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Development and Preliminary Validation of the Teamwork Expectations and Attitudes Measure (TEAM)

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Abstract

Teamwork is essential for success in any group project and understanding how well a team functions can assist both students and teachers with learning. This paper outlines the development and preliminary validation of a new self-report measure of students' perceptions of working in a team, the Teamwork Expectations and Attitudes Measure (TEAM). Two pilot studies, sampling a total of 438 undergraduate students, were conducted to develop and refine the initial items into a 14-item unidimensional measure. A validation study was then conducted with a sample of 226 undergraduate students. A confirmatory factor analysis supported the revealed unidimensional structure with high internal consistency. Correlations between the TEAM and other theoretically relevant variables provide evidence of convergent, discriminant, and criterion validity. Our results suggest that the TEAM has acceptable psychometric properties and may be useful to students, educators, and researchers as a tool for assessing team functioning.

Keywords: teamwork; scale development; TEAM; validation; undergraduate students

Development and Preliminary Validation of the Teamwork Expectations and Attitudes Measure (TEAM)

Teams represent a group of individuals working together towards a common goal, guided by a set of responsibilities (Cohen & Bailey, 1997; Sundstrom et al., 1990). Class-based team activities and projects in educational settings provide students with the opportunity to develop teamwork skills and to navigate the challenges of working with others. By engaging in such activities and projects, students learn through the social context of interacting with their environment and their peers (Adams & Hamm, 1994). However, just because students are placed into groups does not guarantee that they will function effectively as a team. Johnson and colleagues (1991) provided five key elements that must be in place for a group to function as a team. One, teammates need to depend on each other to achieve their goals; if any one teammate fails to complete their part, it brings the whole team down. Two, every teammate is held accountable for doing their share of the workload. Three, although some work may be done on an individual basis, there must be some group interaction whereby tasks are completed as a team with teammates providing constructive feedback and support for one another. Four, teammates have opportunities to work collaboratively to develop and apply the following skills: trust-building, leadership, decision-making, communication, and conflict resolution. Five, the team must cooperatively set group goals, then monitor and adapt their progress so that they can function more effectively. Similar elements were also identified in a qualitative study conducted by Rusticus and Justus (2019), in which they found that successful teams are ones that have good communication, trust, alignment in their goals and motivations, positive group dynamics, and an equitable workload distribution.

Many students find it a positive experience to work with their peers in small groups (Rusticus & Justus, 2019; White et al., 2005). However, some students also hold negative views about working with others and do not want to participate in teamwork (Burdett & Hastie, 2009; Chiriac, 2014; Rusticus & Justus, 2019). If a student develops a negative attitude towards group work, such as through a negative group experience, this tends to affect their perceptions around future group work (Williams et al., 2019). Alternatively, holding a positive attitude towards group work has been linked to improved overall learning (Williams et al., 2006).

While many measures of attitudes towards teamwork or perceptions of team effectiveness have been developed, they differ in terms of their specific focus. Some measures focus on attitudes

towards teamwork generally, without focusing on a specific team; for example, the Beliefs about Groups Scale (Karau & Elsaid, 2009) or the Collective Orientation Scale (Driskell et al., 2010). Other measures focus on teamwork competencies for a specific selection of team members. Examples here include the Teamwork Knowledge, Skill, Ability Test (Stevens & Campion, 1994, 1999) or the Teamwork Competency Test (Aguado et al., 2014). Other measures focus on identifying the roles of teammates, such as the Team Role Self-Perception Inventory (Belbin, 1981). A final group of measures focus on perceptions of the functioning, or effectiveness, of teams; examples here include the Group Attitude Scale (GAS; Evans & Jarvis, 1986) and the Teamwork Scale (French et al., 2016). While our interest is in this latter group of scales, many of these measures focus on health care teams (e.g., TeamSTEPPS Teamwork Attitude Questionnaire; Baker et al., 2010), whereas to our knowledge, similar measures for classroom settings are lacking. Additionally, many of these existing measures are dated (e.g., Evans & Jarvis, 1986; Hartsough & Davis, 1986), have large numbers of items (e.g., Hartsough & Davis, 1986; Loughry et al., 2007; O'Neil et al., 2018), or have had their validity and/or reliability criticized (e.g., O'Neil et al., 2012; Rusticus & Justus, 2019; White et al., 2005). Therefore, we felt there was a gap in the literature in terms of a practical and empirically-based measure of student perceptions of working effectively in a team.

Purpose of the Present Study

In the present study, we sought to develop and preliminarily validate a new self-report measure of students' perceptions of how well their team is functioning. We have called this measure the Teamwork Expectations and Attitudes Measure (TEAM). This scale is intended for use with undergraduate student teams in a classroom setting to assess their perceptions of how well their team is working together to accomplish their team goals. Student perceptions of team functioning could be useful to members of the team, team leaders, instructors, or researchers interested in examining the perceived performance of class-based teams. In this study, we conducted two pilot tests with undergraduate students at a large Western Canadian university to evaluate the quality of the items developed for the TEAM and to refine the scale into a final version. We then conducted a preliminary validation study to provide additional reliability and validity evidence for the TEAM.

Pilot Studies

Methods

Item Development

We used both deductive and inductive reasoning to develop an initial pool of 75 original items for the TEAM. Our deductive approach involved drawing from the themes of Johnson and colleagues (1991) and their five key elements of cooperative learning. Our inductive approach involved drawing from the qualitative themes of Rusticus and Justus (2019) which identified elements that contribute towards successful team functioning. Considering these sources together, our pool of items was based on themes of communication, trust, goals and motivations, group dynamics, and workload distribution, with some items intentionally having similar wording so that the most effective wording could be identified during pilot testing. We ran two pilot studies to evaluate the items and refine the scale into a final version.

Participants

For pilot test one, we recruited a total of 233 students through our university's research pool. Our sample consisted of 50 participants (22%) identifying as male, 180 participants (77%) identifying as female, and 3 participants (1%) identifying as other. Participants' ages ranged from 16 to 51 years with a mean of 22.16 years of age (*SD* = 5.95). Our sample represented a range of years of study: 65 participants (28%) were first year students, 93 (40%) were second year students, 32 (14%) were third year students, and 43 (19%) were fourth year students. Most students were in an arts program (*n* = 162; 78%), followed by 24 (12%) in a STEM program, 12 (6%) in a business program, and 11 (5%) in a health or nursing program.

For the second pilot test, 205 university students were recruited through our university's research pool. Within this sample, 13 participants were removed due to missing data, leaving a total of 192 participants. Our sample consisted of 26 participants (14%) who identified as male, 164 participants (86%) who identified as female, 1 participant (<1%) who identified as non-binary, and 1 participant (<1%) who identified as questioning. Participants ranged in age from 17 to 46 years with a mean age of 22.05 (*SD* = 4.01). Our sample represented a range of years of study: 37 participants (19%) were in their first year, 65 (34%) were in their second year, 46 (24%) were in their third year, 39 (20%) were in their fourth year, and 6 (3%) were in their fifth year or higher. In terms of programs, 150 (78%) were in arts, 3 (2%) were in STEM, 2 (1%) were in business, 9 (5%) were in health or nursing, and 18 (9%) did not indicate their program.

Materials

Pilot test one consisted of a 75-item version of the TEAM. Respondents were asked to "Reflect on a project you are currently working on in a team setting with two or more teammates and indicate your level of agreement with each statement below." Each item was responded to on a 5-point scale: 1 = *strongly disagree* to 5 = *strongly agree*. Participants were also asked to "Briefly describe the project you are currently working on in a team." Pilot test two consisted of a 37-item version of the scale. The instructions and response scale remained the same.

Procedure

All pilot test data was collected via an online survey through Qualtrics. Pilot test one was conducted in the spring of 2019 and pilot test two was conducted in the fall of 2019. In each pilot test, participants provided their consent electronically and then completed the TEAM items, as well as a second scale on the learning environment that was not part of the current study. All data was collected anonymously. Participants received bonus credit for applicable courses as incentive for their participation.

Analysis

For both pilot tests, we conducted a series of item analyses (i.e., means, standard deviations, item-total correlations, item–item correlations) and exploratory factor analyses to examine the quality of each item and determine if the item should be kept, removed, or revised. We conducted the item analyses in SPSS and the factor analyses in Mplus. For the factor analyses we used a weighted least squares estimator (WLSMV) to account for the ordered categorical nature of the data. The number of factors to retain in the model was determined using multiple criteria: statistical fit, scree plot, parallel analysis, and factor loadings (Slocum-Gori & Zumbo, 2011). Model fit was assessed using chi square, the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the Tucker-Lewis index (TLI). Acceptable model fit was deemed to be achieved if chi square was nonsignificant, RMSEA was ≤ .08 (≤ .05 is ideal), SRMR was ≤ .08 (≤ .05 is ideal), and CFI and TLI were ≥ .90 (≥ .95 is ideal; Anunciacao, 2018). Three of these five indicators needed to meet the cut-offs for a conclusion of good statistical fit. We removed items that had factor loadings less than .40 or had cross-loading factor loadings that were .30 or higher on a second factor (Stevens, 1992).

Results

In pilot test one, the outcome of the item analyses and factor analyses was the removal of 38 items, resulting in a 37-item version of the scale. In pilot test two, the results of the factor analysis reduced the 37-item version of the scale to 34-items, as we dropped three items due to low factor loadings. This analysis clearly demonstrated a single factor solution. We then used the results of the item analyses to reduce the number of items in the scale by identifying redundant items that had inter-item correlations of .70 or higher. We decided as a team, based on the wording of the items, which item in the correlated pair to retain and which one to remove. This resulted in a final version of the scale with 14-items representing a single dimension of perceptions of team functioning and performance. The statistical fit indices for this model were as follows: $\chi^2 = 260.10$, $p < .001$; RMSEA = .11; SRMR = .06; CFI = .96; TLI = .96, indicating that three of the five fit indices supported the fit of this model. See Table 1 for the items and factor loadings. Coefficient alpha for this scale was .94.

Validation Study

The goal of the validation study was to confirm the factor structure and reliability of the TEAM and to provide additional construct validity evidence by correlating the TEAM with a set of theoretically relevant variables. To provide evidence of convergent validity, we correlated the TEAM with another measure of attitudes towards teamwork (Group Attitudes Scale; Evans & Jarvis, 1986) and hypothesized a large, positive correlation between these two measures. To provide evidence of criterion validity, we correlated the TEAM to a measure of team satisfaction (Team Satisfaction Scale; Rusticus & Justus, 2019) and a measure of instructional preferences (Instructional Preferences Scale; Baeten et al., 2016). The Instructional Preferences Scale consisted of four dimensions: knowledge construction and cooperative learning (which are both active, student-focused learning preferences) as well as teacher direction and passive learning (which are both passive, teacher-focused learning preferences). We hypothesized that the TEAM would show a large, positive correlation with team satisfaction, a moderate, positive correlation with cooperative learning, a small, positive correlation with knowledge construction, and a small, negative correlation with passive learning. To provide evidence of discriminant validity, we hypothesized that the TEAM would not be related to teacher direction or a measure of socially desirable responding (Reynolds, 1982).

Methods

Participants

We recruited 226 participants through our university's research pool. Our sample had 28 participants identifying as male (12%), 196 participants identifying as female (87%), and 2 participants identifying as other (1%). Participants ranged in age from 17 to 52 with an average age of 22.43 (*SD* = 4.78). Our sample consisted of 52 (23%) first year students, 63 (28%) second year students, 62 (27%) third year students, 46 (20%) fourth year students, 1 (<1%) fifth year student, and 1 (<1%) returning student. In terms of programs: 162 (77.5%) participants were in arts, 24 (11.5%) participants were in STEM, 12 (5.7%) participants were in business, and 11 (5.3%) participants were in health or nursing.

Measure

We used the final version of the TEAM—as finalized in pilot test two—which consisted of 14-items measured on a five-point scale (1 = *strongly disagree* to 5 = *strongly disagree*). A higher score on this measure indicates a more positive perception of one's team and a more successfully functioning team.

The Group Attitudes Scale (GAS; Evans & Jarvis, 1986) is a 20-item measure that is rated on a 5-point scale (*1 = strongly disagree to 5 = strongly agree*). This scale measures the emotions and feelings associated with group dynamics rather than one's behavior within the group, with a higher score indicating a more favourable attitude towards the group. Alpha for this scale was .92.

The Instructional Preferences Scale (IPS; Baeten et al., 2016) is a 40-item measure, with each item rated on a five-point Likert scale (*1 = strongly disagree to 5 = strongly disagree*). The measure is composed of four subscales: (1) knowledge construction (KC; 13 items; $\alpha = .85$), in which a higher score indicates a greater preference for interaction with learning materials via selecting, interpreting, and applying that information, (2) teacher direction (TD; 11 Items; $\alpha = .85$), in which a higher score indicates a greater preference for teachers to provide help on selecting, interpreting, and applying class materials, (3) cooperative learning (CL; 10 items; $\alpha = .89$), in which a higher score indicates a greater preference for cooperative learning with fellow students on class materials, and (4) passive learning (PL; 6 items; $\alpha = .74$), in which a higher score indicates a greater preference for more traditional teacher-based learning (i.e., 3-hour lecture).

The Team Satisfaction Scale (TSS; Rusticus & Justus, 2019) is a 6-item measure that is rated on a five-point scale (*1 = very dissatisfied to 5 = very satisfied*). Higher scores on this measure indicate higher overall satisfaction with the team. Alpha for this scale was .91.

The Marlowe-Crowne social desirability scale (MCSDS; Reynolds, 1982) is a 33-item measure that is rated on a 5-point scale (*1 = strongly disagree to 5 = strongly disagree*). A higher score indicates a greater tendency to respond in a socially desirable manner. Alpha for this scale was .78.

Procedure

All data was collected anonymously online through Qualtrics in the spring of 2020. After viewing an electronic consent form and providing their consent, participants were given access to the study materials. All partcipants completed the scales in the same order: TEAM, GAS, MCSDS, IPS, and TSS. Following this, they completed a set of demographics questions querying their age, sex, year of study, and program. Participants received bonus credit for applicable courses as incentive for their participation.

Results

First, we sought to confirm the single dimension factor structure of the TEAM, as identified in the second pilot test. We conducted a confirmatory factor analysis (CFA) in Mplus using a weighted least squares estimator (WLSMV) to account for the ordered categorical nature of the data. Model fit was assessed using the same statistical criteria as in the pilot studies. The statistical fit indices for our model were as follows: $\chi^2 = 334.54$, $p < .001$; RMSEA = .12; SRMR = .05; CFI = .95; TLI = .94, indicating that three of the five fit indices supported model fit. Coefficient alpha for the scale was .93. See Table 1 for factor loadings and Table 2 for means and standard deviations for each of the TEAM items.

We then conducted a correlational analysis to assess the convergent, criterion, and discriminant validity of the TEAM. Convergent evidence was provided by correlating the TEAM with the GAS. Criterion evidence was provided by correlating the TEAM with the TSS and the IPS subscales. Discriminant evidence was provided by correlating the TEAM with social desirability. As seen in Table 3, consistent with our hypotheses, the TEAM had a large positive correlation with both the GAS and TSS. Also consistent with our hypotheses, the TEAM had a moderate positive correlation with the CL subscale and a small positive correlation with the KC subscale of the IPS. Also, as predicted, the TEAM was not significantly associated with a measure

of socially desirable responding. Contrary to our hypotheses, the TEAM demonstrated small positive correlations with the TD and PL subscales of the IPS.

Overall Discussion

In this study, we reported the development and preliminary validation of the TEAM, a 14-item measure of students' perceptions of working effectively in a classroom-based team. Our results suggest that the TEAM has acceptable psychometric properties, with evidence provided for three of the five sources of validity evidence proposed by the Standard for Educational and Psychological Testing: evidence related to content, internal structure, and relations to other variables (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014).

Regarding content validity and internal consistency, we based the development of items for the TEAM on elements identified in previous research as important to successful team functioning: communication, trust and accountability, goals and motivations, group dynamics and workload distribution (Johnson et al., 1991; Rusticus & Justus, 2019). The final single dimension of the TEAM is consistent with Ubillos and colleagues (2004) recommendation who have noted that the measurement of attitudes can be represented by one, two, or three dimensions that vary in terms of affective, cognitive or behavioural elements (as cited in Mendo-Lázaro et al., 2017). The items in the TEAM represent behaviours related to successful team functioning.

In looking at evidence related to the relationship of the TEAM with other theoretically relevant variables, nearly all our hypotheses were supported. As predicted, the TEAM had strong positive correlations with another measure of attitudes toward teamwork and with a measure of team satisfaction. The TEAM had a moderate positive correlation with a measure of preference for cooperative learning, which is a student-centered instructional technique which focuses on a preference for working with others. The correlations between the TEAM and the other three instructional preferences were all small and positive. As the cooperative learning instructional preference was the most directly related to working with others, the stronger correlation between this subscale and the TEAM provides support for the validity of the TEAM as a measure of attitudes towards working in a team. Additionally, the smaller correlations between the TEAM and the other three instructional preferences scales, in comparison to the cooperative learning scale, provides evidence of discriminant validity for the TEAM. Finally, additional discriminant validity evidence was provided through the lack of correlation between the TEAM and a measure of

socially desirable responding. Taken together, our results provide support for the TEAM to be used as a measure of attitudes towards effective teamwork.

Aside from the overall total score, examining the individual items of the TEAM can be beneficial to team members, team leaders, or instructors as it can indicate areas of strengths or weaknesses within a team. While our data is presented for our sample as a whole, it is still interesting to note that the lowest rated items centered on the distribution of workloads within a team and the highest rated items reflected respect and appreciation among team members and an ability to work towards a common goal. Using this information at a team level during the course of a project may help to identify, for example, instances of social loafing among group members which could then potentially be addressed. Social loafing, which is common when students work in teams, develops as lowered motivation and effort by some team members during a team project results in other students have to pick up the slack (Karau & Williams, 1993). Social loafing creates impressions of unfair workloads among team members and can lead to dissatisfaction with a project, course, or team-based projects generally (Aggarwal & O-Brien, 2008; Williams et al., 2019). Being able to identify and address problems within a team can help foster a more positive learning environment, group work experience, and better learning outcomes (Williams et al., 2006).

There are three key limitations of this study that need to be mentioned. One, the development and validation of this tool was conducted at a single Canadian university among students who were taking psychology as a major or as an elective course, this may impact the generalizability of these findings. Future research may want to replicate these findings at other universities or in other contexts, such as a cohort-based program. There is also the additional possibility that some students took part in multiple stages of this study. As the study was administered anonymously, we are unable to determine the proportion of students who participated in more than one stage of this study. Two, the TEAM is a self-report measure based on student's perceptions of teamwork, this may not accurately reflect the actual behaviours that occurred within the team setting. Future research could examine the link between teamwork attitude and actual team performance (e.g., grades or performance reviews). Three, as this is a new measure, additional validity and reliability evidence is needed for the TEAM.

Overall, the TEAM is a 14-item measure of students' perceptions of working in a team and is intended to be used in undergraduate student team settings; although it has the potential to be

used in other contexts as well, such as in high school or work-based teams. Students and instructors may find it useful to gauge the functioning of a team and researchers may be interested in using the measure to examine perceptions of teamwork more broadly. Specifically, this scale would be particularly useful in the middle of a team-based school project as a diagnostic tool to identify potential problems within team dynamics. Exploring the functioning of a team can aid in the understanding of the dynamics of groupwork processes and may be useful for professional development in classrooms or for appraisals of the learning environment. As teamwork is an essential skill for employment (The Conference Board of Canada, 2018), the development of constructive teamwork attitudes is needed within education and the TEAM may be useful in identifying areas of strengths or weaknesses in regards to group functioning.

Tables

Table 1

Items and Factor Loadings for the Team Expectations and Attitudes Measure for Pilot Study Two and the Validation Study

Items	Pilot Study Two Factor Loadings	Validation Study Factor Loadings
1. I trust that my team is putting in their best effort	.78	.82
2. My team is able to set realistic goals	.87	.79
3. I feel that I have a fair share of the workload	.74	.71
4. Everyone on my team does their share of the workload	.82	.77
5. My team is able to meet their goals by the deadlines	.77	.72
6. My team communicates respectfully with one another	.78	.73
7. My team is working towards a common goal for our project	.73	.83
8. I trust my team will openly communicate when issues arise	.77	.82
9. My teammates respond well to constructive feedback	.82	.78
10. My team is able to complete assigned tasks	.86	.85
11. My team evenly distributes the workload	.76	.82
12. My team resolves conflict effectively	.83	.73
13. My contributions to the team are appreciated	.75	.58
14. My teammates will assist each other to finish their tasks	.87	.76

Table 2

Means and Standard Deviations for Each Item in the TEAM

Items	*M*	*SD*
1. I trust that my team is putting in their best effort	3.56	1.20
2. My team is able to set realistic goals	3.93	1.06
3. I feel that I have a fair share of the workload	3.68	1.32
4. Everyone on my team does their share of the workload	3.28	1.35
5. My team is able to meet their goals by the deadlines	3.98	1.12
6. My team communicates respectfully with one another	4.30	0.98
7. My team is working towards a common goal for our project	4.27	0.94
8. I trust my team will openly communicate when issues arise	3.85	1.16
9. My teammates respond well to constructive feedback	3.74	1.09
10. My team is able to complete assigned tasks	3.97	1.13
11. My team evenly distributes the workload	3.45	1.37
12. My team resolves conflict effectively	3.77	1.11
13. My contributions to the team are appreciated	4.13	0.92
14. My teammates will assist each other to finish their tasks	3.96	1.06

Table 3

Means and Standard Deviations for Each Measure in the Validation Study and Correlations of Each Measure to the TEAM

	M	***SD***	**Correlation with the TEAM**
Team Expectations and Attitudes Measure	3.85	0.82	-
Group Attitudes Scale	3.61	0.78	.78***
Team Satisfaction Scale	3.69	0.91	.78***
Instructional Preferences Scale			
Cooperative learning	3.42	0.82	.46***
Knowledge construction	3.40	0.59	.18**
Teacher direction	3.99	0.61	.12
Passive learning	2.62	0.79	.18**
Social desirability	1.44	0.90	-.07

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

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