluate their teams' development, processes and emergent states because they have ample opportunities to observe members interacting and working together, and have privileged access to information about the team as a whole (e.g.,

Gilson & Shalley, 2004; Jehn et al., 2008). Team members are expected to share homogeneous perceptions of team development, processes and emergent states because they interact with each other and work together on a regular basis (e.g., Aubé & Rousseau, 2005; Zhang, Waldman, & Wang, 2012). There is also ample evidence for the accurateness of single member assessments (e.g., Kumar et al., 1993; Wheelan & Hochberger, 1996) of team development, processes and emergent states.

Building on these arguments (e.g., experience and perceptions in the team are shared, members and supervisors have access to the experiences of others), we operationalized team development using a referent-shift consensus model (Chan, 1998); that is, individual ratings had the team as the referent. According to Klein and Kozlowski (2000), using a referent shift model creates a construct that is conceptually distinct from the original individual-level construct. Specifically, individual ratings of team development, when aggregated to the team level and/or with the team as the referent, form a team-level construct that reflects the experience of the team as a whole (Chan, 1998; Klein & Kozlowski, 2000).

### **Phase 1: Item Generation and Reduction**

Existing theoretical models provide a solid foundation for identifying and mapping dimensions of team development. In fact, despite having several distinctions in terms of, for example, how each stage is defined and how teams are expected to develop (e.g., Tuckman & Jensen, 1977; Karriker, 2005), most theoretical models of the stage approach posit a similar number of dimensions of team development and provide unique information to the broad conceptualization we follow (Arrow, Poole, Henry, Wheelan, & Moreland, 2004; Kozlowski & Ilgen, 2006; Kuipers & Stoker, 2009; Miller, 2003; Oliveira et al., 2005; Smith, 2001; Wheelan, 2005). Thus, we followed a deductive approach to item generation (Hinkin, 1995, 1998). Scales developed using this approach tend to be more generalizable across cultures, have more stable factorial structures and reveal greater content validity (Riordan &

Vandenberg, 1994). As such, the use of the deductive approach is fully aligned with our goal of developing a theory-driven, valid and reliable measure of team development.

Based on a review of the literatures on team development, team processes and team emergent states, we identified the defining aspects of the task and interpersonal dimensions of each stage of team development. Then we generated 40 items to map those aspects (4 stages x 2 dimensions x 5 items). These items were then screened by a panel of experts, composed of three of the authors and two external team development experts (Costa & Anderson, 2011; DeVellis, 2017; Furr, 2011; Hinkin, 1998). Screening criteria included: 1) applicability and relevance to the team context; 2) content validity, or the extent to which the items reflected and fully represented each team development stage and dimension; 3) singularity and identification, or the extent to which each item measured only the corresponding aspect of team development; 4) non-redundancy of item content; and 5) comprehensibility, clarity and wording of the items. Experts independently read all the items and identified those they deemed problematic, justifying their choices. Items were retained only when experts approved them unanimously, in keeping with the extant literature (e.g., Costa & Anderson, 2011; Miller, 2003) and the goal of preventing problems in subsequent phases of scale development and validation (DeVellis, 2017). During this process, 11 items were eliminated because they were flagged by at least one expert as not meeting one or more criteria. The first version of the measure was therefore composed of 29 items.

To further ensure content validity, we confirmed that the retained items still fully captured the defining aspects of each team development dimension. To ensure face validity and clarity, these items were presented to a group of four team members and to a group of two team leaders in a pilot study. These checks did not suggest additional revisions. The scale items and the main theoretical sources from which they derive are presented in the Appendix.

We used the expression “group/team” in some items for three reasons. First, a team is a

goal-oriented group that shares processes, emergent states and characteristics with groups (Ancona & Caldwell, 1992; Karriker, 2005). As such, both terms can be used interchangeably. Second, the exclusive use of the term “group” or “team” could bias responses on items focused on development stages, because people may perceive and attribute different characteristics to teams and groups (Fisher, Hunter, & Macrosson, 1997). Third, the exclusive use of one term could bias responses in some settings, because the attributions may vary across occupations. For example, these terms may have somewhat different connotations in sports and work settings.

In sum, the careful procedure used for generating and selecting items ensured the content and face validity of the TDQ.

### **Phase 2: Psychometric Properties of the Scale**

In phase 2 we evaluated: 1) the dimensionality of the scale; 2) the reliability of each dimension; 3) measurement invariance across language; 4) the stability of the scale over time; and 5) within-team consensus and between-team discriminant power for each dimension.

In line with previous work (e.g., Ito & Brotheridge, 2008; Miller, 2003; Wheelan & Hochberger, 1996), we measured all stages and dimensions at the same time: all stages may be evident at any point in time, although they manifest themselves to different extents. In other words, although teams reveal a dominant stage at any one time, they may also reveal some characteristics of other stages (Agazarian & Gantt, 2003; Ito & Brotheridge, 2008; Smith, 2001). Also, the differential approach used in this phase assumes that teams differ with regard to their developmental stages, processes and emergent states (Roe et al., 2012). Within samples, teams varied with regard to occupation (Samples 1 and 3) and length of existence (Sample 2) and were therefore expected to be in different developmental stages. Accordingly, we had a priori evidence of between-groups variance – a requisite for evaluating the psychometric properties of the scale.

## *Method*

### *Participants and Procedure*

*Sample 1.* US-based employees working full time, under direct supervision and in a team were recruited online, via Amazon's Mechanical Turk, to participate in a two-wave study. At time 1, 473 employees completed the TDQ. It is important to note that each individual was almost certainly from a different team (i.e., the data from each team was independent). The average age of team members was 34.68 years ( $SD = 11.35$ ) and the average tenure in their current team was 3.86 years ( $SD = 3.72$ ). Most participants completed high school (47.3%) or college (51.6%). A variety of occupations was represented, including sales (12.7%), healthcare (9.9%), education, training and library (9.7%), office and administration support (9.5%), computer and mathematical (7.4%), food preparation and related services (7.4%), business and financial operations (6.6%), and management (5.7%). At Time 2, one month later, 209 participants completed the questionnaire again. There are two main reasons to use a one month time span. First, it is sufficient to reduce common source variance (Podsakoff, MacKenzie, & Podsakoff, 2012). Second, it allows balancing two requirements for accurately measuring dynamic constructs: stability in measurement and change in the phenomenon (DeVellis, 2017). Because teams are not expected to change abruptly over a relatively short period of time (Wheelan et al., 2003), one month allows us to test how stable the instrument is – if the instrument truly reflects the construct of team development, it should assess team development comparably on close by occasions. However, because there are small but meaningful changes in team development over relatively short periods of time (Wheelan et al., 2003; Wheelan, 2005), one month should also allows us to assess whether the instrument is capturing small changes over time in the phenomenon of team development.

*Sample 2.* Participants were 152 team leaders from a Portuguese call center

organization. Team leaders were on average 30 years old ( $SD = 5.57$ ) and had been leading the same team for an average of 1.67 years ( $SD = 1.23$ ); 60.5% were women; 55% had a high school degree and 39% a bachelor's degree. Their teams had all the characteristics of real work teams (Cohen & Bailey, 1997): team members were interdependent and interacted frequently; they had common goals and incentives; team membership was stable; and the boundaries of each team were clearly defined. Previous research supports the notion that call center teams are real teams (e.g., Robinson & Morley, 2007; Zhang et al., 2012).

*Sample 3.* Participants were 576 members of 109 teams from a wide range of sports and organizational contexts in Portugal: sports (29.4%), management (18.3%), architecture and engineering (12.8%), computer and mathematical (5.5%), transportation (5.5%), and sales (5.5%). All were Portuguese and belonged to professional teams. On average, each team was composed of 5.28 members (ranging from 2 to 12;  $SD = 2.75$ ), with an average tenure in the team of 4.50 years ( $SD = 3.66$ ). To reduce socially desirable responding and defensiveness, we assured team members that their responses were anonymous and we did not request demographic information (Podsakoff et al., 2012). The link between the members of each team was the name of the direct supervisor. We guaranteed confidentiality to team supervisors, and removed identification information from the data once the collection was concluded. Data from team members were aggregated to the team level, as explained below.

### *Measures*

*Team development questionnaire.* We used the 29-item scale developed in Phase 1. Participants were asked to evaluate the extent to which each item applied to their teams at the current moment, using a 5-point Likert scale (1 = *Practically does not apply* to 5 = *Applies almost totally*). The items were originally developed in Portuguese. The questionnaire was administered in this language to samples 2 and 3 (in Portugal). Sample 1 completed the questionnaire in English. Items were translated from Portuguese to English and back-

translated to guarantee equivalence of meaning and accuracy (Brislin, 1980).

### *Results*

#### *Confirmatory Factor Analyses and Reliability*

Participants' responses to the team development questionnaire covered the entire range of options. This suggests that the scale generates meaningful variance among participants for reliability and confirmatory factor analyses.

We tested the eight-factor theoretical structure using confirmatory factor analyses. Following the recommendations from Brown (2015), we adopted a three-index reporting strategy for model fit, incorporating an incremental fit index (comparative fit index; CFI), an absolute fit index (standardized root-mean-square residual; SRMR), and a parsimony correction index (root mean square error of approximation; RMSEA). Because  $\chi^2$  is oversensitive to sample size, leading to the inadequate rejection of models tested in large samples, we report but do not rely on  $\chi^2$  to assess the fit of our models (Brown, 2015). According to Marsh, Hau, and Wen's (2004) cutoff criteria the following values indicate acceptable fit:  $CFI \geq .90$ ,  $SRMR \leq .10$ , and  $RMSEA \leq .08$  (see also Brown, 2015). To obtain an overall perspective of the structure of the scale we combined the three samples ( $n = 1201$ ). Correlations among latent factors were allowed. The theoretical eight-factor structure was supported:  $\chi^2 (349 \text{ df}) = 1208.69$ ,  $p < .01$ ;  $CFI = .96$ ;  $SRMR = .06$ ;  $RMSEA = .05$ ,  $LO90 = .04$  and  $HI90 = .05$ ). In addition, because all items loaded significantly and above .50 on the corresponding latent variable (all  $p$ 's  $< .01$ ), and modification indices were low, we concluded that there were no important localized areas of strain in the model (Brown, 2015).

Although the integrated stage approach of team development (e.g., Garfield & Dennis, 2013; Smith, 2001; Wheelan, 2005) suggests an eight-factor structure for team development, alternative models might fit equally well. For example, a single dimension might capture the overall maturity of team processes and emergent states (Janz, Colquitt, & Noe, 1997).

Additionally, it is possible that a model with two dimensions (task and interpersonal) but no stages is a viable alternative solution (de Wit, Greer, & Jehn, 2012; LePine et al., 2008).

Finally, disentangling task and interpersonal dimensions of each team development stage might not be required and a 4-stage model with no dimensions might also be a viable solution (Wheelan & Hochberger, 1996).

To assess the viability of these alternative theoretical models we compared the fit of the eight-factor model against nested measurement models in which potentially related latent factors were combined. Given the sensitivity of  $\chi^2$  difference tests in large samples, leading to the detection of statistical differences between alternative structural models that may not have any practical meaning, CFI differences between nested models are recommended as a substitute (Brown, 2015; Cheung & Rensvold, 2002). Large Monte Carlo simulation studies indicated that a CFI oscillation higher than .01 is indicative of a significant drop in fit (Cheung & Rensvold, 2002). The hypothesized model fit better (CFI = .96) than the one-factor solution (CFI = .46;  $\Delta$ CFI = .50); the two-factor model (capturing task and interpersonal dimensions and not the stages; CFI = .48;  $\Delta$ CFI = .48); and the four-factor model (capturing the four stages and not the task and interpersonal dimensions; CFI = .79;  $\Delta$ CFI = .17).

Considered together, confirmatory factor analyses and  $\Delta$ CFI tests indicate that the eight theoretical factors are empirically distinguishable and fit the data adequately. Further, these results are consistent with the integrated stage approach of team development, which suggests that team development has four stages, each one having distinguishable task and interpersonal dimensions.

The reliability of each dimension was assessed using Cronbach's alpha and corrected item-total correlations. Reliabilities ranged from .70 to .92 (see Table 1). Out of eight alpha coefficients, only two were slightly below the stringent standard of .80 (Lance, Butts, &

Michels, 2006). A few modest reliabilities were to be expected given the relatively broad configuration of team processes and emergent states that defines each dimension of team development (Smith, 2001; Van de Ven & Ferry, 1980; Wheelan, 2005). Importantly, given that existing measures of team development have shown low reliabilities (below .60; Ito & Brotheridge, 2008; Wheelan & Hochberger, 1996), this measure is a significant improvement on existing measures in the field. Corrected item-total correlations were high, ranging from .43 to .84 (average = .70). Overall, there is evidence supporting internal reliability of each subscale. Nevertheless, there is scope for further refinement on the two dimensions with modest reliabilities.

#### *Measurement Invariance across Language*

Measurement invariance analyses were conducted to compare the structure of the scale across English and Portuguese languages. Measurement invariance was tested by multi-group confirmatory factor analysis, following a three-step procedure of nested constraints placed on parameters across samples (Brown, 2015). First, we undertook the two key tests of configural and metric invariance (Vandenberg & Lance, 2000). Second, because previous measures of team development have been unable to consistently capture the four stages of team development and to disentangle the task and interpersonal dimensions of each stage, we also tested whether the covariances were invariant (Garcia & Kandemir, 2006). Configural invariance indicates that the number of factors and the items that define each factor are stable across samples – i.e., respondents from different samples perceive team development similarly. Metric invariance indicates that each item has a comparable relationship with the correspondent subscale. Covariance invariance suggests that the relationships between the eight latent variables are similar across samples. When comparing the unconstrained models with the constrained models, a CFI oscillation lower than .01 suggests invariance (Cheung & Rensvold, 2002). Prior to conducting these analyses we merged the Portuguese samples (2

and 3;  $n = 728$ ) and used only Time 1 of Sample 1 (English sample;  $n = 473$ ).

Results suggested that the factor structure (configural invariance:  $\chi^2 (698 df) = 1756.59$ , CFI = .95; SRMR = .08; RMSEA = .04, LO90 = .03 and HI90 = .04), the strength of the relationships between each item and the correspondent latent variable (metric invariance: CFI = .95,  $\Delta CFI = -.003$ ), and the covariances among latent variables (covariance invariance: CFI = .94,  $\Delta CFI = -.008$ ) were similar across language (Cheung & Rensvold, 2002).

### *Temporal Stability*

The stability of TDQ scores was assessed with the 209 participants of Sample 1 who completed the questionnaire at two time points, one month apart. A three step approach was followed (Brown, 2015). First, we cross-validated the overall factor structure on Sample 1, Time 2. Second, we evaluated whether the structure of the scale remained invariant across time, performing a measurement invariance test with Sample 1 (Time 1 and Time 2 data). Third, we evaluated correlations between Time 1 and Time 2 scores.

The eight-factor model was supported at Time 2 ( $n = 209$ ):  $\chi^2 (349 df) = 631.27$ ,  $p < .01$ ; CFI = .93; SRMR = .08; RMSEA = .06, LO90 = .05 and HI90 = .07. Measurement invariance tests indicated configural ( $\chi^2 (698 df) = 1482.76$ ; CFI = .94; SRMR = .08; RMSEA = .04, LO90 = .04 and HI90 = .04), metric (CFI = .94;  $\Delta CFI = -.001$ ) and covariance (CFI = .93;  $\Delta CFI = -.002$ ) invariance. This suggests that the structure of the measure did not change through time. Correlations between Time 1 and Time 2 scores were positive, significant ( $p < .01$ ) and strong (Cohen, 1988) for all subscales, ranging from .51 to .65. This indicates that the scores are relatively stable through time. Importantly, the correlations between Time 1 and Time 2 scores were always below the corresponding Cronbach's alphas. This may be an indication of actual change/development over time (DeVellis, 2017). Together, these results suggest appropriate test-retest reliability, measurement invariance over time, and that the TDQ is capturing changes in team development through time.

### *Consensual and Discriminant Power of Each Subscale*

When researchers collect data from multiple team members on team processes, emergent states and development stages, aggregation to the team level is frequently required (Klein & Kozlowski, 2000). To justify aggregation to the team level and, simultaneously, provide evidence of the consensual and discriminant power of each subscale, we used several tests: the average deviation index (AD; Burke & Dunlap, 2002),  $\eta^2$ ,  $F$  ratios and intraclass correlations (ICC1 and ICC2; Bliese, 2000). In Sample 3, AD values (ranging from .42 to .67, well below the upper threshold of .83 for 5-item scales; Burke & Dunlap, 2002), indicated that team members agreed on their ratings for all subscales. ICC1 values (ranging from .18 to .37, above the median of .12 found across other studies; Bliese, 2000), indicated a medium to large team effect and substantial variance between groups. This suggests that individual assessments on each subscale are reliable (LeBreton & Senter, 2008). ICC2 values (ranging from .53 to .76) fell within the range of acceptable values for group mean reliabilities (Bliese, 2000; Klein & Kozlowski, 2000). One-way ANOVAS between teams revealed significant  $F$  ratios ( $2.14 \leq F \leq 4.18$ ,  $p$ 's  $< .01$ ) and sufficiently high eta squared statistics ( $.33 \leq \eta^2 \leq .49$ ) to further support the discriminant power of the subscales.

To further evaluate whether the eight-factor structure holds at the team level we conducted an additional CFA, aggregating the data from sample 3 to the team level ( $n = 109$  teams). The eight-factor structure was supported at the team level:  $\chi^2 (349 \text{ df}) = 605.43$ ,  $p < .01$ ; CFI = .91; SRMR = .08; RMSEA = .08, LO90 = .07 and HI90 = .09).

Taken together, these results indicate that each subscale has adequate consensual and discriminant power, that team members' ratings can be aggregated with confidence to the team level, and that the theoretical eight-factor structure is replicated at the team level.

### **Phase 3: Convergent and Discriminant Validity**

When a construct is meaningfully related to and does not overlap excessively with

established measures of similar constructs, and is unrelated to dissimilar measures, there is evidence of convergent and discriminant validity (Campbell & Fiske, 1959; Hinkin, 1998; Nunnally, 1978). To evaluate convergent validity we examined correlations with constructs that prior theory and research indicate are related to team development, including: proximal team processes (relationship conflict, creative processes, tacit knowledge sharing, knowledge utilization and helping behaviors); team emergent states (trust, potency, goal clarity and commitment, task and social cohesion, learning and vitality); and team characteristics (participation in decision making and task interdependence). Divergent validity analyses examined four theoretically and conceptually unrelated variables (i.e., team members' and leaders' tenure in team and sex).

Considering the literature on team development (e.g., Bonebright, 2010; Garfield & Dennis, 2013; Ito & Brotheridge, 2008; Kozlowski & Ilgen, 2006; Kuipers & Stoker, 2009; Miller, 2003; Oliveira et al., 2005; Smith, 2001; Tuckman & Jensen, 1977; Wheelan, 2005), we expect the following global pattern of relationships between stages of team development and measures of positive proximal team processes, emergent states and characteristics. In the first stage, members are dependent on the leader, trying to better understand the task at hand and are concerned with their inclusion. As such, we expect only weak correlations between the two dimensions of stage 1 and other variables. In the second stage, team members experience tension and conflict as they struggle with clashing perspectives and vie for influence in the team. Therefore we expect the second stage to be positively associated with relationship conflict and negatively associated with other variables. During the third stage, team members develop more effective processes. They restructure their work, revise strategies and redefine interpersonal norms to set a common course of action and achieve their goals, contributing to more positive emergent states and characteristics. Accordingly, we expect weak to moderate associations in stage 3. Finally, in the fourth stage, efficient

processes are in place, enhancing performance. Accordingly, we expect medium to strong positive correlations (and a negative correlation with relationship conflict). The main sources supporting each specific relationship are displayed in Table 2.

With regard to discriminant validity, we considered that TDQ scores should be only weakly related to the length of time that teams have been in existence, as indexed by team members' and leaders' tenure in teams. Although common conceptions of biological or psychological development typically reflect increasing maturation over time, evidence suggests that teams do not mature or evolve towards more efficient processes linearly over time. In fact, teams can jump stages, change through time in non-linear ways, become blocked in a stage or even regress to less mature stages depending on both internal and external factors (Arrow et al., 2004). Given that TDQ captures configurations of team processes, emergent states and characteristics, scores should also be unrelated to team members' or leaders' sex. Absence of excessive overlap with conceptually related team processes, emergent states and characteristics, and a pattern of weak or null relationships with tenure and sex variables can therefore be viewed as evidence of discriminant validity.

Both the differential approach and the temporal approach (Roe et al., 2012) were used in Phase 3 analyses. We used the differential approach in all three samples to evaluate the pattern of relationships with proximal and unrelated constructs. For sample 1 (two-wave data), we also used the temporal approach to evaluate whether changes in TDQ scores over one month predicted team processes, emergent states and characteristics at Time 2.

### *Method*

#### *Participants and Procedure*

We used data from the three samples described above. In sample 1 we controlled for common method bias, as suggested by Podsakoff et al. (2012): TDQ scores at Time 1 were correlated with other measures collected at Time 2; and TDQ scores at Time 2 were

correlated with other measures collected at Time 1. In sample 3, convergent and discriminant validity tests were performed for a subset of 77 teams only, because we could not collect additional variables for sports teams.

### *Measures*

*Team development* was measured with the 29-item scale developed in Phase 1. The remaining measures used in these analyses are displayed in Table 2.

### *Results*

In line with previous work (e.g., Dobrow & Tosti-Kharas, 2011; Ferris et al., 2008), we evaluated convergent and discriminant validity based on the differential approach in three ways. First, we examined the significance and magnitude of correlations between TDQ scores and other constructs, and evaluated whether these relationships were consistent with theory. Second, we used confirmatory factor analyses to evaluate whether the eight TDQ factors were empirically distinguishable from the other constructs. Specifically, we evaluated whether nine-factor models (8 TDQ factors plus each additional construct) fit the data better than eight-factor models (where items from the additional construct were forced to load on each of the eight TDQ subscales; Anderson & Gerbing, 1988). We followed this procedure because including all variables at the same time would very likely mask excessive overlap between a specific pair of variables (Brown, 2015).

Following Cohen's (1988) classification, each correlation was categorized as small ( $r \leq .29$ ), medium ( $.30 \leq r \leq .49$ ) or large ( $r \geq .50$ ). Table 3 shows that all but one correlation between the dimensions of stage 1 and convergent validity variables were small (absolute average  $r = .14$ ). Dimensions of stage 2 were negatively related to team processes, emergent states and characteristics, and positively associated with relationship conflict. On average, dimensions of stage 2 had a medium correlation with convergent validity variables ( $|r| = .31$ ). Overall, dimensions of stage 3 were positively related to proximal constructs, with effect

sizes ranging from small to medium ( $|r| = .24$ ). Dimensions of stage 4 were generally positively related to proximal constructs, and negatively related to relationship conflict, and most associations were of medium to large magnitude (average  $|r| = .44$ ). With regard to discriminant validity, we found only weak and non-significant relationships (average  $|r| = .07$ ) between TDQ scores and both team leaders' and members' sex and tenure in the team. These results are consistent with the theory-based expectations outlined above, both in terms of magnitude and direction.

Confirmatory factor analyses allayed concerns about excessive overlap between TDQ scores and team processes, emergent states and characteristics. Nine-factor models (8 TDQ factors plus each additional construct) always fit the data better than eight-factor models (where items from the additional construct were forced to load on one of the eight TDQ subscales;  $\Delta CFI$  ranged between  $-.02$  and  $-.13$ ; Cheung & Rensvold, 2002).

Based on the temporal approach, convergent and discriminant validity were evaluated using the inter-team methodology because in the process of scale validation we are interested in conclusions regarding aggregated change at the sample level (cf. Li & Roe, 2012; van der Haar, Li, Segers, Jehn, & Van den Bossche, 2015). In line with previous research (e.g., van der Haar et al., 2015), we first computed percentage change ratios from Time 1 to Time 2 for each team development dimension, and then used hierarchical multiple regression to examine the effects of these relative change ratios on other variables at Time 2, controlling for all eight dimensions of team development at Time 1. The results are shown in Table 4. Overall, changes in stage 1 dimensions had weak effects (average  $|\beta| = .10$ ). Changes in dimensions of stage 2 tended to be negatively related to other variables (average  $|\beta| = .17$ ). Changes in dimensions of stage 3 had weak to moderate positive effects (average  $|\beta| = .14$ ). Finally, changes in dimensions of stage 4 had medium to large positive effects (average  $|\beta| = .34$ ). These results indicate that the TDQ can detect the relatively small changes in team

development that occur during one month (Wheelan, 2005), and that these changes reveal the expected pattern of relationships with team processes, emergent states and characteristics.

In sum, these results indicate that TDQ scores are meaningfully related to, yet separable from, team processes, emergent states and characteristics, and unrelated to indicators of team tenure and sex, thus providing evidence of convergent and discriminant validity.

#### **Phase 4: Criterion Validity**

In this phase we examined whether the TDQ scores and changes in team development over one month predict three facets of team effectiveness: team viability, extra-role performance and reputation. This way, we sought to expand the available knowledge on the nomological network of team development and provide further evidence of the construct validity of the TDQ (Cronbach & Meehl, 1955; Hinkin, 1998). Using the differential approach, three steps were followed. First, we examined theoretically meaningful correlations between TDQ scores and team effectiveness. Second, we evaluated the extent to which each dimension of team development explains criteria above and beyond related constructs. Third, we evaluated whether task and interpersonal dimensions of each stage explain unique variance in criteria. Using the temporal approach, we evaluated whether changes in TDQ scales over one month explain team viability at Time 2.

Drawing on the multidimensional conceptualization of team effectiveness (Mathieu & Gilson, 2012; Sundstrom, McIntyre, Halfhill, & Richards, 2000), we examined three facets of team effectiveness (viability, extra-role performance and reputation) for the following reasons. First, they are theoretically distinguishable and complement each other (Mathieu & Gilson, 2012). Team viability is “the team’s capacity to adapt to internal and external changes as well as the probability that team members will continue to work together in the future” (Aubé & Rousseau, 2005, p. 192). Team extra-role performance focuses on spontaneous actions that go beyond formal requirements and contribute to performance (Bakker,

Demerouti, & Verbeke, 2004; Eisenberger et al., 2010; Tjosvold, Hui, & Yu, 2003). Team reputation reflects third parties' subjective opinions about a team (Tyran & Gibson, 2008). Competitive and effective teams sustain success over time (viability), go the extra mile to increase their performance (extra-role performance), and are credible to external observers (reputation). Second, previous research found that these facets of team effectiveness are related but distinguishable, and have their distinct correlates and predictors (e.g., Bakker et al., 2004; Cropanzano, Li, & Benson, 2011; Tyran & Gibson, 2008). Finally, these facets are particularly relevant for our purpose because previous research has found that they are influenced by team processes, emergent states, characteristics and developmental stages (e.g., Behfar, Peterson, Mannix, & Trochim, 2008; Cropanzano et al., 2011; Jacobsson et al., 2014; LePine et al., 2008; Tjosvold et al., 2003; Tyran & Gibson, 2008).

Team effectiveness is expected to vary across stages of team development. At each stage, however, task and interpersonal dimensions of team development are expected to reveal similar relationships with different facets of team effectiveness because these dimensions reflect broad configurations of team processes and emergent states (Smith, 2001; Wheelan, 2005). This notion is consistent with theory (Marks et al., 2001; Wheelan, 2005) as well as with research using other broad measures of team development and team processes (e.g., Jacobsson et al., 2014; Lepine et al., 2008; Wheelan & Hochberger, 1996).

Viable teams are able to adapt to changes in their internal and external environment, and have satisfied team members eager to continue working in the team (Aubé & Rousseau, 2005; Behfar et al., 2008; Hackman, 1987). In stage 1, teams have not yet developed a series of processes and emergent states to sustain success over time (Smith, 2001). In stage 2, tension, conflict and negative emotions tend to undermine perceived team viability (Jacobsson et al., 2014; Jehn et al., 2008). In stage 3, members restructure norms and relationships, and develop more positive processes and emergent states that enhance team

viability. By stage 4, teams are mature, having adopted effective processes and nurtured positive emergent states (Janz et al., 1997), further enhancing team viability (Aubé & Rousseau, 2005; Jehn et al., 2008). Therefore, we hypothesize:

*Hypothesis 1:* Team viability has a) a negative relationship with both dimensions of stage 1; b) a negative relationship with both dimensions of stage 2; c) a positive relationship with both dimensions of stage 3; and d) a positive relationship with both dimensions of stage 4.

Team extra-role performance depends on the team members' inclination to make constructive suggestions, to use their knowledge for the benefit of the team, and to protect the team from potential threats (Eisenberger et al., 2010; Tjosvold et al., 2003; Tjosvold & Yu, 2004). In stage 1, team members are highly dependent on the leader. They are trying to learn and comply with the existing norms. They may be unclear about their goals and feel insecure about their roles. Accordingly, they may refrain from making suggestions or going out on a limb to benefit the team. In stage 2, conflict and tension may exacerbate concerns about power and influence and undermine team members' inclination to go over and above the call of duty to support their peers and the team. In stage 3, teams restructure processes, norms and patterns of interaction to be more effective. For this purpose, members are likely to help the team to learn and improve. By stage 4, team members have established clear goals, have effective interpersonal processes, feel secure about their roles, and are focused on task accomplishment (Janz et al., 1997; Porter & Lilly, 1996; Smith, 2001; Tuckman & Jensen, 1977; Wheelan & Hochberger, 1996). They are therefore even more willing to go the extra mile, to make helpful suggestions and to share useful knowledge. Therefore, we hypothesize:

*Hypothesis 2:* Team extra-role performance has a) a negative relationship with both dimensions of stage 1; b) a negative relationship with both dimensions of stage 2; c) a positive relationship with both dimensions of stage 3; and d) a positive relationship with both

dimensions of stage 4.

Team reputation refers to third parties' "future expectations for the team's performance, social interaction, and other behaviors" (Tyran & Gibson, 2008, p. 49). Clients, suppliers, and members of other teams may form such subjective opinions based on their interactions or other information about a team (Laird, Zboja, & Ferris, 2012). The team processes, emergent states and characteristics that configure development stages can be observed by third parties (Wheelan et al., 2003; Wheelan & Williams, 2003). Therefore, we expect team development to influence the reputation of a team. In stage 1, dependency and lack of sound processes and norms may elicit perceptions of low competence and effectiveness. In stage 2, conflict, tension and negative emotions, compounding the lack of sound processes, may amplify perceptions that the team is dysfunctional (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). In stage 3, teams start to establish a set of effective processes and a positive emotional atmosphere likely to enhance their reputation. However, reputation attributions require consistency in observed behaviors (Zinko, Ferris, Humphrey, Meyer, & Aime, 2012), which may be lacking during team restructuring. In stage 4, teams reveal effective processes and a positive atmosphere. Also, they are motivated to develop fruitful relationships with clients, suppliers and other teams (Kuipers & Stoker, 2009). Accordingly, we hypothesize:

*Hypothesis 3:* Team reputation has a) a negative relationship with both dimensions of stage 1; b) a negative relationship with both dimensions of stage 2; c) a positive relationship with both dimensions of stage 3; and d) a positive relationship with both dimensions of stage 4.

### *Method*

#### *Participants and Procedure*

We used all three samples for these analyses. We controlled for common method bias (Podsakoff et al., 2012) using two-wave data (Sample 1) and multisource data (Sample 3). In

sample 1, the TDQ subscales were collected at Time 1 and Time 2, and the criterion variable (team viability) at Time 2, one month later. In sample 2, team leaders completed the TDQ and criterion measure (team extra-role performance) at the same time. In sample 3, members of 77 teams completed the TDQ and their supervisors rated the reputation of the team. Most supervisors were men (74%) and had university degrees (83.2%). They averaged 43 years of age ( $SD = 8.50$ ) and 8 years of tenure as supervisors of their current team ( $SD = 6.01$ ).

### *Measures*

*Team development* was measured with the 29-item scale developed in Phase 1.

*Team viability* was measured with the four-item scale developed by Aubé and Rousseau (2005). A 5-point scale ranging from 1 (Not true at all) to 5 (Totally true) was used. A sample item is “The members of this team could work together for a long time.”

*Team extra-role performance* was evaluated with five items adapted from Eisenberger et al. (2010). Items were adapted such that the referent was the team instead of a single employee (e.g., “My employees looked for ways to make our team more successful”). The response scale ranged from 1 (Strongly disagree) to 7 (Strongly agree).

*Team reputation* was assessed with three items developed by Hochwarter, Ferris, Zinko, Arnell, and James (2007), adapted to the team level. An example item is “In this organization my team has the reputation for producing the highest quality performance.” The response scale ranged from 1 (Strongly disagree) to 7 (Strongly agree).

### *Results*

Table 3 presents the correlations between TDQ subscales and the three facets of team effectiveness. In line with our expectations, for stage 1 the task dimension was negatively related to team reputation ( $r = -.26, p < .05$ ) and the interpersonal dimension was negatively related to both team viability ( $r = -.25, p < .01$ ) and extra-role performance ( $r = -.23, p < .01$ ). Contrary to our expectations, the task dimension of stage 1 was unrelated to team viability

and extra-role performance, and the interpersonal dimension was unrelated to team reputation. Consistent with our predictions, teams in stage 2 were found to be less viable, to display less extra-role performance efforts and to be less reputable ( $r$  values ranged from  $-.40$  to  $-.27$ ,  $p < .01$ ). Stage 3 dimensions were positively related to team viability (e.g.,  $r = .18$ ,  $p < .01$ ), as expected, but negatively related to extra-role performance (e.g.,  $r = -.18$ ,  $p < .05$ ) and unrelated to reputation (e.g.,  $r = .13$ ,  $p > .05$ ), contrary to our expectations. Stage 4 dimensions revealed substantial positive relationships with all three facets of effectiveness (lowest  $r = .29$ ,  $p < .05$ ; highest  $r = .54$ ,  $p < .01$ ), in line with our hypotheses.

We tested whether the relationships reported above held controlling for the effects of related team processes and emergent states. In Sample 1, we controlled for trust, team potency and relationship conflict. These variables and the TDQ were measured at Time 1, and team viability at Time 2, minimizing common method variance (Podsakoff et al., 2012). In sample 2, we controlled for helping behaviors. In sample 3, we controlled for learning, vitality and tacit knowledge sharing. Hierarchical multiple regression analyses were used, entering control variables in step 1 and TDQ scores in step 2. Most (78%) of the relationships reported above remained significant or marginally significant. These results suggest that TDQ subscales explain significant variance in team effectiveness and capture a configuration of team processes and emergent states, rather than a single aspect of team development.

Next, we evaluated whether task and interpersonal dimensions at each stage explained unique variance in criteria. As can be seen in Table 5, task and interpersonal dimensions often revealed unique effects. In some cases, they even related to criteria in opposite directions. For example, in stage 1 the task dimension relates positively ( $\beta = .14$ ,  $p < .05$ ), whereas the interpersonal dimension relates negatively ( $\beta = -.27$ ,  $p < .01$ ), to team viability. This implies that merging dimensions of the same stage would mask the individual relationships of each dimension with criteria, resulting in an overall non-significant

relationship. Finally, the effects of the two dimensions of each stage varied across facets of team effectiveness. For example, the task dimension of stage 1 was positively related to viability ( $\beta = .14, p < .05$ ) and negatively related to reputation ( $\beta = -.25, p < .05$ ), whereas the interpersonal dimension of stage one was negatively related to viability ( $\beta = -.27, p < .01$ ) and unrelated to reputation ( $\beta = -.06, p > .05$ ). If we merged the two dimensions of each stage, we would erroneously conclude that stage 1 was unrelated to both team viability and team reputation. These results further support the separation of task and interpersonal dimensions.

Criterion-related validity using the temporal approach was assessed with the same methodology reported in the convergent and discriminant validity phase (Li & Roe, 2012). Table 4 shows that relative changes in each dimension of team development over one month predicted team viability at Time 2. Overall, the pattern of relationships was aligned with Hypothesis 1 (except that the task dimension of stage 1 was positively, albeit weakly, related to team viability and the interpersonal dimension was unrelated to team viability). These results provide further evidence of criterion validity.

## Discussion

Most stage models of team development shift across four stages that can be described along two dimensions: task and interpersonal. However, previous empirical research has been unable to consistently capture the four stages of team development and to disentangle the task and interpersonal dimensions of each stage. Therefore we sought to create a new measure of team development that captures its eight theoretical factors (two dimensions per stage), based on a definition of team development informed by an integrated stage approach. Overall, the present findings provide evidence that the TDQ is a valid measure of team development. This conclusion is robust insofar as our results were generally consistent across research designs and samples: using one key informant per team and aggregated data from multiple team members; using cross-sectional, multisource and two-wave data from three samples and two

countries; using both a differential approach and a temporal approach to data analyses; and using evaluations of 1278 team members and leaders from several occupations.

The psychometric properties of the TDQ were sound. An array of tests support this assertion: 1) confirmatory factor analyses showed that the eight factor model fit the data appropriately; 2) internal consistencies for each factor ranged from .70 to .92; 3) measurement invariance analyses, showed consistency in the structure and meaning of the instrument across language (Portuguese and English); 4) construct distinctiveness analyses ( $\Delta$ CFI of nested models) suggested that, for ongoing teams, development occurs along four stages, each having distinguishable task and interpersonal dimensions; and 5) consensual and discriminant power analyses indicated that team members largely share their perceptions on the developmental stage of the team and, thus, each factor can be aggregated with confidence to the team level and can be measured accurately with both a key respondent per team (leader or member) or multiple respondents. Also, temporal stability tests indicated that while the meaning of the measure remained stable through time (measurement invariance tests), the relationships between scores of team development at T1 and T2 were lower than the reliability (Cronbach's alpha) of each team development dimension. Together, these findings indicate that the adjustments in team development scores are more likely to be due to the small changes in team development occurred over a one-month period (Wheelan, 2005) than to the measure being unreliable (DeVellis, 2017).

In addition, we demonstrated convergent and discriminant validity between each team development factor and team processes (relationship conflict, creative processes, tacit knowledge sharing, knowledge utilization and helping behaviors), team emergent states (potency, goal clarity and commitment, task and social cohesion, and thriving), team characteristics (participation in decision making and task interdependence) and leader and member demographics (sex and tenure in team). Lastly, we established the criterion validity

of TDQ factors by showing that they explain variance in team viability, extra-role performance and reputation. Furthermore, we found that most of these relationships remained significant after controlling for (one to three) relevant team processes and emergent states, and the task and interpersonal dimensions of each stage had unique effects on criteria. Thus, the instrument demonstrated predictable relationships with variables in the nomological network of team development.

To complement the above results, based on the differential approach, we also conducted analyses based on the temporal approach (Li & Roe, 2012). Using an inter-team methodology, we further established convergent validity and criterion-related validity. In particular, we showed that, for each stage of team development, relative changes in task and interpersonal dimensions over one month related, in the expected direction and magnitude, to relevant constructs as well as to team viability. Considering stability tests and the effects of changes in team development dimensions together suggests that the TDQ balances two requirements for measuring dynamic constructs. On the one hand, the measure reveals temporal reliability – as expected, considering that most teams do not change abruptly over a short time period. On the other hand, the measure is able to detect the small changes that do occur even in a relatively short time period.

The development and validation of this theory-driven measure makes three theoretical contributions. First, because previous measures have been unable to consistently disentangle task and interpersonal dimensions, and capture the four theoretical stages of development in ongoing teams, some have questioned the four-stage perspective of team development (Ito & Brotheridge, 2008; Wheelan & Hochberger, 1996). Our results support the widely held and integrative view that ongoing teams vary in terms of four stages and two dimensions: task and interpersonal.

Second, consistent with the notion that team development reflects changes in

configurations of team processes, emergent states and characteristics (Chang et al., 2006; Garfield & Dennis, 2013; Smith, 2001; Wheelan, 2005), we found that each developmental dimension and stage was related to, yet distinguishable from, a range of related constructs including team processes, emergent states and characteristics. Meaningful but not excessive correlations between each dimension of team development and these related constructs suggest that the theoretical nomological network of the TDQ is valid and consistent with the definition of team development on which it was based. Although different stages of development share similar processes and emergent states, they also reveal different patterns of relationships with these constructs. For example, the fourth stage (reflecting higher team maturity) revealed moderate to strong relationships with adaptive team processes and positive emergent states, whereas the preceding stage (when teams begin to establish sound processes to enhance effectiveness) revealed only weak to moderate relationships.

Third, this study extended the available knowledge on the nomological network of team development by examining three facets of team effectiveness. Researchers often assume that developed teams are more effective than teams in early stages of development because their established processes and emergent states promote effectiveness (e.g., Kuipers & Stoker, 2009; Wheelan, 2005). However, scant research has examined relationships between stages of team development and team effectiveness. Our results suggest that mature teams are more viable and reputable, and foster higher extra-role performance. We are among the first to show that task and interpersonal dimensions of each stage have unique, and sometimes opposite, effects on effectiveness. These findings highlight the importance of considering not only a team's developmental stage but also task and interpersonal dimensions to fully understand team effectiveness.

#### *Limitations and Future Directions*

This study has some limitations. First, our goal was to develop a measure of team

development that could be administered to key team informants (single team member and team leader) as well as to several team members. At present, we cannot guarantee that this measure will also be valid and reliable if administered to external observers. Relatedly, because we used a referent-shift consensus approach (Chan, 1998), it is still an open question whether variations in individual perceptions of team development are relevant to team and/or individual effectiveness, and whether this measure is valid and reliable when a full team answer it together (true team level measure). Exploring these multilevel issues and validating the measure with a full team discussion are potential avenues for further research. Second, this measure assumes the existence of a team leader. Further research is required to adapt and evaluate the validity of TDQ with self-managed teams.

Third, we cannot claim that the relationships observed between stages of team development and team effectiveness reflect causal effects. We used two-wave and multisource data, performed analyses based on both the differential and temporal approaches, and found solid evidence of criterion validity (Dobrow & Tosti-Kharas, 2011; Ferris et al., 2008). Nonetheless, some conceptual overlap between stages of team development and effectiveness criteria is unavoidable. The taxonomy upon which the present work is based reflects team processes, emergent states, and team characteristics, overlapping to some extent with team effectiveness. By design, the fourth stage of team development reflects mature and efficient team functioning. This conceptualization may be viewed as an advantage for researchers and practitioners interested in a broad level of analysis, and as a disadvantage by those seeking to distinguish team processes, emergent states, and effectiveness.

Relatedly, we controlled for common method bias in criterion validity tests (Podsakoff et al., 2012) using two-wave data (Sample 1; one month apart) and multisource data (Sample 3). Further, the inclusion of control variables from the same source (used in Samples 1, 2 and 3) tends to attenuate the effects of common method bias (Siemsen, Roth, & Oliveira, 2010).

The fact that the pattern of results between the TDQ and criteria was very similar with and without control variables indicates that it is very unlikely that these findings can be explained by common method bias.

Fourth, only three facets of effectiveness were evaluated: viability, extra-role performance and reputation. Future research should examine relationships between team development and other facets of effectiveness, such as task performance, absenteeism, and turnover intentions (Mathieu & Gilson, 2012). Fifth, we only evaluated the validity of this measure in Portugal and in the USA. Translation and back-translation procedures (Brislin, 1980) in conjunction with measurement invariance tests (Cheung & Rensvold, 2002) provided strong evidence for lexical and meaning equivalence of the items for Portuguese and English languages. Future research should extend these procedures to other languages.

Lay views and common definitions of development emphasize growth or increasing maturity over time. Our claim that teams do not necessarily shift to more mature stages of development linearly over time goes against this assumption. We have argued that the stages of development measured by the TDQ reflect common configurations of team processes, emergent states and characteristics that act as "attractors" in complex change dynamics. Teams can shift to more mature processes and positive states over time, becoming more efficient. However, they can also shift to less efficient processes or to more dysfunctional behavior, depending on factors internal and external to the team. Future research should investigate these transitions between dimensions and stages of team development, and what triggers them. In particular, different leadership styles or behaviors (Morgeson, DeRue, & Karam, 2010) and external forces (Garfield & Dennis, 2013) may promote or hinder team development, depending on the current stage of the team. For example, a leader who systematically establishes expectations and goals for the team may unintentionally keep the team at the task dimension of the first stage of development. Understanding which factors

promote the development of the interpersonal dimension and which promote the development of the task dimension may also be a great avenue for future research. Finally, identifying profiles of transitions among stages and dimensions of team development might also be a fruitful avenue for future research.

The goal of this paper was to develop and validate a measure assessing the extent to which teams fit different stages, as identified by an important body of theory on team development. In light of the empirical evidence presented here, we believe this goal was met. Nonetheless, it is important to recognize that the work of validation does not end here. Although prior theory and research suggest that these modes of team functioning are relevant across cultures, further evidence of cross-cultural validity for our scale is also needed before we can confidently recommend that it be used in different cultural contexts.

Moreover, the ultimate value of the TDQ depends on the soundness of the theoretical models from which it was derived. Further research is needed to evaluate whether the stages of team development identified by this theoretical literature provide the most useful and comprehensive taxonomy, or whether this taxonomy needs further elaboration or revision. We believe that our measure and the taxonomy upon which it is based are useful for evaluating modes of team functioning at a fairly broad level of analysis. For example, practitioners may use it to identify salient stages of team development, foster awareness of strengths and weaknesses in a team, and start a reflective discussion of steps to be taken to further develop the team. Practitioners seeking a more fine grained analysis of team functioning may wish to examine specific team processes and emergent states relevant to previously identified stages of team development.

### *Practical implications*

This study has at least three practical implications. First, the team development questionnaire can be used as a diagnostic tool for instructors, team leaders and organizations.

An instructor who understands the developmental stage that best characterizes a team's functioning can develop more tailored and effective team-building programs. A team leader can use this instrument to facilitate a discussion with team members about what can be done to promote or to sustain sound processes and a healthy team atmosphere. From an organizational perspective, the instrument could be useful for signaling training needs that are transversal to several teams in the organization.

Second, disentangling task and interpersonal dimensions of team development stages facilitates effective interventions. When asked, team members tend to frame team problems as interpersonal problems (Buzaglo & Wheelan, 1999). The use of the TDQ makes targeted interventions on task and/or interpersonal dimensions possible. Finally, our results suggest that team leaders and organizations interested in fostering team effectiveness should invest in the development of their teams. Teams at the fourth stage of development, our results indicate, tend to be more viable, to go the extra mile, and to be more reputable.

### *Conclusion*

Team development has been conceptualized from a variety of theoretical perspectives and different models have been proposed to explain the changes that occur in teams over time. Integrative approaches have sought to combine valuable contributions from various models and perspectives into an overall description of each stage and dimension of team development. However, until now, these efforts at integration were not used to improve the measurement of team development. With the TDQ, researchers can now capture the overarching stages and dimensions of team development, as proposed by the integrative approach, and accumulate and communicate empirical findings on team development using a standard classification. Although analyzing specificities of team development remains crucial for theory development, now we also have a measure that allows researchers to study stages and dimensions of team development comprehensively, at a broad level of analysis.

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Table 1

*Descriptive Statistics, Reliabilities and Correlations among the Subscales of TDQ*

	<i>M</i>	<i>SD</i>	T-Stg1	T-Stg2	T-Stg3	T-Stg4	I-Stg1	I-Stg2	I-Stg3	I-Stg4
T-Stg1	3.02	0.90	<b>.70</b>	.14**	.01	.08*	.39**	.15**	.10**	.01
T-Stg2	2.07	1.01	.08**	<b>.83</b>	-.27**	-.47**	.61**	.82**	.05	-.51**
T-Stg3	3.42	0.99	.04	-.24**	<b>.90</b>	.50**	-.12**	-.30**	.57**	.52**
T-Stg4	3.78	0.78	.09**	-.39**	.45**	<b>.84</b>	-.34**	-.59**	.25**	.78**
I-Stg1	2.38	0.93	.29**	.48**	-.08**	-.23**	<b>.76</b>	.64**	.21**	-.38**
I-Stg2	1.87	0.96	.09**	.71**	-.27**	-.51**	.51**	<b>.89</b>	.03	-.65**
I-Stg3	2.97	1.08	.10**	.05	.52**	.22**	.22**	.02	<b>.92</b>	.30**
I-Stg4	3.78	0.88	.05	-.43**	.47**	.67**	-.27**	-.57**	.27**	<b>.86</b>

*Note.*  $n = 1201$ . Correlations below the diagonal are among scales created from averaging items. Correlations above the diagonal are among

latent variables. Alphas are on the diagonal in bold. T-Stg  $x$  = Task dimension of stage  $x$ ; I-Stg  $x$  = Interpersonal dimension of stage  $x$ .

<sup>+</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ .

Table 2

*Overview of Measures Used in Convergent Validity Analyses*

Measure (Number of Items; Sample Item; Source)	Response Scale	Sources Indicating A Relationship
Relationship Conflict (3 items; e.g., “How much relationship tension is there in your work team?”; Jehn & Mannix, 2001)	1 (None) to 5 (A lot)	Wheelan, 2005; Wheelan & Hochberger, 1996
Team Creative Processes (3 items; “Team members, as a whole, are willing to try creative solutions to solve difficult problems”; Gilson, Mathieu, Shalley, & Ruddy, 2005)	1 (Strongly disagree) to 5 (Strongly agree)	Anderson, Potočnik, & Zhou, 2014
Team Tacit Knowledge Sharing (3 items; e.g., “I share my know-where or know-whom knowledge with my coworkers.”; Bock, Zmud, Kim, & Lee, 2005)	1 (Very infrequently) to 7 (Very frequently)	Drach-Zahavy & Somech, 2001; Faraj & Sproull, 2000
Team Knowledge Utilization (3 items; e.g., “Team members’ task-related expertise and skills are fully utilized in our team’s activities.”; Sung & Choi, 2012)	1 (Strongly disagree) to 5 (Strongly agree)	Drach-Zahavy & Somech, 2001; Faraj & Sproull, 2000
Helping Behaviors in the Team (3 items; e.g., “Members of my team help each other out if someone falls behind in his/her work.”; Podsakoff, Ahearne & MacKenzie, 1997)	1 (Never) to 7 (Frequently)	Ehrhart, Bliese, & Thomas, 2006; Wheelan, 2005
Trust Between Team Members (3 items; e.g., “How much do you trust your fellow team members?”; Jehn & Mannix, 2001)	1 (Not at all) to 5 (A lot)	LePine et al., 2008; Wheelan et al., 2003
Team Potency (3 items; e.g., “My team can take on nearly any task and complete it.”;	1 (Strongly disagree)	Goncalo, Polman, & Maslach, 2010;

Campion, Medsker, & Higgs, 1993)	to 5 (Strongly agree)	LePine et al., 2008
Team Goal Clarity and Commitment (4 items; e.g., “How far are you in agreement with your team objectives?”; Kivimaki & Elovainio, 1999)	1 (Not at all) to 5 (Completely)	Gersick, 1988; Jacobsson et al., 2014; Kozlowski & Ilgen, 2006
Task Cohesion (4 items; e.g., “Our team is united in trying to reach its goals for performance”; Carless & De Paola, 2000)	1 (Strongly disagree) to 5 (Strongly agree)	Kozlowski & Ilgen, 2006; Smith, 2001; Wheelan, 2005
Social Cohesion (4 items; e.g., “Members of our team do not stick together outside of work time” – reverse coded; Carless & De Paola, 2000)	1 (Strongly disagree) to 5 (Strongly agree)	Kozlowski & Ilgen, 2006; Smith, 2001; Wheelan, 2005
Team Members’ Learning in the Team (5 items; In my team... “I find myself learning often”; Porath, Spreitzer, Gibson, & Garnett; 2012)	1 (Strongly disagree) to 7 (Strongly agree)	Gibson & Vermeulen, 2003; Jacobsson et al., 2014; Wheelan, 2005
Team Members’ Level of Vitality (5 items; In my team... “I feel alive and vital”; Porath et al., 2012)	1 (Strongly disagree) to 7 (Strongly agree)	Atwater & Carmeli, 2009; Kark & Carmeli, 2009
Participation in Decision Making (3 items; e.g., “Most members of my team get a chance to participate in decision making.”; Campion et al., 1993)	1 (Strongly disagree) to 5 (Strongly agree)	Campion et al., 1993; Wheelan & Hochberger, 1996
Task Interdependence (3 items; e.g., “Within my team, jobs performed by team members are related to one another.”; Campion et al., 1993)	1 (Strongly disagree) to 5 (Strongly agree)	Janz et al., 1997; Wageman, 1995

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Table 3

*Convergent and Discriminant Validity, and Criterion Validity Analyses: Correlation Results for All Samples (Differential Approach)*

	<i>M</i>	<i>SD</i>	$\alpha$	T-Stg1	T-Stg2	T-Stg3	T-Stg4	I-Stg1	I-Stg2	I-Stg3	I-Stg4
<i>Convergent Validity Analyses</i>											
Relationship Conflict (S1T1)	2.24	1.04	.91	-.13 <sup>+</sup>	.55**	-.11	-.38**	.29**	.60**	.01	-.44**
Team Creative Processes (S1T2)	3.23	0.99	.88	.10	-.19**	.36**	.41**	.02	-.22**	.34**	.49**
Team Tacit Knowledge Sharing (S3)	6.09	0.82	.97	-.14	-.14	.17	.47**	-.35**	-.40**	.14	.50**
Team Knowledge Utilization (S1T2)	3.64	1.00	.92	.13 <sup>+</sup>	-.35**	.31**	.56**	-.15*	-.37**	.22**	.55**
Helping Behaviors in the Team (S2)	6.24	0.78	.87	.08	-.26**	.02	.44**	-.29**	-.30**	-.11	.51**
Trust Between Team Members (S1T1)	3.86	0.94	.90	.15*	-.40**	.31**	.58**	-.15*	-.50**	.16*	.55**
Team Potency (S1T1)	3.78	0.99	.90	.20**	-.36**	.34**	.55**	-.07	-.42**	.21**	.52**
Team Goal Clarity and Commitment (S1T2)	4.07	0.76	.84	.12 <sup>+</sup>	-.28**	.29**	.59**	-.26**	-.39**	.19**	.50**
Task Cohesion (S1T2)	3.86	0.88	.78	.03	-.40**	.17*	.47**	-.29**	-.51**	.10	.41**
Social Cohesion (S1T2)	2.69	1.16	.91	-.02	-.16*	.30**	.28**	.03	-.19**	.34**	.35**
Team Members' Learning in the Team (S3)	5.78	0.63	.89	-.10	-.22 <sup>+</sup>	.46**	.39**	-.11	-.25*	.37**	.42**
Team Members' Level of Vitality (S3)	5.57	0.68	.91	-.16	-.35**	.44**	.42**	-.25*	-.35**	.22 <sup>+</sup>	.43**

Participation in Decision Making (S1T2)	3.49	1.11	.90	-.04	-.16*	.39**	.42**	-.11	-.22**	.28**	.37**
Task Interdependence (S1T2)	3.53	0.84	.65	.11	-.14*	.19**	.17*	-.01	-.05	.15*	.21**
<i>Discriminant Validity Analyses</i>											
Team Member Sex (S1T1)	-	-	-	-.11	.08	.05	-.01	.03	.04	-.04	.03
Team Member Tenure in Team (S1T1)	4.53	4.17	-	.05	-.08	.01	.13 <sup>+</sup>	-.15*	-.16*	-.06	.09
Team Leader Sex (S2)	-	-	-	.01	.06	.11	.12	-.08	-.02	.15 <sup>+</sup>	.09
Team Leader Tenure in Team (S2)	1.67	1.23	-	.09	-.04	.05	.04	.03	-.01	.08	.01
<i>Criterion Validity Analyses</i>											
Team Viability (S1T2)	3.82	0.82	.82	.09	-.34**	.18**	.53**	-.25**	-.40**	.14*	.52**
Team Extra-Role Performance (S2)	5.72	0.88	.87	.05	-.30**	.09	.46**	-.23**	-.27**	-.18*	.54**
Team Reputation (S3)	5.35	1.08	.80	-.26*	-.39**	.17	.40**	-.12	-.31**	.13	.29*

*Note.* Sample 1, Time 1 (S1T1):  $n = 209$  team members; correlations between TDQ at Time 2 (T2) and other variables at Time 1 (T1). Sample 1, Time 2 (S1T2):  $n = 209$  team members; TDQ at Time 1 and other variables at Time 2. Sample 2 (S2):  $n = 152$  team leaders. Sample 3 (S3):  $n = 77$  teams because we could not collect data for other measures in sports teams. T-Stg  $x$  = Task dimension of stage  $x$ ; I-Stg  $x$  = Interpersonal dimension of stage  $x$ . Sex: 0 = Male; 1 = Female. <sup>+</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ .

Table 4

*Convergent and Discriminant Validity, and Criterion Validity Analyses: Multiple Regression Results for Sample 1(Temporal Approach)*

	Team Creative Processes		Team Knowledge Utilization		Team Goal Clarity and Commitment		Task Cohesion		Social Cohesion		Participation in Decision Making		Task Interdependence		Team Viability	
<i>Predictors</i>	Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$		Step 2: $\Delta R^2$	
	$\beta s$		$\beta s$		$\beta s$		$\beta s$		$\beta s$		$\beta s$		$\beta s$		$\beta s$	
T-Stg1 change	.10	.01	.10	.01	.18**	.02**	.22**	.03**	.12	.01	-.05	.01	.02	.01	.22**	.03**
T-Stg2 change	-.05	.01	-.18**	.02**	-.17*	.02*	-.30**	.06**	-.12	.01	-.21**	.03**	-.09	.01	-.20**	.03**
T-Stg3 change	.36**	.08**	.29**	.05**	.14*	.01*	.11	.01	.20*	.02*	.35**	.07**	.13	.01	.24**	.03**
T-Stg4 change	.38**	.10**	.45**	.14**	.41**	.12**	.25**	.04**	.13 <sup>+</sup>	.01 <sup>+</sup>	.39**	.10**	.25**	.04**	.47**	.15**
I-Stg1 change	.05	.01	.10	.01	-.08	.01	-.16*	.02*	-.10	.01	.06	.01	.04	.01	-.05	.01
I-Stg2 change	-.10	.01	-.17**	.02**	-.24**	.04	-.45**	.15**	.03	.01	-.15*	.02*	-.08	.01	-.33**	.08**
I-Stg3 change	.11	.01	.07	.01	.05	.01	.07	.01	-.01	.01	.06	.01	.02	.01	.16*	.02*
I-Stg4 change	.45**	.14**	.42**	.12**	.44**	.13**	.43**	.13**	.11	.01	.51**	.17**	.07	.01	.49**	.16**

*Note.*  $N = 209$ . Criterion data were collected at Time 2. In step 1 we controlled for the eight dimensions of team development measured at Time

1. T-Stg x = Task dimension of stage x; I-Stg x = Interpersonal dimension of stage x. <sup>+</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ .

Table 5

*Criterion Validity Analyses: Task and Interpersonal Dimensions of Each Stage Entered**Together (Multiple Regression - Differential Approach)*

<i>Predictors</i>	Team Viability (S1T2)		Team Extra-Role Performance (S2)		Team Reputation (S3)	
	Step 1: $\beta s$	$\Delta R^2$	Step 1: $\beta s$	$\Delta R^2$	Step 1: $\beta s$	$\Delta R^2$
1 <sup>st</sup> Model:		.08**		.07**		.07 <sup>+</sup>
T-Stg1	.14*		.12		-.25*	
I-Stg1	-.27**		-.26**		-.06	
2 <sup>nd</sup> model		.17**		.10**		.16**
T-Stg2	-.12		-.22**		-.34*	
I-Stg2	-.32**		-.13		-.07	
3 <sup>rd</sup> model		.04*		.06*		.03
T-Stg3	.16 <sup>+</sup>		.17*		.14	
I-Stg3	.07		-.24**		.06	
4 <sup>th</sup> model		.31**		.33**		.16**
T-Stg4	.32**		.24**		.39**	
I-Stg4	.27**		.41**		.01	

*Note.* S1T2: Sample 1;  $n = 209$  team members; Team Development Questionnaire was collected at Time 1 and team viability at Time 2. S2: Sample 2;  $n = 152$  team leaders. S3: Sample 3;  $n = 77$ . T-Stg  $x$  = Task dimension of stage  $x$ ; I-Stg  $x$  = Interpersonal dimension of stage  $x$ . The four regression models are independent. <sup>+</sup>  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ .