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Team Success: A Mixed Methods Approach to Evaluating Virtual Team Leadership Behaviors

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Abstract: The virtuality of organizational teams have gained interest and popularity in recent years, and have become more prevalent amidst the COVID-19 pandemic. Organizational productivity and team relationship-building may suffer certain pitfalls in virtual communication and support without the understanding of the dynamics of short-term, project-based virtual teams. The manuscript aimed to expand what is currently known about short-term virtual team dynamics related to types of effective leadership behaviors. The present study employed a mixed method approach to understanding the dynamics of these teams at both the individual and team level. Small teams were formed and instructed to collaborate on a virtual survival task. Team-related outcomes were measured at the individual level, such as team coordination, team support, and team success. Additionally, distinct latent profiles of leadership behaviors were developed and analyzed at the team level. Team support, more so than team coordination, significantly predicted team success at the individual level, with instrumental support having the strongest effect. Distinct leadership behaviors emerged in teams and were classified through a latent profile analysis, but none of the profiles were significantly related to team performance scores. Demonstrating instrumental support in short-term virtual teams may improve team success. It is important to understand that distinct leadership behaviors exist and future research should explore the impact of these leadership behaviors on other team-related outcomes.

Keywords: team support; team coordination; team success; team performance; mixed methods; leadership behaviors; structural equation model; latent profile analysis

1. Introduction

Team success has been a focal topic in organizational psychology largely due to the complexity of team-based work design and the rapid evolution of frameworks and research methods [1–3]. Virtualization and decentralization have produced immediate impacts on team success and related topics such as leadership and communication [4,5]. To ensure the relevance and efficacy of team success research, there have been calls for continuous reexaminations of existing findings in the context of virtuality and team development (e.g., [6,7]). The study aims to examine the key elements of team success and team performance specific to short-term virtual teams. Leadership behaviors that facilitated team success and team performance were also examined in the context of short-term virtual teams. First, we evaluated team success and team performance in a short-term team activity conducted virtually to identify key factors that catalyze team success and team performance. Second, we conducted an exploratory analysis of leadership profiles by using qualitative data at the team level to identify key leadership behaviors that facilitate team success and performance. In the following sections, we provide an overview of key concepts relevant to our study: short-term virtual teams, team success, team support, team coordination and shared leadership.

1.1. Short-Term Virtual (STV) Teams

To better understand the specific team environment that we aim to examine, the current literature on short-term virtual (STV) teams is collated to provide context as to the specific generalizability of the paper. We adopt the philosophy that most organizational teams fall on a spectrum of virtuality rather than a mutually exclusive categorization of virtual or face-to-face (e.g., [6]). An in-depth discussion of virtual teams is beyond the scope of this paper; however, communication behaviors in virtual teams are of particular interest in this study due to the heightened influence of time, space, and technology on interaction cues and context [8–10]. Beyond virtuality, we focus on the dynamics of short-term teams, which are often assembled to complete a complex project within a limited amount of time [11]. Short-term teams, sometimes referred to as project teams, can be characterized as work groups that do not have prior experience working together nor expectations to work together beyond a given project [4]. For example, a task force could be created to determine alternative go-to-market strategies due to regulatory changes. This task force may bring together employees from finance, sales, operations, and marketing to direct part of their time to developing solutions and mitigating obstacles. This group would likely have a set end date by which their solutions are to be implemented, at which point, they would knowingly disband.

Despite the historical prevalence of short-term teams in practice [12], research is sparse and lacking a comprehensive narrative [13]. Evidence suggests short-term teams lack traditional components of team development, such as time to build relationships and establish role expectations [14,15]. Additionally, short-term teams may have a higher degree of self-management compared to ongoing teams due to the complexity and urgency of projects [16] and the presence of shared leadership (discussed later). These structural and contextual constraints likely contribute to the employment of swift trust, which is built through actions rather than relationships. Swift trust appears to be less strong and enduring when compared to trust built over time via social interactions. In highly virtualized environments, swift trust acts as a flywheel for performance by enabling action, which requires team member communication, which subsequently contributes to building more trust. This is critical to short-term virtual teams as they are subject to more uncertainty, vulnerability, and misaligned expectations [4,17].

1.2. Team Success, Team Performance, and Team Support and Coordination

To contextualize metrics of success and existing concepts related to team success, team performance, and team support and coordination specific to this study, the current literature is summarized. Conceptualizations of team success are as extensive as the various criterion of interest [3]. Despite the contextual complexity of a team's research [2], there is general agreement upon variations of an input-process-output (IPO) framework of team success that accounts for temporal factors (i.e., development processes, episodic cycles [3]). Inputs such as support from team members and team coordination have been positively related to outcomes such as team satisfaction, performance, and motivation (e.g., [5,10,18]). Potential issues specific to virtuality have been identified in the socio-emotional and task processes of teams [10]. Drawing on this research, we aimed to explore the influence of team support (a socio-emotional process) and team coordination (a task process) on team success and performance.

First, team support behaviors are thought to extend beyond an individual trait altruism (making them permeable to contextual influences) and have been categorized based on four characteristics [18,19]. Emotional team support refers to sympathetic understanding and encouragement. Informational team support refers to willingness to exchange work-related knowledge. Instrumental team support refers to tangible assistance to team members when they are in need. Finally, appraisal team support refers to help in the form of team member problem-solving. These theoretical foundations and context-specific empirical findings form the basis of our first hypothesis.

Hypothesis 1: *Team support is positively related to team success in short-term virtual (STV) teams.*

Next, meta-analytic findings from Castelao et al. (2013) [20] characterize team coordination via three mechanisms: (1) planning (i.e., organization of tasks), (2) communication (i.e., flow of information and knowledge, and (3) leadership (i.e., management of task complexity and action). These coordination mechanisms are likely reciprocal and reinforcing, as evidenced by findings that specific communication behaviors have enhanced effects on team performance via team coordination [5]. The uncertain environment of short-term virtual teams may necessitate a high degree of transactive memory [21,22], which is a construct for the relationships that link knowledge systems between the individual and the group [23]. Transactive memory is relevant to this study, as it has been linked to job performance and job satisfaction [24]. We formulated our second hypothesis based on the role of team coordination as a mediator.

Hypothesis 2: *Team coordination mediates the relationship between team support and team success in short-term virtual (STV) teams.*

1.3. Shared Leadership

To gain a better understanding of the existing types of leadership that will contribute to the dynamics of short-term virtual teams, the existing literature on leadership factors contributing to team success is summarized. Similar to team success, there is a considerable body of leadership research, which can be summarized by theoretical subcategories: trait-based leadership, contingency leadership, and behavioral leadership [25]. Trait-based leadership theories suggest that leaders are individuals who possess a range of stable characteristics that foster effective leadership [26]. Contingency leadership theories posit that leader effectiveness depends on alignment between situational circumstances and the style of the leader [27]. Finally, behavioral leadership theories are primarily focused on the observable actions of leaders [28]. These theories have been expanded to include many behavioral models of leadership, such as transactional and transformational leadership [29,30].

Leadership processes are a prominent component to team success and are especially relevant in uncertain or unstable environments, such as those of short-term virtual teams [10,31]. Research has commonly focused on traditional leadership (characterized by a single, formal leader [32]). Measuring leadership in short-term teams may be more difficult due to the presence and degree of shared leadership [31]. Shared leadership is the mutual influence of team members over the team's decision-making and processes [33]. Wang et al.'s (2014) meta-analysis [31] offered promising results which demonstrated that leadership has an incremental and positive relationship with team effectiveness compared to traditional leadership. Additionally, the authors suggested that the degree of "sharedness" in leadership practices appears to be less important than the content of shared leadership (i.e., transactional, charismatic, transformational behaviors). Despite the overall dearth of research on short-term teams, leadership behavior has been cited as one of the most common research streams in the existing literature, particularly transactional and transformational [13].

Virtuality challenges leaders to find novel approaches to communication due to the lack of non-verbal cues and the presence of time delays [25,34]. Extant research suggests that leader affect is a salient determinant of team success inputs (e.g., trust [35]) and outcomes such as goal commitment [1] and cooperation [14]. Thus, demonstrating positive affect may be one potential communication solution for leaders of short-term virtual teams. The present study adopted a behavioral theory of leadership and aimed to identify patterns of leadership behaviors that influence team success in short-term virtual teams.

Exploratory Hypothesis: *Leadership behaviors have an impact on team support, team coordination and, in turn, the success of the short-term virtual (STV) team.*

The present study addresses the complexity of measurement in teams by using a mixed methods approach. Collecting and integrating qualitative and quantitative data is thought to form a more comprehensive analysis of a phenomenon [36] and also allow researchers uncover complex relationships [37]. Mixed method designs can also expose inconsistencies and contradictions in the data, further validating findings that are consistent across methods [38]. The present study uses quantitative analysis at the individual level and qualitative analysis at the team level, creating a mixed methods and multilevel approach.

2. Materials and Methods

This study used a mixed methods approach to investigate the relationship between team behaviors and perceptions of team success. Quantitative data, shown in Section 2.3 below, was collected from individuals using a self-report survey and qualitative data was collected from transcribed recordings of the virtual team activity, described in Section 2.2, below.

2.1. Participants

Incomplete data from two participants allowed 200 undergraduate students from a Western University in our study, who received course credit in exchange for participation. The sample consisted of 110 males (55%), with an average age of $M = 19$ years ($SD = 2$). The majority of participants reported their ethnicity as Caucasian (150, 75%), followed by 28 Hispanic (14%), 9 Asian (4.5%), 7 Black (3.5%), and 6 Other (3%).

2.2. Procedures

In the study, participants completed a consent form and were randomly assigned into teams of three or four. Teams completed the 20 min virtual team activity, which involved a problem-solving scenario described below. Participants then completed a survey of the measures described below. In total, the study took approximately 45 min to complete.

Virtual Team Activity

For the STV team activity, individuals were placed in separate rooms but were remotely connected via Skype so they could hear each other through a headset and access a shared document used for the activity. The STV team activity involved a survival scenario where participants were told to imagine their STV team was stranded on a lifeboat in the middle of the Atlantic Ocean with only 15 items to aid their survival. Their problem-solving task was to rank the items in order of importance for survival. Each STV team member first reviewed the items individually and submitted their individual rankings. For the STV team portion of the activity, STV teams had to discuss and come to a consensus as a group on the rankings of their items. Final scores were provided to STV teams by comparing their final rankings to those from subject matter experts in the U.S. Coast Guard.

2.3. Measures

Unless otherwise stated, all scales used a 5-point Likert type scale from 1 = strongly disagree to 5 = strongly agree.

2.3.1. Demographics

Participants were asked to report age, gender, and ethnicity.

2.3.2. Team Support

Team support are helping behaviors between team members [39]. The Team Support scale from Drach-Zahavy and Somech (2002) [14] was used, which has three subscales with four items each (i.e., emotional support $a = 0.76$, informational support $a = 0.85$, and instrumental support $a = 0.90$). The subscale appraisal support (i.e., two items), was

dropped because it could not be analyzed as an independent subscale with fewer than three items. For two items, the wording was slightly adjusted to reference an activity such as, "There were real attempts to share information throughout the activity".

2.3.3. Team Coordination

Team coordination is the organization and management of tasks during a team procedure to assist in achieving team performance [20]. Team coordination was measured using the five-item Coordination subscale from the Transactive Memory Systems scale [21], $a = 0.74$. An example item includes, "Our team worked together in a well-coordinated fashion".

2.3.4. Team Success

Team success is a team's capacity to achieve the goals administered by an authorized source [1]. Team success was measured using a single-item self-report question written for this study, "Overall, my team was effective in the activity".

2.3.5. Team Performance

Team performance was how well a team performed on the given task. Specifically, this was how well the team agreed upon the final rankings. Team performance was evaluated using the final rankings the team agreed on in the activity. By comparing the team's rankings to those from subject matter experts, a percentage score from 0 to 100 was assigned to each group. Since the team had to discuss and agree on their answers for the final team rankings, only one score was given per team, making this a team-level measure.

2.4. Qualitative Data

Qualitative data was collected using the audio recordings from the team activity, which were transcribed, reviewed, and coded by two independent raters using a behavioral checklist described below. Raters first made ratings independently then met to discuss ratings until a consensus was reached.

Behavioral Checklist

A behavioral checklist was created to identify leadership behaviors demonstrated during the team activity. The Generalized Opinion Leadership Scale (GOLS), which consists of five factors (i.e., gatekeeping, influencing, legitimizing, advice-giving, and harmonizing [40]), was used to create a framework for the types of leadership behaviors that could be displayed during the activity. The GOLS framework is based on the concept of opinion leaders who were described in early research as, "...people who exerted a disproportionately great influence on the...intentions of their fellows." [41]. In this early research, the term opinion leader was used to reference those who had influence over others voting habits, but has more recently been used to discuss individuals (not necessarily those in positions of legitimate power [42]) who have influence over the ideas and behaviors of others [40]. Qualitative content analysis [43] was used to review the transcripts of the team activities, identify relevant behaviors, and create identifying labels for those behaviors. Eight leadership behaviors were identified that mapped onto the GOLS framework, see Table 1. Scores were generated as a count of the number of times a behavior was displayed by any team member during the team activity. Thus, each behavior produced a score at the team level that was a count of the number of times each behavior occurred by that team during the team activity. This data was also used to identify leadership types that emerged in the team. Teams were coded as single leader (i.e., an individual took primary control over the group), dual leaders (i.e., two individuals equally displayed leadership behaviors), or shared leadership (i.e., individuals shared leadership or had no clear leader).

Table 1. Descriptives for behavioral checklist items mapped onto the GOLS factors.

Generalized Opinion Leadership Scale	M	SD	Range	Behavioral Checklist	
Gatekeeping [1]	5.46	5.13	0–16	Elicited Input	Asked questions and sought opinions and input from others.
				Informative Review	Verbally reviewed team progress to confirm all team members had the same information.
Legitimizing [2]	8.55	4.15	1–23	Directed Action	Verbally declared information to direct the actions of other team members in a specific direction.
Harmonizing [3]	3.51	2.58	0–12	Sought Agreement	Asked questions to confirm agreement from other team members on decisions.
				Showed Agreement	Expressed agreement or consensus with an idea put forth by another team member.
Influencing [4]	2.74	1.86	0–12	Used Humor	Used a joke or humor to generate rapport with team members.
				Initiated Dialogue	Spoke up and initiated dialogue within the team, particularly after a period of silence.
Advice-Giving [5]	7.52	2.14	1–21	Voiced Opinion	Asserted opinion and gave brief reasoning for their own perspective.

Note. Mean, standard deviation, and range of counts for group level behaviors displayed during the virtual team activity. [1] Filter information and determine which aspects are important to pass onto others. [2] Validate the opinions and actions of others while acting as a trustworthy role model. [3] Mediate between team members working towards team harmony. [4] Guide or shape the attitudes and beliefs of others. [5] Present confidence and knowledge while guiding others' actions.

3. Results

The current dataset is available in the Supplementary Materials and included teams with three and four members. Comparisons showed no systematic differences based on team size, $F(1, 197) = 1.09$, $p = 0.30$; where teams of three were $M = 3.80$, $SD = 0.85$ and teams of four were $M = 3.96$, $SD = 0.83$ on team effectiveness scores.

Prior to testing our hypotheses, we reviewed the relationships between study variables, see Table 2. The means, standard deviations, and intraclass correlations for the study variables are also provided. As expected, the three subfactors of team support were all positively and significantly correlated with one another where emotional support was related to both informational support $r = 0.71$, $p < 0.01$ and instrumental support $r = 0.71$, $p < 0.01$, and information and instrumental support were related to one another $r = 0.79$, $p < 0.01$. Similarly, the subscales of team support were positively and significantly related to team coordination (i.e., emotional support, $r = 0.57$, $p < 0.01$; informational support, $r = 0.53$, $p < 0.01$; and instrumental support $r = 0.50$, $p < 0.01$). We further evaluated the relationships between team support and team coordination with team success. Both measures were significantly related to team success; emotional support, $r = 0.44$, $p < 0.01$; informational support $r = 0.46$, $p < 0.01$; instrumental support, $r = 0.54$, $p < 0.01$; and team coordination $r = 0.44$, $p < 0.01$. Because team performance was measured at the team level, it was only used in analyses with the qualitative data, which were also measured at the team level.

Table 2. Means, standard deviations, intraclass correlations, and correlation coefficients for study variables.

		M	**SD**	**ICC**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Age	19.26	2.04	–	–						
2	Sex at Birth	0.56	0.51	–	0.21 **	–					
3	Emotional Support	3.97	0.60	0.44 ***	−0.07	−0.01	**0.76**				
4	Informational Support	4.03	0.59	0.58 ***	−0.03	−0.01	0.71 **	**0.85**			
5	Instrumental Support	4.04	0.58	0.70 ***	−0.13	−0.05	0.71 **	0.79 **	**0.90**		
6	Team Coordination	3.99	0.60	0.36 ***	−0.09	0.01	0.57 **	0.53 **	0.50 **	**0.74**	
7	Team Success	4.02	0.74	–	−0.10	−0.09	0.44 **	0.46 **	0.54 **	0.44 **	

** $p < 0.01$, *** $p < 0.001$. Note. Sex: 0 = female, 1 = male. Reliability estimates are provided in bold across the diagonal. Team success was a single item-measure with no reliability estimate.

We used Mplus version 8 [44] to test a structural equation model of the proposed hypotheses. We used maximum likelihood estimation to estimate the model fit indices following fit statistic recommendations from Hu and Bentler (1998) [45]: Root Mean Square Error of Approximation (RMSEA) <0.08 indicating adequate fit, Standardized Root Mean Square Residual (SRMR) <0.08 indicating good fit. We also considered Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) with >0.90 indicating acceptable fit. In all of our models described below, the data was clustered by team to account for the lack of independence between team member responses. We tested a measurement model with all scale items loading onto their respective factors, for emotional support (factor loadings λ = 0.87, 0.87, 0.59, and 0.43), informational support (factor loadings λ = 0.70, 0.75, 0.80, and 0.80), instrumental support (factor loadings λ = 0.82, 0.81, 0.89, and 0.84), and team coordination (factor loadings λ = 0.82, 0.56, 0.80, 0.59, and 0.28). The measurement model demonstrated good fit ($\chi^2(113)$ = 177.970, $p < 0.001$, RMSEA = 0.05 [0.04, 0.07], p = 0.33; CFI = 0.94; TLI = 0.93; SRMR = 0.05).

3.1. Hypothesis Testing

Our first hypothesis stated that all three levels of team support would have a significant direct effect on team success. We tested a model with all three types of team support and team coordination having a direct effect on team success. This model demonstrated good fit ($\chi^2 (126)$ = 198.05, $p < 0.001$, RMSEA = 0.05 [0.04, 0.07], p = 0.33; CFI = 0.94; TLI = 0.92; SRMR = 0.05). In this model only instrumental support explained a significant portion of the variance in team success, B = 1.05, SE = 0.34, p = 0.002, 95%CI = 0.377, 1.72, see Figure 1. The correlations between latent variables from this model are shown in Table 3. We reran this model restricting the sample to only teams with four members (i.e., dropping all samples from teams of only three members). This model demonstrated good fit, ($\chi^2 (126)$ = 192.75, $p < 0.001$, RMSEA = 0.06 [0.04, 0.07], p = 0.24; CFI = 0.94; TLI = 0.92; SRMR = 0.05). In favor of using the simplest model with good fit, we stayed with our initial model examining a data set with all teams regardless of team size.

Table 3. Correlations between latent study variables in final structural equation model.

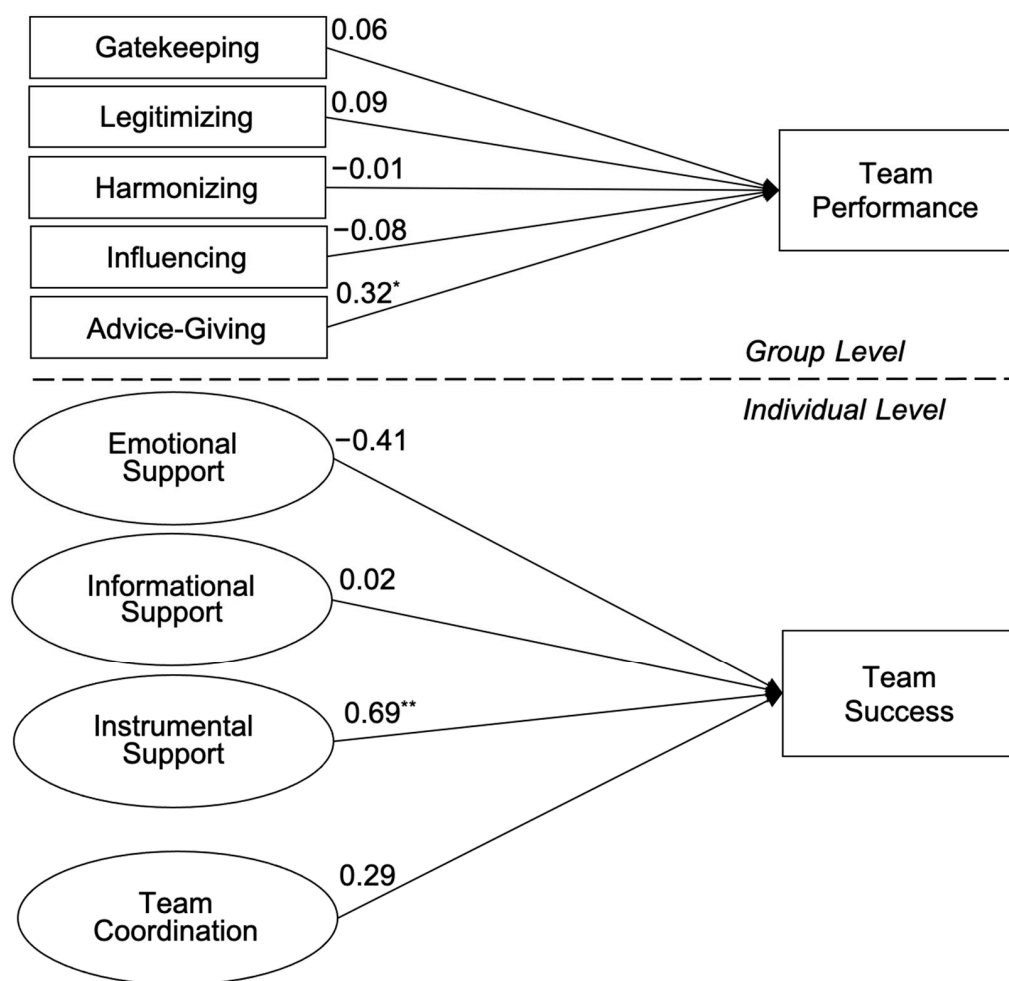|		**1**	**2**	**3**
1	Emotional Support			
2	Informational Support	0.89 ***		
3	Instrumental Support	0.88 ***	0.89 ***	
4	Team Coordination	0.81 ***	0.71 ***	0.68 ***

*** $p < 0.001$.

Figure 1. Standardized regression coefficients predicting team effectiveness and performance. * $p < 0.05$, ** $p < 0.01$.

Our second hypothesis stated that team coordination would explain a significant portion of the variance in the relationship between team support and team success. We did not test this model, considering no direct effect was found between team coordination and team success in the previous model, meaning team coordination could not mediate the relationship without first having a direct effect. Thus, hypothesis 2 was not tested and could not be supported.

Figure 1 demonstrates our final model with team support and team coordination having a direct effect on team success where that relationship is only significant for the subfactor instrumental support. To ensure this is the best fitting model, we ran a simpler comparison model where all items of support loaded onto a general factor of team support rather than loading onto separate factors. This model had poor fit, (χ^2 (133) = 252.50, $p < 0.001$, *RMSEA* = 0.07 [0.05, 0.08], $p = 0.02$; *CFI* = 0.90; *TLI* = 0.88; *SRMR* = 0.06). This demonstrates that our model, using subfactor measures for team support, is a better fitting model than a simpler model using a general factor of team support.

3.2. Exploratory Analysis

Our exploratory analyses reviewed data collected at the group level. We were primarily interested in the leadership behaviors that were demonstrated during the team activity and the impact these may have had on team performance. The leadership behaviors demonstrated during the team activity are summarized in Table 1. There was a range in behaviors expressed by groups, with some behaviors occurring more frequently (e.g., Advice-Giving $M = 7.52$, $SD = 2.14$) than other behaviors (e.g., Influencing $M = 2.74$,

SD = 1.86). Our first step was to examine if any of the leadership behaviors predicted team performance. Results showed that one behavior, Advice-Giving (i.e., Voiced Opinions), predicted team performance, $B = 0.16$, $SE = 0.06$, $p = 0.02$, $95\%CI = 0.03, 0.28$, see Figure 1.

A final step in our exploratory analysis was to identify differences in the leadership behaviors demonstrated by the teams. We believe there are latent profiles demonstrating leadership behaviors for these teams. We proposed a latent construct that represents these behaviors. We used latent profile analysis (LPA) to identify homogeneous categories of teams based on the demonstrated leadership behaviors with the goal of identifying profiles with probabilities each behavior belongs to that profile. With these profiles we wish to identify the level of team performance achieved by teams in each latent profile. We first ran several models to determine the number of latent profiles. Table 4 compares one-profile through five-profile models. Based on these values, we could have chosen either a three-profile or four-profile solution. An examination of an elbow plot in Figure 2 indicated a three-profile solution may be better. Further, when evaluating the four-profile solution, two of the profiles were identical, and this led us to choose the more parsimonious three-profile solution. Figure 3 shows the count of each leadership behavior as it is relevant in each profile. This enables identification of the profile characteristics described below. We used an f-test to compare the team performance scores for each profile and found no significant difference in team performance between the three profiles, see Table 5.

Table 4. Latent Profile Analysis (LPA) results to determine the number of profiles.

	Number of Profiles			
	1	**2**	**3**	**4**
Loglikelihood	74.19	79.85	90.93	90.93
Number of parameters	10	16	22	28
BIC	−106.05	−91.96	−88.71	−63.31
Adjusted BIC	−137.54	−142.35	−158.00	−151.49
AIC	−128.39	−127.70	−137.86	−125.86
Vuong-Lo-Mendell-Rubin LRT (k − 1) *p*	–	0.64	0.05	0.02
Lo-Mendell-Rubin Adjusted LRT (k − 1) *p*	–	0.65	0.05	0.02
Bootstrapped Likelihood Ratio (k − 1) *p*	–	0.50	0.01	0.19
Entropy	–	11.32	22.84	22.84

Table 5. Summary of the three-profile LPA model.

	Profile 1	**Profile 2**	**Profile 3**
N	5	57	7
Number of Leaders			
Single leader	2	37	1
Dual leaders	1	7	3
Shared leadership	2	13	3
Team Performance			
M	0.45	0.46	0.50
SD	0.05	0.09	0.15

Note. Team Performance was statistically the same between the three profiles $F(2, 67) = 0.54$, $p = 0.58$, $R^2 = 0.017$.
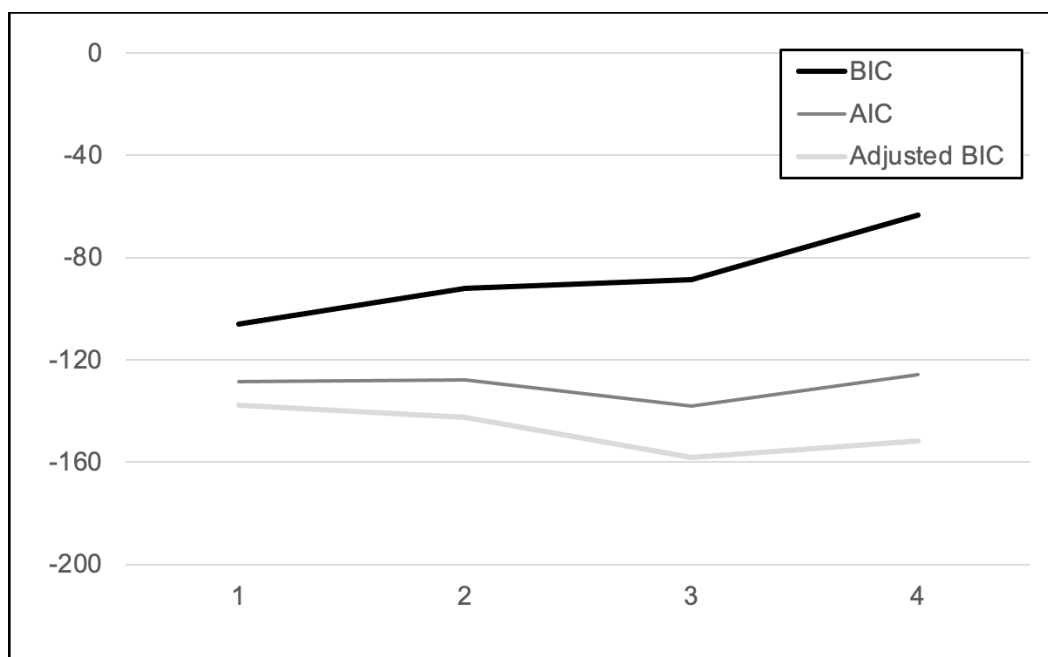
Figure 2. Elbow plot of group level profile solutions determining the number of latent profiles.
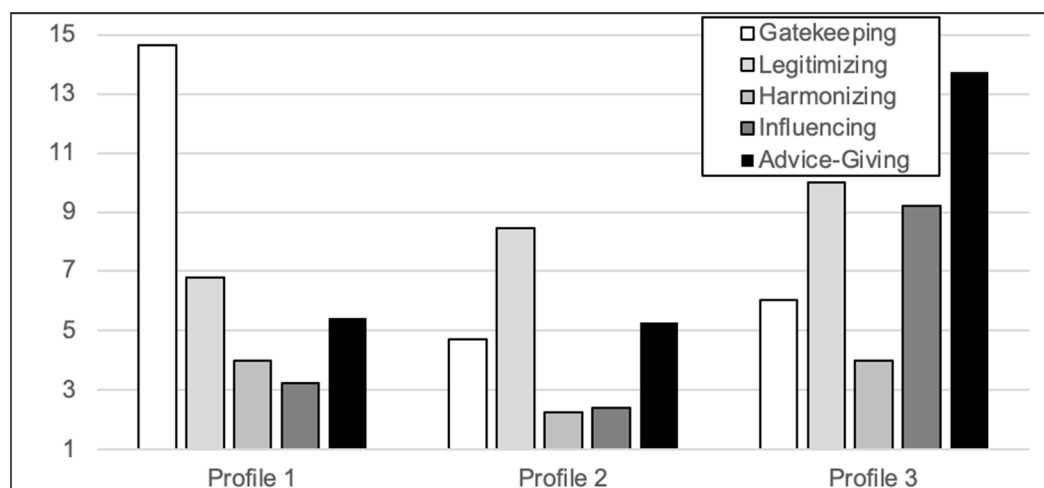

Figure 3. Average number of times each behavior occurred in each profile for the three-profile solution.

3.2.1. Profile 1—Unfocused Leadership

There were five teams that fit best into Profile 1, where teams demonstrated predominantly Gatekeeping behaviors, followed distantly by the other behaviors. Teams in this profile demonstrated leadership behaviors principally through filtering information to determine what was important enough to focus on as a group. This is the only profile that heavily relied upon eliciting input from teammates and engaging in periodic informative review of progress on the task. There was no consistent pattern of single, dual, or shared leadership in Profile 1. Teams in Profile 1 scored the lowest among the three profiles, with an average Team Performance score of $M = 0.45$. This low average score, in combination with a strong tendency of teammates to spend time asking each other for their input instead of finalizing decisions, is why we are labeling Profile 1 as Unfocused Leadership.

3.2.2. Profile 2—Conventional Leadership

Profile 2, which made up the majority of teams, displayed a generally balanced utilization of leadership behaviors. Teams in this profile used Legitimizing slightly more than the other leadership behaviors, followed by Gatekeeping and Advice-Giving. This categorizes Profile 2 teams as those who displayed leadership by directing the actions of their teammates and sharing their opinions freely. Teams in Profile 2 typically used a single leader structure ($n = 37$), occasionally were leaderless ($n = 13$), and infrequently had dual leaders ($n = 7$). Due to the balanced distribution of leadership behaviors, heavy reliance on single leadership, and mid-range performance, we are labeling Profile 2 as Conventional Leadership.

3.2.3. Profile 3—Collaborative Leadership

Teams in Profile 3 had the highest average Team Performance scores ($M = 0.50$, $SD = 0.15$), although this performance average was not statistically different from the performance averages of the teams in the other two profiles. These teams displayed the most Advice-Giving out of all of the profiles, followed by Legitimizing and Influencing. Although Influencing was only the third most prevalent behavior for teams in Profile 3, Influencing was still noticeably higher in Profile 3 than the other two profiles. Profile 3 teams predominantly displayed leadership by asserting opinions, directing actions, using humor, and initiating team dialogue throughout the task. Thus, Profile 3 leaders spent less time filtering information and more time promoting agreement among members and cultivating a collaborative environment for all team members to contribute. Interestingly, most Profile 3 teams either used a dual leadership structure or shared leadership, while single leadership was more common among the other two profiles. Due to the lack of single leadership and the heavy use of Advice-Giving, we are labeling Profile 3 as Collaborative Leadership.

What we generally surmise from these three profiles is that teams take different approaches when it comes to leadership, i.e., Unfocused Leadership, Conventional Leadership, or Collaborative Leadership. From the exploratory analysis of this small sample, we were not able to find evidence that these approaches to leadership had differing effects on Team Performance. However, Team Performance is a multifaceted construct that can be measured in a multitude of ways, and the present study only employed one measurement method. It was apparent, though, from this analysis that different leadership behaviors resulted in different experiences for the teams. The present study highlighted distinctions in leadership behaviors, and future research should explore the impact of these leadership behaviors on Team Performance.

4. Discussion

While virtual teams are exceedingly prevalent in the modern workplace, less is known about the dynamics of short-term virtual (STV) teams [10]. We investigated the antecedents of team success and team performance in project-based virtual teams using a mixed methods approach. First, we used quantitative data to explore how team coordination and three levels of team support related to team success. Then, we used qualitative data to perform an exploratory analysis of the relationship between leadership behaviors and team performance. Our results indicate that team support is a critical component of team dynamics and predicts team success moreso than team coordination. We have predicted that the three types of team support presented here, along with team coordination, would predict team success. Our results only found support for instrumental support as a significant predictor of team success; instrumental support being the tangible assistance to team members when they are in need. In the exploratory analysis, we predicted that specific leadership behaviors would emerge and that these would predict team outcomes. Our results from the latent profile analysis did show that distinct styles of leadership emerged in the STV teams in our study. However, we found that none of the leadership behaviors significantly impacted team performance. This is meaningful to consider as these leadership behaviors and behaviors emerged in teams.

These findings are relevant to the existing literature on the concept of virtual teams, concepts of team success, and shared leadership, as they align with the findings of existing research that suggests team satisfaction, success, and motivation are positively influenced by channels of support [5,10,18]. Specific to concepts of STV teams, instrumental support had the most visible effect on these metrics of team success compared to other forms of support. This is significant to consider, as current trends suggest that short-term virtual teams are becoming more prevalent throughout an increasingly volatile, unstable, complex, and ambiguous (VUCA) world [46]. Based on this emerging concept of VUCA, we are developing an expectation that people need to be able to address and handle more complex problems both quickly and easily, and thus, understanding that leaders could be directed towards instrumental support is potentially critical for organizations and generally serves as a contribution to the current field. This understanding helps us develop strategies in the form of interventions, such as team training, leadership, development, and coaching, in ways that could help teams structure and strategize their work. It could also benefit our understanding of the optimal types of leadership, guidance, and training that could be provided which best support these types of STV teams as we advance to an increasingly VUCA environment and understand the space that short-term virtual teams will occupy.

A recent study from 2023 reinforced the point that virtual teams are increasingly popular in the workspace, and understanding this trend is critical to workplace success [47]. This paper looked at leadership behaviors that are relevant to shared leadership and suggested that shared leadership theory may act as a potential solution to understanding the growing role of virtual teams [47]. This heavily aligns with the results of our study, in which, we discussed different profiles of leadership that tended to emerge in STV teams. As we have developed an understanding that we are moving towards shared leadership behaviors, we challenge the prevalence of more conventional leadership behaviors involving gatekeeping and advice giving. This is important, as other researchers have recently shared an emphasis on shared leadership in looking at the importance of different types of leadership that are going to be used in this growing space for virtual teams.

Organizations have an opportunity to combat the challenges of virtuality by understanding how different aspects of team support and coordination impact team success. Based on this study and previous research, team support is strongly related to team success, and team-building interventions can be utilized to enhance team support [16]. Instrumental support was found to have the most significant impact on team success. One explanation for this could be that it is conducive to an individual's self-improvement and effort input [48]. Thus, instrumental support may benefit both the team and its members, ultimately leading to greater team success and performance. We encourage organizations and team leaders to enhance team support in short-term virtual teams, and to consider how various leadership behaviors and approaches impact team experience and performance.

4.1. Implications and Future Research

At the individual level, our model demonstrated a good fit with all three levels of team support and team coordination having a direct effect on team success, supporting our first hypothesis. Researchers have established instrumental support and emotional support as two global types of support [49]. Interestingly, only instrumental support explained a significant amount of the variance in our sample. Instrumental support has been found in previous literature to strongly predict team success [1].

Emotional support has previously been found to reduce team stress and increase engagement, whereas lack of emotional support may contribute to psychological detachment and fatigue [18,48]. However, these emotional support findings were not based on the dynamics of short-term virtual teams. The lack of a significant effect could indicate a greater need for instrumental support when time and distance do not permit sufficient development of an emotional team bond. Future research should expand on how emotional support is impacted and demonstrated in short-term virtual teams. Research may also

show how instrumental support makes up for this lack of emotional support and impacts team success in short-term teams.

In this sample, team coordination did not have a significant direct effect on team success, which rendered our original mediation model infeasible and did not support our second hypothesis. Team coordination comprises communication, leadership, and task management, which are team dynamics impacted by the nature of leaderless, virtual, and short-term teams [20,25]. This may serve as an explanation of how team coordination did not have a significant direct effect on team success, and instrumental support was found to be more predictive.

At the team level, individual leadership behaviors were identified and aggregated by each team. Each of the eight leadership behaviors mapped onto the GOLS five-factor framework [40] to create a team composite score for each factor, see Table 1. With this data, we performed a Latent Profile Analysis (LPA) to identify homogeneous distributions of leadership behaviors in the teams. A three-profile model best fits the data, see Figure 3. The LPA highlighted the different leadership behaviors that teams employed. The majority of teams utilized Conventional Leadership, which was typically directed by a single leader and was characterized by a balance of leadership behaviors. Teams that employed Unfocused Leadership typically displayed higher levels of Gatekeeping behaviors and very few Advice-Giving and Influencing behaviors. This may indicate that leaders in these teams spent more time eliciting input from others and less time building relationships and consensus. Teams that employed Collaborative Leadership, on the other hand, displayed more Advice-Giving, Harmonizing, and Influencing behaviors, which contributed to a cooperative climate.

This exploratory analysis indicates that even in short-term virtual teams with very little task instruction, differences arise in the ways leaders choose to interact with teammates and drive team success. Some teams had leaders that chose to focus on relationship-building, through the use of Harmonizing and Influencing behaviors, while other teams had leaders that chose to focus on process and progress through Legitimizing and Gatekeeping. The three profiles, Unfocused Leadership, Conventional Leadership, and Collaborative Leadership, did not produce statistically significant differences in team performance. However, the present study used only one measurement of team performance—the team's score on the virtual task. Future research should delve into the impact these leadership behaviors have on performance and other team-related outcomes (i.e., team support, team coordination, and team trust). Future research should also examine how these leadership behaviors are employed and established in long-term teams and projects.

4.2. Limitations

Although we took great care in our study, there still were several limitations that should be highlighted. These are aspects of the study to which we want to draw attention, as these limitations to the current findings may help guide future research. The present study used a small study sample, which is not highly generalizable. The participants of this study were mostly university students with a lack of diversity in ethnicity and age. A larger sample size that more accurately reflects the diverse working-world would present more accurate and generalizable findings for team coordination, support, leadership behaviors, and effectiveness in virtual settings. A larger sample size may also provide more clarity in the LPA and potentially point to leadership behaviors that facilitate higher team performance than others. Although we had a large enough sample size to look at the individual-level data, there is a limitation looking at the team-level data because there was an uneven and small number of teams in some of the leadership profiles. Some team profiles had small sample sizes of five (Profile 1) to seven (Profile 3) teams compared to fifty-seven teams (Profile 2). This difference and small sample size for each team profile limits the power to find meaningful differences in leadership behaviors and team performance.

Additionally, teams in this study only met once for the single task, with little task instructions. While some project teams only meet once to complete a single task, most organizations assemble project teams to complete a project over the course of several meet-

ings. This allows for more variability in the impact of team support and team coordination on team success. Additionally, leadership behaviors and approaches may develop and evolve in teams over time. As long-term virtual teams become more prevalent, it would be beneficial and valuable to conduct longitudinal studies focused on virtual leadership.

Cross sectional data do not have evidence of the order in which these were experienced. There was no evidence that support was a predecessor to coordination; therefore, we relied on a theoretical model from previous research for this imposed structure.

5. Conclusions

Virtual teams are a standard practice of the modern workplace due to technological advancement and increasingly flexible business operations [5,50]. The present study contributes to the virtual team literature through a multidimensional examination of team success factors at the individual level and interactive factors of team performance at the team level. We aimed to comprise a more complete picture of these dynamics in short-term virtual teams. It was concluded that team support and team coordination played an important role in team success. This supports previous findings that team coordination and support have different elements, which affect the way team members communicate, work together, complete tasks, and achieve goals [19,20]. Despite our best efforts, there were several limitations to our study, which we highlighted in the previous section.

Along with team support and coordination, leadership is a significant component of team dynamics, and is strongly related to team performance and effectiveness [30]. It was concluded in this study that satisfactory team performance can be achieved through multiple leadership behaviors. These leadership behaviors can greatly affect the experience of short-term virtual team members, and future research should expand on the relationship between team member experience and team success. By examining how team support and coordination impact team success, organizations and team leaders can create new ways to enhance team dynamics.

Further, organizations can consider how leadership behaviors and approaches may shape overall team experience and performance.

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