2018

Adaptation and Resilience of Extreme Teams: A Qualitative Study Using Historiometric Analysis

Lauren Campbell
University of Central Florida

ADAPTATION AND RESILIENCE OF EXTREME TEAMS: A QUALITATIVE STUDY USING HISTORIOMETRIC ANALYSIS

by

LAUREN N. P. CAMPBELL
B.S. Pennsylvania State University, 2015

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the Department of Psychology
in the College of Sciences
at the University of Central Florida
Orlando, Florida

Summer Term
2018

Major Professor: C. Shawn Burke

ACKNOWLEDGEMENT

This work was supported by a grant from the Army Research Institute (W911NF-17-1-0344) to Dr. C. Shawn Burke, Principal Investigator. The views expressed in this work are those of the authors and do not necessarily reflect the organizations with which they are affiliated or their sponsoring institutions.

ABSTRACT

The business and academic worlds agree that team resilience and team adaptation are in increasing need of study. This study explores the behavioral processes of team adaptation—specifically, those action phase and interpersonal processes mapped by Marks, Mathieu, and Zaccaro (2001) and overlapping with the team adaptation model by Burke, Stagl, Salas, Pierce, and Kendall (2006) and expanded by Rosen et al. (2011). Additionally, the impact of trigger type on adaptive behaviors is explored as suggested by Maynard and Kennedy (2016). These explorations are conducted within the context of extreme teams, and the primary method used is Crayne and Hunter's (2018) historiometric analysis (HMA). The chosen sources include crew diaries and new articles detailing the events of the 2014-2015 Volvo Ocean. Critical incidents are pulled from these sources and coded for trigger type as either taskwork- or teamwork-focused, and the adaptive behaviors in response to these triggers are coded in a bottom up, emergent process. The data is reported as rank-ordered frequencies. Results suggest that resilient teams engage in some of those processes suggested by the Marks et al. (2001) framework—coordination, monitoring, communication, and backup—as well as other adaptive behavioral processes. Furthermore, taskwork-focused triggers are seen as resulting in more action phase behavioral adaptation processes, though limited data is found to speak to the mechanisms of teamwork-focused triggers. Future research directions are suggested to include examination of teams of various levels of expertise in both taskwork-specific and generalized teamwork skills.

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INTRODUCTION

Since 1973, the Volvo Ocean Race has seen elite sailors compete in what has been called "the ultimate test of a team" (VolvoOceanRacing.com). Every four or so years, six to eight teams of up to 11 of the world's most skilled sailors from all over the world race around the globe for a total distance of approximately 40,000 nautical miles. They work 24 hours a day, sleeping in four-hour shifts, for approximately nine months, split into eight or nine legs between 10 and 35 days long. The teams face all the challenges that the oceans have to offer—including sudden, unforeseeable changes in weather patterns, extreme heat and cold, tumultuous waves, and infuriating stillness—as well as all the interpersonal challenges that come with being an essentially isolated team working against the clock in competition against equals. No prize money is given to winners; victory over such a feat serves as its own reward for these teams.

These races represent the most elite sailing teams facing extreme conditions and emerging resilience in the face of life threatening challenges. Building to exactly what these teams are begins with one of the most commonly accepted definitions of a team, which comes from Kozlowski and Ilgen (2006):

> (a) two or more individuals who; (b) socially interact (face-to-face or, increasingly, virtually); (c) possess one or more common goals; (d) are brought together to perform organizationally relevant tasks; (e) exhibit interdependencies with respect to workflow, goals, and outcomes; (f) have different roles and responsibilities; and (g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system (p. 79)

In a recent study exploring the mechanisms of leadership in extreme teams, Burke, Shuffler, and Wiese (2018) describe long-duration sailboat racing as an extreme environment in which teams operation under conditions of high unpredictability, confinement, and both magnitude and probability of severe consequences of error. As such, it is accepted that these teams are, in fact, extreme teams, as defined by Bell, Fisher, Brown, and Mann (2016):

> (a) complete their tasks in performance environments with one or more contextual features that are atypical in level (e.g., extreme time pressure) or kind (e.g., confinement, danger) and (b) for which ineffective performance has serious consequences (p. 2)

Finally, given the complex, dynamic environments that extreme teams operate within and the many stressors they face, literature notes that adaptation and resilience play a key role in effective team performance (e.g. Burke, Stagl, Salas, Pierce, & Kendall, 2006). Team resilience has been defined by Alliger, Cerasoli, Tannenbaum, & Vessey (2015, p. 176) as "the capacity of a team to withstand and overcome stressors in a manner that enables sustained performance." Likewise, team adaptability has been defined by Maynard, Kennedy, and Sommer (2015, p. 655) as "the capacity of a team to make needed changes in response to a disruption or trigger."

While the examples above are presented within the context of ocean racing, the need for teams to be resilient under challenging conditions are not unique to this community. As evidence of this, key research organizations, including the National Aeronautics and Space Administration (NASA), international consulting firm, Accenture (Kennedy, Landon, & Maynard, 2016), and US military organizations (Boermans, Delahaij, Korteling, & Euwema, 2012), are asking about how to help teams become more resilient. Published research echoes this call for analysis of resilience at the team level (Kennedy et al., 2016; King, Newman, & Luthans, 2016; Bowers, Kreutzer, Cannon-Bowers, & Lamb, 2017). Researchers are just beginning to explore resilience at the team level. Three theoretical models have been presented in recent years (Alliger et al., 2015; Sharma & Sharma, 2016; Bowers et al., 2017) in an effort to understand the nature and mechanisms of team resilience, yet empirical research has lagged behind. Therefore, based on these models detailed below, the current research serves to begin to answer calls for by exploring adaptive behavioral processes that lead to team resilience using historiometric analysis.

LITERATURE REVIEW

The Nature of Team Resilience

One of the first conceptualizations of team resilience comes from Alliger et al. (2015). They define team resilience as a buildable capacity: "the capacity of a team to withstand and overcome stressors in a manner that enables sustained performance," (p. 176) as well as "helps teams handle and bounce back from challenges that can endanger their cohesiveness and performance" (p. 177). In an intervention-focused exploration of team resilience, Alliger et al. (2015) describe the challenges faced by teams and compare behavioral markers of resilient versus non-resilient teams. They emphasize that team resilience is only visible when challenges occur, and though their overview is not built into a model, they detail those actions that resilient teams take to minimize, manage, and mend when facing a challenge.

Similarly, a second model by Sharma and Sharma (2016) defines team resilience as an ability: "the ability of the teams/groups to bounce back and sustain in the facade of adverse conditions" (p. 37). Their study reviews measures of individual-level resilience and develops a new measure specific to team resilience based on this conceptualization. Their hierarchical, multidimensional model considers team resilience as a result of underlying processes and group-level attributes, which include mastery approaches, group structure, social capital, and collective efficacy.

Bowers et al. (2017) expand the theoretical understanding of team resilience by placing it within an IMOI model and delineating the interrelated processes and emergent states. Specifically, this model slots team resilience as a second-order emergent state—that is, a result of first-order emergent state(s), which results from process(es), which results from input factor(s). In this context, team resilience is described as a buildable capacity that facilitates performance rebound in the face of challenges. Bowers et al.'s (2017) developed model includes the inputs, processes, and emergent states that research indicates enable team resilience at three levels—individual, team and organizational. Of most interest to this study is adaptability, which they have slotted as team level emergent state.

Some theoretical overlap exists between these models. Specifically, the given definitions of team resilience are, by and large, in agreement as to the following two components: sustaining (Sharma & Sharma, 2016; Alliger et al., 2015) and recovering, rebounding, or bouncing back performance levels in the face of adversity (Alliger et al., 2015; Sharma & Sharma, 2016; Bowers et al., 2017). Furthermore, Alliger et al. (2015) and Bowers et al. (2017) agree on two key points: first, that team-level resilience is distinct from individual resilience and, second, that a team comprised of resilient members does not necessarily make a resilient team. Alliger et al. (2015, p. 177) further explain: "team members who are high in both ability and psychological 'hardiness' may, perhaps precisely because of their past solo successes, operate with less regard for other team members or the team." These statements are particularly important, because they indicate that the study and training of individual resilience is not sufficient to ensure successful performance in the face of adversity for teams.

This leads to the question: if individual resilience does not necessarily lead to team resilience, what does? As a final point of agreement, each of the described studies calls for further exploration of the construct of team resilience and how it relates to team processes. Building upon the models detailed above, this research seeks to answer these calls and explore the relationships between team resilience and the behavioral processes of team adaptation. Specifically, this study seeks to answer the following driving research questions:

1. What behavioral processes are engaged in by extreme teams where adaptation and resilience are factors?
2. Does the nature of the trigger change the behavioral processes of adaptation?

For the purposes of this study, team resilience is defined based on Bowers et al.'s (2017) description of resilient teams as those who thrive, rebound, and/or positively adapt to adversity and are, therefore, less likely to experience inhibiting effects of challenges faced. The components of recovering, sustaining, and possibly gaining in performance levels (Alliger et al., 2015; Sharma & Sharma, 2016; Bowers et al., 2017) are accepted and explored within the context of visible challenges faced by extreme teams. In response to these studies and calls for future exploration and to answer the driving research questions of this study, a qualitative study is conducted using historiometric analysis of extreme teams in long duration ocean racing events. The hypotheses in answer to the driving research questions are outlined below.

The Behavioral Processes of Team Adaptation

Literature has already begun to connect the constructs of team adaptability and team resilience, most recently in Bowers et al.'s (2017) model described above. As expected, the relationship between the two constructs at the team level is close and complex. Burke et al. (2006) present a conceptual analysis and model of the intricacies of team adaptation and define it as follows (p. 1189-1190):

Team adaptation is defined herein as a change in team performance, in response to a salient cue or cue stream that leads to a functional outcome for the entire team. Team adaptation is manifested in the innovation of new or modification of existing structures, capacities, and/or behavioral or cognitive goal-directed actions.

Further, Maynard and Kennedy (2016) parse out distinctions between team adaptive outcomes, team adaptability, and team adaptation process. Team adaptive outcomes are defined, naturally, as consequences of the adaptation process and are suggested to include emergent states and affective reactions (Maynard & Kennedy, 2016). The model proposed by Bowers et al. (2017) suggests that team resilience is an emergent state that is, in part, a byproduct of the team engaging in adaptive behaviors. As previously discussed, team adaptability is “the capacity of a team to make needed changes in response to a disruption or trigger” (Maynard et al., 2015, p. 655). Finally and most significantly, team adaptation process is defined as “adjustments to relevant team processes (i.e. action, interpersonal, transition) in response to the disruption or trigger giving rise to the need for adaptation” (Maynard et al., 2015, p. 656).

In building to this concept of team adaptation, Maynard and Kennedy (2016) build upon the taxonomy of team process phases developed by Marks, Mathieu, and Zaccaro (2001), as well as the model of the adaptive team performance cycle developed by Burke et al. (2006), which was later expanded by Rosen et al. (2011) to include specific behavioral markers for each phase of the adaptive process. The contributions by each are outlined below.

In an early review, Marks et al. (2001) develop a taxonomy of team processes as subdivided into 3 categories: transition, action, and interpersonal. First, transition phase processes are those in which “teams focus primarily on evaluation and/or planning activities to guide their accomplishment of a team goal or objective” and include the sub-processes of mission analysis, goal specification, and strategy formulation (Marks et al., 2001, p. 360). Next, action phase processes are those in which “teams are engaged in acts that contribute directly to goal accomplishment (i.e., taskwork)” and include the sub-processes of monitoring progress toward goals, systems monitoring, team monitoring and backup, and coordination (Marks et al., 2001, p. 360). Finally, interpersonal processes are those in which teams “manage interpersonal relationships” and “govern interpersonal activities” (Marks et al., 2001, p. 368). These processes occur throughout both transition and action phases, and they include the sub-processes of conflict management, motivating and confidence building, and affect management. For a figure depicting this model, see Appendix A. Though these phases and process are not discussed specifically in terms of adaptation or resilience, they are described as mechanisms by which teams achieve effective performance.

Much of Marks et al.’s (2001) framework is echoed in Burke et al.’s (2006) model, though theirs is much more refined to the specifics of team adaptation. Rosen et al.’s (2011) expansion only furthers this. That said, Burke et al. (2006) conceptualize team adaptation as a process comprised for four cyclical phases. First is situation assessment, which consists of cue recognition and meaning ascription. Rosen et al. (2011) add team communication. The second is plan formulation, to which Rosen et al. (2011) add the sub-processes of mission analysis; goal specification; strategy formulation, which consists of deliberate planning and contingency planning; role differentiation; and preemptive conflict management. The third phase is plan execution, consisting of coordination, which then consists of mutual monitoring, communication, backup behavior, and leadership. Rosen et al. (2011) do not include leadership, but add systems monitoring, reactive strategy planning (another component of strategy formulation from the plan formulation phase), reactive conflict management, and affect management. Finally, the fourth phase is team learning, to which Rosen et al. (2011) add the sub-processes of recap, which consists of information search and structuring and events review, and reflection / critique, which consists of active listening, framing / convergent interpretation, reframing / divergent interpretation, and strength / weakness diagnosis, and summarizing lessons learned, which consists of accommodation and integration. For figures depicting Burke et al.'s (2006) and Rosen et al.'s (2011) models, see Appendices B and C, respectively. Each of the four phases and all the sub-process behaviors from these models are described as key in allowing a team to face and overcome changes and challenges.

Each of the behavioral processes of adaptation as described in the models above are noted to facilitate team resilience. This is likely because both adaptation and resilience are prompted by a change. That said, it is important to note that a trigger for team adaptation might not also be a trigger for resilience; triggers for resilience are prompted by adverse change, a trigger, or challenge. However, literature suggests that triggers for resilience require adaptation as a response. The behavioral processes of adaptation as described in the models above facilitate team resilience as follows: the phases of situation assessment and plan formulation provide goal-oriented direction; the processes within plan implementation enable response to adverse triggers; and team learning facilitates long-term team growth (Burke et al., 2006). Furthermore, Kennedy et al. (2016) note that team resilience is salient in team adaptation, and this study considers that the reverse is true as well. The two constructs are so intertwined, in fact, that in a series of studies on team resilience in athletes, Morgan, Fletcher, and Sarkar (2013; 2015; 2017) define team resilience as the positive adaptation of a team. Bowers et al. (2017) attempt to disentangle the two constructs with the distinction that adaptability is a response to novel stimuli, while resilience is a response to adverse stimuli. That is to say, the relationship as described by Bowers et al. (2017) suggests that all resilience requires adaptation, but not all adaptation results in resilience.

This study is interested in the adaptive behavioral processes engaged in by resilient teams. Specifically, resilient teams will be examined for the degree to which the following behaviors are witnessed in response to a triggering stressful event: coordination, mutual monitoring, systems monitoring, communication, backup, and conflict management. These behaviors were chosen as they represent those action and interpersonal processes which are identified by Marks et al. (2001) and overlap with recent models of team adaptation (Burke et al., 2006; Rosen et al., 2001). Due to the nature of events and sources as discussed in the methods section below, transition phase processes and the interpersonal process of affect management are not examined. As such, Hypothesis 1 is stated as follows:

> H1. Teams who demonstrate resilience will engage in adaptive process behaviors, such as coordination, mutual monitoring, systems monitoring, communication, backup, and conflict management.

The Triggers of Team Adaptation

In their synthesis and framework for team adaptation, Maynard and Kennedy (2016) note the importance of trigger type on the adaptation process. Building upon previous understanding of team processes as either taskwork or teamwork (e.g. Stout, Cannon-Bowers, Salas, & Milanovich, 1999), they dichotomize triggers as being either taskwork- or teamwork-focused. Specifically, taskwork-focused triggers are described as those which hinder "what the team is doing," including interactions with tasks, tools, machines, and systems (Maynard & Kennedy, 2016, p. 660). Similarly, teamwork-focused triggers are described as those which hinder “the means by which the team accomplishes its task by doing it with each other” (Maynard & Kennedy, 2016, p. 660). The type of trigger, they propose, instructs which type of adaptive behaviors on which the team focuses their efforts. Echoing the propositions made by Maynard et al. (2015), this study explores this relationship between trigger type and adaptive behavioral process. Specifically, Hypotheses 2 and 3 are stated as follows:

> H2. Taskwork-based triggers more frequently result in action phase processes of adaptation, such as coordination, mutual monitoring, systems monitoring, and backup, as compared to interpersonal processes.
>
> H3. Teamwork-based triggers more frequently result in interpersonal processes to aid adaptation, such as conflict management, as compared to action phase processes.

METHOD

Historiometry

In order to test the above hypotheses, this research relies on historiometric analysis (HMA). Historiometry is the systematic analysis of the content of past events through review and coding of narrative historical sources—that is, previously published media documenting historical persons and events, such as biographies, periodicals, and written histories. Crayne and Hunter (2018) argue that this method is especially useful for organizational sciences in particular, because it allows researchers to convert historical content into numerical data that might be analyzed statistically. The usefulness of this method is further amplified when unique or rare data samples, context and situational specifics, and/or longitudinal data are examined (Crayne & Hunter, 2018). In a recent study on team leadership using this methodology, Burke et al. (2018) note that historiometry is particularly useful when exploring relatively new constructs which have not be thoroughly examined or understood, and further suggest that historiometry offers the benefits of "contextual richness of the data and the corresponding external validity" (p. 8). Though traditionally more prominent in social psychology literature, recent studies have relied on inductive, qualitative methods like HMA in industrial / organizational psychology and related fields. Specifically, HMA has been used to review the topics of group-level impacts on leadership, multi-team systems (MTSs), team leadership, and team adaptation (Mumford et al., 2008; DeChurch et al., 2011; Resick, Randall, & DeChurch, 2011; Parry, Mumford, Bower, & Watts, 2014; Burke et al., 2018), all of which closely relate to team resilience. Additionally, similar qualitative methods have been used to successfully study team resilience in particular (Morgan et al., 2013; Morgan et al., 2015, Morgan et al., 2017).

Critical Incident Technique

Mirroring the method used by Burke et al. (2018), this study also employs the critical incident technique in order to ensure systematic extraction of relevant information from the archival data sources. Each critical incident contains several parts: (1) the trigger which initiates an adaptive response, (2) the behavioral response employed as a result of the trigger, and (3) the consequence of the action as recorded in the archival source material. Breaking the critical incidents down in this manner allowed for examination of the degree to which each team was able to either maintain or bounce back their performance levels after encountering the trigger (i.e. evidence for resilience). As described in the procedure below, the critical incidents are structured to allow the components (trigger and behaviors) to be coded for analysis of the hypotheses.

Events

For this study, HMA is used to examine the events of the 2014-2015 Volvo Ocean Races and the behaviors of the teams of sailors who competed in them. This event was chosen based on the availability of detailed documentation on the behaviors of the team members as they competed, which is due to high publicity of the event and its recency. Furthermore, this event is ideal, as it includes environments and circumstances in which the crews frequently experience a need for adaptation and resilience in response to the many, varied stressors inherent in this context (i.e. variable wave and wind conditions, extreme variations in temperature, crew illness and injury, equipment breakage, capsizing, hull damage). Finally, this race year in particular has been chosen due to a change in the race format to implement the role of a designated media person on each team, which facilitates the availability of information and documentation of team behaviors during the race. This documentation and information is spread over various sources, including news articles, official race reports, and web blogs written by team members during the race.

PROCEDURE

In a recent review, Crayne and Hunter (2018) outline the details of the HMA process, broken down into key steps and sub-step actions that should be taken (see Appendix D for steps as detailed by Crayne and Hunter, 2018). These are detailed and summarized below to include the actions taken for each step.

Definition of Constructs and Research Questions

The constructs and research questions were defined as outlined and discussed above. Per recommendations by Parry et al. (2014), the constructs have not only been defined, but specified to a level of detail that allows for thorough investigation of specific phenomena. That is, this research is not simply examining the relationships between team adaptation and team resilience at a high level, but rather, it is specifically looking at the behavioral processes of team adaptation demonstrated by extreme teams who engage in behaviors indicative of a state of resilience during participation in the 2014-2015 Volvo Ocean Race. To this end, an extensive literature review was conducted on the key construct of team resilience, and an annotated bibliography was written to summarize the key articles and determine a state-of-the-literature within this domain. A literature review was also conducted for the construct of team adaptation. Finally, searches were conducted to gather available resources pertaining to the chosen events.

Investigative Piloting

Investigative piloting was conducted such that key documents relating to the chosen events were reviewed to ensure that the constructs from the research questions were present and extractable. Specifically, the author read and reviewed source material pertaining to the Volvo

Ocean Races in a case analysis-type review, including Mundle's (2002) chronicle of the 2001-2002 race, *Ocean Warriors*, and the Volvo Ocean Race website historical records, including blogs written by and videos of the teams (VolvoOceanRacing.com). Potential narratives in the form of critical incidents were gathered from each of these documents to serve as initial proof of concept and examples of various types of triggers and adaptive behavioral processes contained within them. For an example of this proof of concept and the form used to record these critical incidents, see Appendix E. This stage of investigative piloting also served to inform decisions on how this information might be coded to determine the levels of adaptation and resilience demonstrated by the teams.

Decision of Data Structure

A format for gathering critical incidents was chosen (see Appendix E). This format follows the guidelines set forth for critical incidents by Flanagan (1954), specifically in that they include context, content, and consequences related to the phenomena of interest. However, this format was further developed and tailored to the specific needs of this study such that each critical incident includes the following components: relevant contextual information; a description of the trigger initiating the critical incident; a description of the action taken by the team in response to the trigger; a description of the consequences of the team's actions; identification of the relevant goal which is the trigger prohibiting reaching; a summary of the critical incident; and a list of the specific sources used to draft it.

Prototyping and Codebook Drafting

While the coding of the behavioral responses was bottom up, a codebook was developed for the delineation of trigger types. This codebook integrated work by Maynard and Kennedy (2016) with that of Alliger et al. (2015) to delineate trigger types and examples of them. The trigger types indicated team challenges which cue a need for resilience as argued by Alliger et al. (2015). These triggers were further classified as either teamwork- or taskwork-focused triggers guided by Maynard and Kennedy (2016). The last step was to operationalize these triggers within the context of long duration ocean racing events. The results can be seen in Appendix F.

Data Source and Collection Refinement

The sources from which data was collected were finalized to include published and publicly available works detailing the events of the 2014-2015 Volvo Ocean Race and the behaviors of the teams and individuals who competed in it. The criteria for choosing these sources follows recommendations by Parry et al. (2014) concerning historiometric analysis processes: namely, varied source types have been chosen, to ensure the generality of conclusions drawn that might otherwise be impacted by the limited levels of quality, relevance, context, objectivity, or biases presented by a single source. As mentioned, these include the Volvo Ocean Race website historical records (VolvoOceanRacing.com), specifically two different types of sources: (1) twice daily watchlogs, which are official race reports detailing the positions and speeds of the boats and major events of the past 12 hours or so in the race, and (2) daily crew diaries, which are journals recording the teams' events, attitudes, and behaviors over the past day. The watchlogs are written by unidentified, official race personnel, and the crew diaries are written by the assigned media person for each team, called an onboard reporter (OBR), as well as occasional guest writers including other crew members and the skipper or leader of the sailing team.

Event and Chapter Selection and Dissemination

Specific selections from the data sources described above were chosen and pulled using quotes from the original diaries and watchlogs into the critical incident format as discussed above and exemplified in Appendix E. The original source materials from the Volvo Ocean Race website were saved from the website and stored electronically on a database accessible by all participating coders.

Coder Training

Coders included a total of five subject matter experts (SMEs), arranged into two sets: one set extracted critical incidents from the source material (extraction team) and a second set was responsible for the actual coding of the extracted critical incidents (coding team). The extraction team consisted a team of two research assistants as well as the author, all of whom are graduate-level industrial / organizational psychology students with experience in teams research. The coding team consisted of two senior researchers, both of whom are practicing industrial / organizational psychologists specializing in teams research.

The extraction team was thoroughly trained on the critical incident technique as well as the specific format developed and used for this study. This training consisted of learning about the critical incident technique as well as how to apply it within the context of this study. Next, members of the extraction team engaged in a practice round where they each assembled sets of critical incidents and received iterative feedback as to the quality of the incident pulled. This process continued until the lead researcher was satisfied that the extracted incidents contained the needed elements in the right amount of detail and were being pulled in a similar manner across the extraction team.

The training of the coding team involved a slightly different process. Both coders have extensive experience in the coding of adaptive team behaviors across a number of similar contexts, so they already had a thorough understanding of team behavior and adaptation processes. This combined with the emergent, bottom up nature of the coding led to the members of the coding team not having a formally defined training process. In essence, they were guided by their prior knowledge in the area, as well as the use of the trigger coding document that was created as discussed above (see Appendix F). Moreover, while each member of the coding team coded all critical incidents independently, all critical incidents were double coded with any discrepancies resolved in consensus meetings.

Protocol Execution and Managing Coder Fatigue

Execution began with the pulling of critical incidents from the source material by trained coders. Each critical incident was built from quotes from the chosen sources, as well as paraphrasing and summaries of the events and behaviors of the team. After each critical incident was pulled from the source material, it went through a quality control review by the author to ensure that all relevant information was pulled from the original source material and that the pulled quotes were placed in the correct category in the critical incident format.

The critical incidents were then used by coders to identify trigger type as either taskwork- or teamwork-related and to specify the behavioral response(s) to the trigger within each incident.

If the behavioral response to a specified trigger reflected more than a single behavior, all behaviors were captured. Coders went through critical incidents by team. That is, coders coded all critical incidents for a single sailing team at a time. This served to ensure that coders have the maximum available context when coding each critical incident, as well as to minimize cognitive load and coder fatigue. At the conclusion of coding, the coding team met for consensus meetings to resolve any discrepancies in coding.

During the coding process, a total of 136 critical incidents were pulled from the source material for six teams, giving an approximate average of 23 critical incidents per team. See Table 1 for a breakdown by team.

Table 1
Count of Critical Incidents by Race Team

Team Name	**Number of CIs**
Team Alvimedica	33
Team SCA	30
Team Brunel	27
Dongfeng Race Team	20
MAPFRE	17
Team Vestas Wind	9

Data Analysis

To examine Hypothesis 1, the coding of behavioral responses to triggers for resilience was examined to determine the behavioral adaptive processes enacted by teams who demonstrated resilience. To analyze this data, the frequency with which each behavior was witnessed was rank ordered to provide further insight into those behaviors which most commonly characterize resilient teams. Furthermore, the frequency of behaviors witnessed was rank ordered for each team that was coded in order to provide insight in to the level to which each behavior is used by each team. To examine Hypotheses 2 and 3, behavioral responses to taskwork- and teamwork-focused triggers were similarly examined to determine the behavioral adaptive processes enacted by teams who demonstrate resilience in response to different types of triggers. Again, the frequency with which these appeared in the source material was rank ordered to provide insight into which behaviors are most commonly enacted in response to specific trigger types by resilient teams.

To conduct these analyses, this study considers the conceptualization of team resilience as an emergent state which is an outgrowth of teams engaging in adaptive processes in response to a trigger event. To examine the degree to which each of the Volvo Ocean Race teams were resilient to the atypical trigger events presented during the course of the race, this research examines how each team was able to "bounce back" their performance levels following trigger events. This bouncing back is operationalized by examining the longitudinal trend of responses and the degree to which the teams' subsequent actions facilitated their ability to bounce back across a series of events. In essence, in order to say that a team is demonstrating the state of resilience, the team must have, over time, been able to "withstand and overcome stressors in a manner that enables sustained performance" (Alliger et al., 2015, p. 176) and/or "…cope, recover and adjust positively to difficulties" (Carmeli et al, 2013, p. 149). This can be seen at a high level in these teams by examining their placement at the end of each leg. More specifically, a team that is resilient is one who is able to sustain its performance levels despite significant adversity (i.e. the atypical triggers encountered these extreme contexts) and, in so doing, would consistently finish the race towards the top place across race legs. Alternatively, taking the view of resilience as the capacity to bounce back, resilience may be evidenced by a team faltering in one leg, but recovering its performance capacity, as evidenced by race placement in this case, within a subsequent leg. Using this operationalization, the six teams included in the present analyses could all be argued to be resilient, with most of the resilience witnessed by bouncing back in performance levels following various triggers. Few instances are seen where a single team remains in the lead throughout a single leg of the race, much less the entire race. Additionally, while teams may not always be successful in their immediate behavioral response to a trigger within each of the race legs, the teams do ultimately recover their performance level and maintain a consistent note of optimism and persistence even in the face of extreme challenges.

RESULTS

Results indicated partial support for Hypothesis 1. Specifically, teams that demonstrated resilience were found to respond to challenges (i.e. triggers) by engaging in some of the hypothesized adaptive behaviors, including coordination, monitoring, and backup, as reflected in the Marks et al. (2001) framework. It should be noted that monitoring was coded singularly, rather than separated into mutual monitoring and systems monitoring; however after review, it was determined that nearly all instances of monitoring were systems monitoring. Additionally, no instances of conflict management emerged in response to triggers for team resilience. In conjunction with the hypothesized behaviors, eleven other behaviors were found to be enacted in response to the taskwork and teamwork triggers: problem solving, endurance, leadership / leader mobilization, boundary spanning, team care, entrainment, risk taking, interpersonal support, maximizing available resources, vigilance, and team mobilization.

Additionally, rank ordering of the frequency of occurrence indicates that coordination, problem solving, endurance, monitoring, backup, and team care were the most commonly seen behavioral responses, accounting for 79.8% of the total behavioral responses witnessed (see Table 2). These behaviors highlight the importance of not turning inward during stressful events, but capitalizing on the strength of the entire team (e.g. coordination, backup). These also highlight the importance of attention not only to the more typical team behaviors, but also the importance of those behaviors which foster wellbeing (e.g. team care). Table 2 contains the full list of adaptive behaviors witnessed, rank ordered based on frequency counts and percentage of total behaviors witnessed, as well as a description of the behavioral adaptive process and a contextualized example of each as witnessed in the critical incidents.

Table 2

Rank Ordered Frequency of Behavioral Adaptive Processes Witnessed

Rank	Adaptive Process	Freq.	Percent	Description	Contextualized Example(s)
1	Coordination*	60	26.3%	"Orchestrating the sequence and timing of interdependent actions" (Marks et al., 2001, p. 363)	"On my last watch we just did the most horrible of all the sail changes you have to do: the J1 to J2 change, a really, really hard job requiring the whole team on the bow to wrestle the J1 down into its bag and off the foredeck" (SCA-11)
2	Problem solving	47	20.6%	Engaging in analytic and diagnostic behaviors to better understand and combat difficult or complex issues	"We tried rebooting the whole system twice and fortunately, after the second time, the gremlin left the boat and we were safe." (SCA-10) "The sea state was still rather rough so we started from the bottom up, problem solving." (TVW-01)
3	Endurance	30	13.2%	Persistent, continued goal-directed action	"It seems hourly we need to bail this giant sieve of seawater, it's coming in from parts we didn't even know we had. This job is exhausting but necessary…." (TVW-04)
4	Monitoring*	21	9.2%	Monitoring of system resources to include the equipment, task, and team	"We are getting ready for tough sailing conditions, we checked the mast and the winches...." (MAPFRE-04)
5	Backup*	12	5.3%	Assisting team members in performing their tasks (can be behavioral or informational)	"…the crew off-watch was up on deck within a few minutes to help out and save the situation." (SCA-14) "Xabi and Jean Luc are standing in for him and doing a great job." (MAPFRE-09)
5	Team care	12	5.3%	Behaviors which foster the physical health of the team	"Ñeti took wonderful care of me, and together with Pablo, the race's doctor, they helped me recover really quickly," he says." (MAPFRE-09)
6	Leadership / leader mobilization	9	3.9%	Actions which involve direct guidance or immediate, directive calls to action	"The call to go on deck came loud and clear and the situation was under control again within a few minutes." (MAPFRE-07)

Rank	Adaptive Process	Freq.	Percent	Description	Contextualized Example(s)
7	Boundary spanning	8	3.5%	Communicating and coordinating with entities outside the team	"Within minutes, Nicholson alerted race control in Alicante, Spain." (VW-07)
8	Entrainment	7	3.1%	Member synchronization (i.e. team rhythm)	"…as boring as staying on one tack for a week can be, it really helps with routines and rhythms…." (TA-07)
9	Communication*	6	2.6%	Clear, concise exchange of information	"Routing agrees on tacking up the coast of Luzon (that will be fun), so for now the brief is simple: go east until the wind begins to shift from the coast" (TA-21) "At least one of the crew had to watch and call the waves all the time so others could brace as the water broke on to the boat." (VW-07)
10	Interpersonal support	5	2.2%	Behaviors which serve to foster the psychosocial health of the team (e.g. motivational, morale building)	""It's a long leg and this will undoubtedly change, it's a big casino," says Jean Luc, with a cheery tone in his voice to lift our spirits." (MAPFRE-13) "We're encouraging each other and pushing hard...." (MAPFRE-17)
11	Risk taking	4	1.8%	Engaging in behaviors and strategies which involve an element of calculated risk or are not the norm	"This time the manoeuvre is much more risky for there's a man in the water, the sea is slightly wavy, and we have 17 knots wind." (MAPFRE-08)
12	Maximizing available resources	3	1.3%	Making use of the resources available with the recognition that the use may not be optimal and continuing to strive to move beyond the satisficed decision	"We're now sailing with the J3 (staysail). It's OK for now but we're going to miss the J2." (BRUN-27)
13	Vigilance	2	0.9%	Sustained, continual monitoring of environment and resources	""Quick! They're not looking," jokes our navigator Capey but in fact the young Belgian does take advantage of a moment's inattention by the Spaniards to slide ahead of them." (TBRUN-25)
14	Team mobilization	2	0.9%	Team member self-initiated calls to quick action	"The guys who were off watch jumped up and stormed on deck, just feeling that something was not right." (TBRUN-13)

*Processes hypothesized based on Marks et al. (2001) framework

To ensure that any one team was not skewing results and that the behaviors witnessed in the teams' behavioral responses were fairly balanced amongst the observed teams, the witnessed behaviors were listed for frequency and rank ordered by team. As such, Table 3 contains the frequency of each adaptive behavior witnessed by each team. The top three ranked behaviors—namely coordination, problem solving, and endurance—were all witnessed in all teams. The subsequent three behaviors—namely monitoring, backup, and team care—were witnessed in all but one team. The remaining nine behaviors that were witnessed were seen less frequently or with less even spread amongst the teams. This may be due to the factors specific to the methodology or source material from which the data was pulled, as further discussed in the limitations. As such, this points to the strongest evidence for the top six adaptive behaviors witnessed as being most important for teams who frequently demonstrate resilience.

It should be noted that the rank order of behaviors witnessed shows slight variation between Table 2 above and Table 3 below. This is due to the fact that some critical incidents were coded for multiple trigger sub-types. For example, a single critical incident may have both a challenging condition trigger, such as extreme heat, as well as a crisis event trigger, such as a broken water maker. In this case, a response of the adaptive behavior or endurance to each event would be counted once in Table 2 and twice in Table 3.

Table 3

Rank Ordered Frequency of Behavioral Adaptive Processes Witnessed by Race Team

	Adaptive Process														
Team Name	Coordination	Problem Solving	Endurance	Monitoring	Backup	Team Care	Leadership	Entrainment	Boundary Spanning	Interpersonal Support	Risk Taking	Communication	Vigilance	Maximizing Available Resources	Team Mobilization
Alvimedica	7	3	9	4	1	3	0	5	1	0	0	1	0	0	0
SCA	15	5	5	6	5	1	2	1	0	1	2	0	1	0	0
Brunel	6	7	1	3	1	3	2	0	0	1	0	0	1	1	1
Dongfeng	5	11	2	3	1	2	0	0	0	0	0	0	0	1	0
MAPFRE	11	8	3	0	3	2	2	0	2	2	1	0	0	0	0
Vestas Wind	5	4	2	2	0	0	1	0	2	0	0	2	0	0	0

An examination of the frequency of behaviors within the action phase portion of teamwork in conjunction with the types of triggers which cued their enactment suggest support for Hypothesis 2. That is, taskwork-based triggers more frequently resulted in action phase processes of adaptation—namely, coordination, monitoring, and backup—as compared to interpersonal processes. A total of 201 taskwork-based triggers were coded in the critical incidents. Of these, 191 were responded to with an action phase behavioral process of adaptation. In contrast, 10 were responded to with interpersonal processes. The most frequent behavioral responses to taskwork-based triggers were coordination, problem solving, endurance, monitoring, and backup. Behaviors including leader mobilization, boundary spanning, team care, entrainment, and communication were also commonly seen, but less so than the first set previously mentioned. Finally, in terms of rank ordered frequency of occurrence, behaviors including risk taking, interpersonal support, maximizing available resources, vigilance, and team mobilization were seen least often. In Table 3, the full list of action phase processes coded in response to taskwork-based triggers listed, rank ordered by frequency witnessed in the critical incidents.

Table 4
Rank Ordered Frequency of Action Phase and Emergent Behavioral Adaptive Processes Witnessed in Response to Taskwork-Based Triggers

Rank	**Adaptive Process**	**Freq.**	**Phase**
1	Coordination*	59	Action
2	Problem solving	43	Action
3	Endurance	25	Action
4	Monitoring*	17	Action
5	Backup*	10	Action
6	Leadership / leader mobilization	8	Action
6	Boundary spanning	8	Action
7	Team care	6	Interpersonal
8	Entrainment	5	Action
8	Communication	5	Action
9	Risk taking	4	Action
9	Interpersonal support	4	Interpersonal
10	Maximizing available resources	3	Action
11	Vigilance	2	Action
11	Team mobilization	2	Action

*Processes hypothesized based on Marks et al. (2001) framework

The results, although tentative, do not suggest support for Hypothesis 3. In examining the frequency with which teamwork-focused triggers engendered interpersonal versus action phase adaptive behaviors, results indicated that action phase behaviors were seen more often (15 and 6 occurrences, respectively). However, due to the overall low number of teamwork triggers found within the sample, this result is tentative, and no solid conclusions should be drawn. This result was particularly surprising and may be due to the highly visible nature of the source material used as further discussed in the later limitation section. In Table 4, the full list of processes coded in response to taskwork-based triggers listed, rank ordered by frequency witnessed in the critical incidents.

Table 5

Rank Ordered Frequency of Interpersonal Phase and Emergent Behavioral Adaptive Processes Witnessed in Response to Teamwork-Based Triggers

Rank	**Adaptive Process**	**Freq.**	**Phase**
1	Team care	5	Interpersonal
1	Endurance	5	Action
2	Problem solving	2	Action
2	Monitoring	2	Action
2	Backup	2	Action
3	Interpersonal support	1	Interpersonal
3	Coordination	1	Action
3	Leadership / leader mobilization	1	Action
3	Entrainment	1	Action
3	Communication	1	Action

DISCUSSION

Implications

The current study represents a bottom-up, emergent approach to understanding the set of behavioral processes that characterize resilient teams as they respond to taskwork and teamwork-based triggers. In this vein, as predicted, many of the behaviors which have been listed in prominent teamwork models serve as the mechanisms by which resilient teams respond to triggers necessitating a need for adaptation and resilience. In addition to those behaviors hypothesized to fostered the ability to adapt, as well as the later corresponding resilience, were found, some of which are not commonly seen in prominent team taxonomies (namely problem solving, endurance, leader mobilization, boundary spanning, team care, entrainment, risk taking, interpersonal support, maximizing available resources, vigilance, and team mobilization). Specifically, the top behaviors seen were coordination, problem solving, endurance, monitoring, backup and team care. Furthermore, these same top behaviors were seen most evenly across all or most teams, giving the strongest evidence for their importance to teams who frequently adapt and display resilience in response to triggers.

The study also begins to expand work by Maynard et al. (2015) by further investigating the impact of trigger type (taskwork versus teamwork) on the adaptive behavioral responses. In the study, trigger type was captured as well as the specific type of action phase or interpersonal behavioral response. As argued in the analysis section above, all teams could be argued to be resilient over the course of the race in that they either maintain or bounce back their performance levels following the triggers they face either immediately following them or across race legs.

Due to this, the results provide insight into not only the relationship between trigger type and category of behavioral response, but also into the types of behavioral responses used by teams that foster resilience. That is, though the results do not speak to the differences between resilient and non-resilient teams, they begin to suggest a set of adaptive behavioral processes that are engaged in by resilient teams based on the descriptions put forth in the literature (e.g. Carmeli et al, 2013; Alliger et al., 2015). Additionally, the results speak to the specific types of behaviors that are seen in response to task and teamwork triggers.

An unexpected finding that emerged was the less frequent presence of teamwork-focused triggers as compared to taskwork-focused triggers. As the literature has often shown that a team of experts does not equate to an expert team, it was a welcome surprise to find a set of teams that, upon further digging into compositional aspects, were found to not only be task experts, but also seem to have high levels of generalized team skills. Thereby, many of the challenges that often serve as teamwork triggers seem to have appeared to a lesser extent, though additional potential explanations are identified in the subsequent limitations. Future work on the larger project from which this study originated will be able examine teams with lower skill levels, both as it relates to taskwork and teamwork, which will serve to begin to investigate to what degree the fewer number of teamwork triggers is a function of the context (i.e. extreme ocean racing) or experience level of the team.

Limitations

Like all studies, this one has limitations. A primary limitation of this study is that it considers a single type of team: elite, extreme teams who frequently display resilience. These teams and the members that comprise them are highly skilled and experienced in their sport.

They frequently face various challenges or triggers and respond with adaptive behaviors and rebounds in performance that are indicative of resilience. The results found may not hold to less skilled teams in these same contexts. Furthermore, this study is limited in how thoroughly it can speak to teams who are resilient, because it does not offer comparison to teams who frequently fail to show adaptation or resilience in the face of triggers. However, this study is a part of a larger project funded by the Army Research Institute, which is considering amateur teams, who participate in the Clipper Round the World Race, alongside expert teams from the Volvo Ocean Race. Like the Volvo Ocean Race, this competition consists of a single-boat, round-the-world sailboat race in which many teams race over the course of 9 months, split into 9 or more race legs. This larger project's study may have further implications and insight on the adaptive behavioral processes for teams with lower levels of taskwork-specific and generalized teamwork skills in this context. Furthermore, as the teams examined in this larger project are comprised largely of amateur sailors with low levels of taskwork and teamwork skills, they are not expected to adapt or recover their performance levels in the face of triggers (i.e. demonstrate resilience) as frequently or well as the teams from the Volvo Ocean Race.

Additionally, as with all studies, the types of teams studied form boundary conditions for the results. Therefore, it is expected that the results presented herein best apply to extreme teams as defined by Bell et al. (2016): those who (a) complete their tasks in performance environments with one or more contextual features that are atypical in level (e.g. extreme time pressure) or kind (e.g. confinement, danger) and (b) for which ineffective performance has serious consequences. That is, the findings may hold for elite military personnel, astronauts, wildland firefighters, or other teams with high skill level who operate in intense, dynamic contexts under the pressure of extreme consequences, often life or death. They may also be most applicable to extreme teams who are predominantly intact in their membership and where members have a high level of task-based experience.

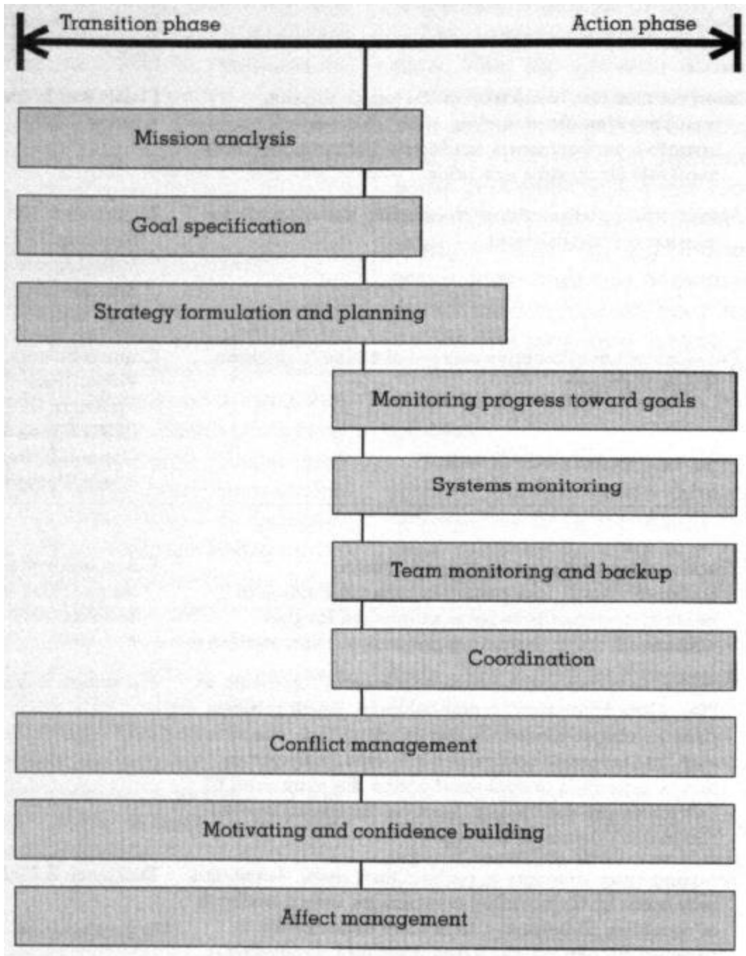
As previously mentioned, this study has a particularly low rate of capture of teamwork-based triggers; so much so that Hypothesis 3 was found inconclusive. As mentioned, the reason for the lack of teamwork triggers is not clear. While the use of source material produced immediately following the teams action reduces the potential impact of hindsight bias, it also introduces its own set of limitations. Though it may be that these elite teams did not experience a high level of teamwork triggers, a more likely case based on teams literature is that the low rate of appearance of teamwork triggers is a function of other factors. For example, one possibility is a positive framing bias due to the high visibility of the team's output, whether in terms of performance or crew diary documentation, which may have lead members to choose to not highlight interpersonal issues. This is especially likely due to the a second related factor – the small community of long distance ocean racing sailors, which increases the likelihood that members will work together again after the race. Additionally, because the crew diaries were written soon after the events which they described, the authors may have been disinclined to describe negative occurrences to maintain positive morale on the team, specifically in regards to teamwork focused triggers such as conflict. Similarly, a positive framing bias might also have come from the fact that the source material consisted of public facing documents meant to garner further interest by the public in the race and its events.

Further study, possibly even the larger project mentioned, may serve to begin to answer these limitations. That is, because the larger project includes amateur teams who are supposed to be less likely to display the behaviors associated with adaptation and correlated resilience, they may also be more likely to display or discuss teamwork focused triggers. This may be either or both because they experience more teamwork focused triggers or because they are less aware of how to or less able to screen out teamwork focused triggers in the public facing source material. As such, this comparison many significantly further the research directions begun in this study.

CONCLUSION

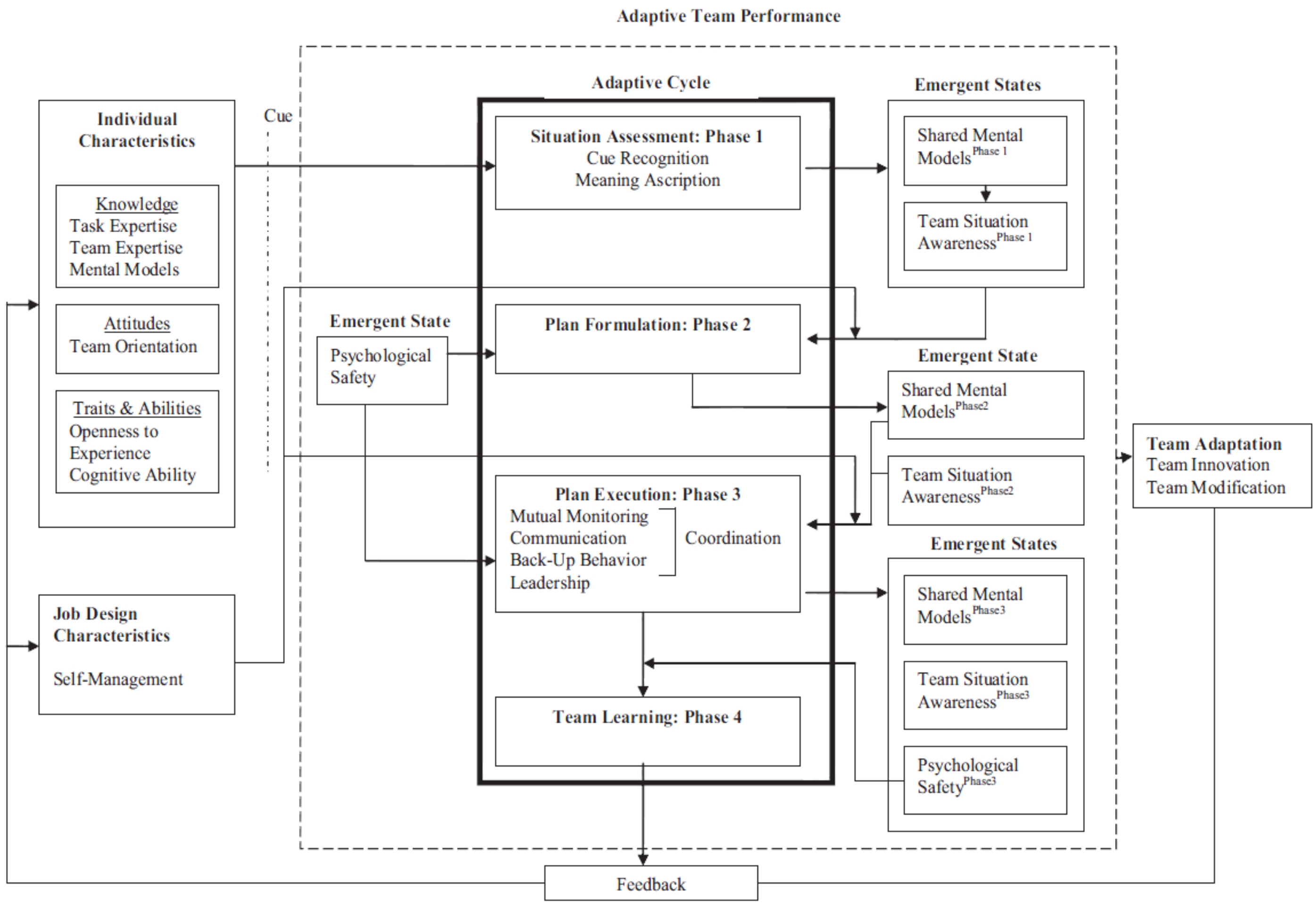
As focus on the importance of team research continues, the importance of team resilience and adaptation continue as well. This study serves to begin to break apart the specifics of what team resilience is, how team adaptation leads to team resilience, and what specific behavioral processes enable team resilience. Though this study works within a specific type of team (i.e. elite, extreme teams) in a specific context (i.e. ocean racing), it may well have implications for other types of extreme teams. Furthermore, this study may serve as a springboard for further research to continue to look into the specifics of these processes as well as continue to examine them through other, varied methods.

APPENDIX A: MARKS ET AL.'S (2001) MANIFESTATION OF PROCESSES IN TRANSITION AND ACTION PHASES

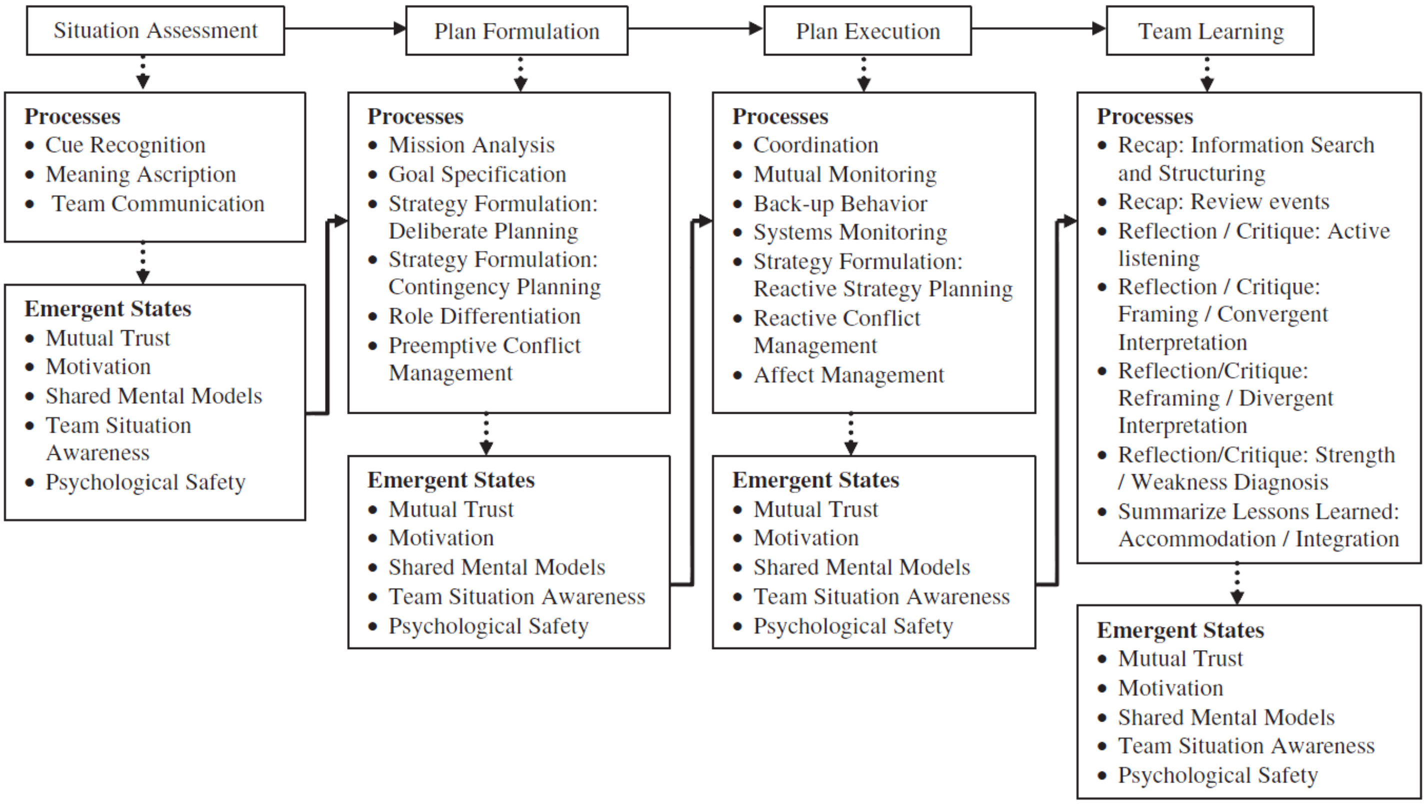


Note: The 3 bottom-most processes are interpersonal processes and occur during both transition and action phases, as indicated.

APPENDIX B: BURKE ET AL.'S (2006) MODEL OF ADAPTIVE TEAM PERFORMANCE


Adaptive Team Performance
Adaptive Cycle
Individual Characteristics
Knowledge
Task Expertise
Team Expertise
Mental Models
Attitudes
Team Orientation
Traits & Abilities
Openness to Experience
Cognitive Ability
Cue
Situation Assessment: Phase 1
Cue Recognition
Meaning Ascription
Emergent States
Shared Mental Models Phase 1
Team Situation Awareness Phase 1
Emergent State
Psychological Safety
Plan Formulation: Phase 2
Emergent State
Shared Mental Models Phase2
Team Situation Awareness Phase2
Team Adaptation
Team Innovation
Team Modification
Plan Execution: Phase 3
Mutual Monitoring
Communication
Back-Up Behavior
Leadership
Coordination
Emergent States
Shared Mental Models Phase3
Team Situation Awareness Phase3
Psychological Safety Phase3
Job Design Characteristics
Self-Management
Team Learning: Phase 4
Feedback

APPENDIX C: ROSEN ET AL.'S (2011) EXPANDED FRAMEWORK OF TEAM ADAPTATION


Situation Assessment
Plan Formulation
Plan Execution
Team Learning
Processes
• Cue Recognition
• Meaning Ascription
• Team Communication
Emergent States
• Mutual Trust
• Motivation
• Shared Mental Models
• Team Situation Awareness
• Psychological Safety
Processes
• Mission Analysis
• Goal Specification
• Strategy Formulation: Deliberate Planning
• Strategy Formulation: Contingency Planning
• Role Differentiation
• Preemptive Conflict Management
Emergent States
• Mutual Trust
• Motivation
• Shared Mental Models
• Team Situation Awareness
• Psychological Safety
Processes
• Coordination
• Mutual Monitoring
• Back-up Behavior
• Systems Monitoring
• Strategy Formulation: Reactive Strategy Planning
• Reactive Conflict Management
• Affect Management
Emergent States
• Mutual Trust
• Motivation
• Shared Mental Models
• Team Situation Awareness
• Psychological Safety
Processes
• Recap: Information Search and Structuring
• Recap: Review events
• Reflection / Critique: Active listening
• Reflection / Critique: Framing / Convergent Interpretation
• Reflection/Critique: Reframing / Divergent Interpretation
• Reflection/Critique: Strength / Weakness Diagnosis
• Summarize Lessons Learned: Accommodation / Integration
Emergent States
• Mutual Trust
• Motivation
• Shared Mental Models
• Team Situation Awareness
• Psychological Safety

APPENDIX D: CRAYNE AND HUNTER’S (2018) STEPS AND SUBSTEPS FOR HISTORIOMETRIC ANALYSIS

Steps	Substeps
1. Definition of constructs and research questions	a. Develop theory and hypotheses through extensive literature review
	b. Operationalize constructs of interest through theory and / or the use of previously validated construct measures
2. Investigative piloting	a. Primary investigator engages in a “proof of concept” exploration of the research landscape via case analysis
	b. Acquire a small set of potential narratives and use them to demonstrate that phenomena of interest are likely to be identified in such content
3. Decision of data structure	a. Determine how the how the data captured through content analysis should be structured
	b. Establish how constructs or relationships of interest are best captured - choose an “event-based” or “chapter-based” perspective
	c. Determine whether the study is to approach data from a within-subjects or between-subjects design, or some combination
	d. Identify a method for capturing criterion variables
4. Prototyping and codebook drafting	a. Develop a codebook that reflects the intended data structure and identifies predictor, control, and outcome variables
	b. Engage the research team in piloting to establish operational benchmarks, which examples for low, medium, and high levels of target constructs and phenomena
5. Data source and collection refinement	a. Use the coding strategy established during codebook development and information collected during piloting to identify and acquire data sources

	b. Review the selected content and make assessments of potential author biases, information completeness, sourcing, and consistency
6. Event / chapter selection and dissemination	a. Research team reviews the research materials and identifies content that is likely to be relevant to the research effort and eliminate content which is irrelevant
	b. Develop a plan for disseminating the selected content to the research team, and for storing any research materials
7. Coder training	a. Familiarize the rating team with the goals and objectives of the research, as well as the codebook
	b. Conduct pilot tests to develop socialized mental models within the team, whereby team members engage in discussion over materials to come to mutual agreement and consistency
	c. Engage in meetings with the rating team in order to maintain consistent perspectives on the materials and processes, as well as address specific questions or concerns
8. Protocol execution and managing coder fatigue	a. Establish a coding framework so that coders know how to progress through research materials and record data efficiently
	b. Organize materials such that coders are not constantly grouped together
	c. Remain vigilant for signals of coder fatigue or judgmental lapses. Check in with coding team directly, as well as look for statistical indicators of inconsistency
9. Data analysis	a. Organize final dataset and conduct statistical analyses necessary for hypothesis testing
	a. Assess the results of statistical analyses as

10. Integrating quantitative values with qualitative data	they relate to both predictions and existing theory and research
	b. Look for opportunities to illustrate findings or support theory through the story-telling ability of the narratives
	c. Consider revisiting data sources in search of theoretically sound moderators, informing future research

APPENDIX E: EXAMPLE CRITICAL INCIDENTS

Team#	Team SCA
CI#	SCA-01-JM
Context	Leg One; Lack of wind
Trigger	“Despite not having much wind, the night has been incredibly full on” - October 12 - Corinna Holloran, OBR
Action	“‘We are sailing upwind and downwind, upwind and downwind,' Sophie explained as she climbed back into her bunk. ‘This means we are constantly maneuvering the boat on our way to the Atlantic; we are constantly tacking, gybing, and setting new sails depending on the wind shifts.’ We have not had much sleep, but we are in full on race mode now so sleep does not matter.” - October 12 - Corinna Holloran, OBR
Consequence	“The clock struck 0115 UTC and Libby downloaded the “scheds” (the schedule, with all of the boat’s locations—only available every 6 hours). Her sigh was audible around the boat. The team collectively hooted and hollered for joy as Libby told us we were 21 nautical miles ahead of the fleet! Our risk paid off big time and we are now officially sailing in the Atlantic Ocean!” - October 13 - Corinna Holloran, OBR
Goal	Make gains despite a lack of wind
Summary	Team SCA encountered a lack of wind during the start of Leg One causing inconsistent sailing. They adjusted their sailing strategy to suit the conditions and were constantly tacking and gybing through the night. It paid off because by the next day they had a lead of 21 nautical miles over the fleet.
Source	October 12 - Corinna Holloran, OBR October 13 - Corinna Holloran, OBR

Team#	Team SCA
CI#	SCA-02-JM
Context	Leg One; A widely growing gap between Team SCA and the rest of the fleet due to very slow sailing. “Forrest Gump once wisely said: "Life is like a box of chocolates, you never know what you're gonna get." That could never be more true than today. Except our chocolate got squished as well; it's still good, we still love it, but it's just been a bit sticky and messy the last 24 hours.” - October 29 - Corinna Holloran, OBR
Trigger	“Last night, as we happily made our way southwest, we got caught under our own personal rain cloud that sucked every ounce of wind. Our "parade" was both literally and figuratively rained on. By morning, we were 90 miles behind MAPFRE, and by 1pm, we were another 49 miles behind. Unsure if "gutted" gives the best description of the mood of all of us on board - but it felt like we had all been stabbed in the stomach.” - October 29 - Corinna Holloran, OBR
Action	“Yes, today was not easy, but we did not allow ourselves to slow us down - we sailed with the conditions given and sailed at 100% performance. So, as I've

	said before: don't rule us out. Don't expect anything but the best from us. Don't stop believin'. There is still thousands of miles left, and with a newly added "Ice Gate" in the Southern Ocean, the next couple of days racing may get even closer. We are fighting and that's the most important part. After all, who knows what chocolates we'll have tomorrow…" - October 29 - Corinna Holloran, OBR
Consequence	"We take one day at a time; each day is different—each hour is different. "The rich will get richer at this point," Libby said yesterday afternoon. And we all felt like deflated balloons—the distance just kept growing! Yesterday afternoon we couldn't hit our performance numbers either—we had the best sailors in the correct places and they all said the boat felt slow, but couldn't figure out why. By late afternoon though, everything had changed. The wind picked up and decided to stick around a bit longer than expected, waves began crashing over the bow, and we were sailing fast. Everything felt a little better. Even the position report didn't sting as much." - November 1 - Corinna Holloran, OBR "The back of the pack (Team SCA, MAPFRE) were in 20 knots overnight, making great bounding gains on the leaders." - November 2 - 0630 UTC Watchlog
Goal	Make gains despite very slow and unpredictable sailing conditions
Summary	Team SCA found themselves losing ground between themselves and the rest of the fleet due to slow and unpredictable sailing conditions. Despite their losses and the team being upset about their position, they chose to fight their best to try and regain some position. After sailing in the slow conditions for several days, they finally found some wind and were able to make gains on the leaders.
Source	October 29 - Corinna Holloran, OBR November 1 - Corinna Holloran, OBR November 2 - 0630 UTC Watchlog

Team#	Team SCA
CI#	SCA-03-JM
Context	Leg Two; Variable winds and sailing conditions
Trigger	"We started the day off with nearly 28 knots of wind and waves crashing into the cockpit. However, by mid-day the sails were flopping and the decks were dry. Then, by the evening, the wind was back and we were hooning along back with 20 knots of breeze. " - November 22 - Corinna Holloran, OBR
Action	"We are doing all that we can do with the stack—moving forward and aft quite often. "When the wind is changing this much you just need to focus on keep going. We've moved the stack quite a bit—internal and external, and made big adjustments on the sails. So we're pretty busy, constantly trying to keep the speed going. So, it is a bit frustrating because you never know what's going to happen next, " Annie said… But that's life offshore—you never know exactly

	what you're going to be handed by Mother Nature. And that's why it is so important to be ready for what the game throws at you. It's also another reason why it's important to have a plan in place." - November 22 - Corinna Holloran, OBR
Consequence	"Finally, at 1900 UTC, the fleet has regrouped, with the blue boat, Vestas, and the magenta boat, SCA, still in the most southern position. Speaking of them… SCA has gained 35nm since the last report, and Vestas, 42nm. Could their option have worked? " - November 22 - 1915 UTC Watchlog
Goal	Make gains despite variable winds (high to low to high) and rough seas
Summary	Team SCA encountered extremely variable winds -- with high winds in the morning, almost no wind in the afternoon, and back to very high winds in the evening -- along with rough seas. Their strategies to attempt for gains in these conditions included moving the stack quite a bit—internal and external, and making big adjustments on the sails. The team kept constantly busy, trying to keep the speed going. Ultimately they were able to gain 35 nautical miles within this sailing period despite these conditions.
Source	November 22 - Corinna Holloran, OBR November 22 - 1915 UTC Watchlog

Team#	Team SCA
CI#	SCA-04-JM
Context	Leg Two; Unpleasant conditions aboard, rough seas, exhaustion
Trigger	"I'm not going to sugar coat it: the last few days have been tough—really tough. I'm shocked I have kept my food down, but only with the help of meds and choosing my editing time wisely—others have not been as lucky. Waves catapult us into each other, the deck, deck hardware, and tangle us in sheets. Add fighting constant exhaustion to the mix and life is far from pleasant."
Action	"A working body clock is vital out here. It's a constant mind and body battle—your mind knows it needs to work hard but your body can physically not or visa versa. That's why rhythms out here are so important—to help get your body clock into sync. But getting into that rhythm this leg has not been easy. Which ultimately leads us back to the importance of having trained for so long. Our bodies needed to be ready to take on the relentless waves and lack of sleep. However, even with all the training, it's still a challenge for the first few days as you trick your body clock into the schedule you need. And trust me, all the will and want you can muster: if your body is exhausted your body still usually wins. Hence the ridiculous spelling errors that must be strewed across my last few blogs and photo captions."
Consequence	Enhanced team morale and positive affect in the face of difficult conditions.

	"So we have to take the tough moments and the rough conditions to have the best jobs in the world—it's not a bad exchange. I knew this was the way life should be when the sun was setting, the 3-meter waves were moving under us, and at least four Albatross were dancing on the horizon. There was Dee, the most experienced Southern Ocean sailor on the boat, smiling from ear to ear—yep, this exhilaration, this awe, this appreciation, doesn't get old!"
Goal	Attempt to make gains in unpleasant conditions (sea sickness, rough seas, exhaustion)
Summary	Team SCA spoke of how unpleasant the conditions were on mind and body while sailing through a particularly rough patch of seas. The crew experienced sea sickness and a lack of sleep. The importance of rhythms was discussed; they have to try and get their bodies into a sync in order to keep up with the grueling pace. Despite these conditions, the crew describe their happiness and awe at having the opportunity to sail in the Volvo Ocean Race.
Source	November 23 - Corinna Holloran, OBR

Team#	Team SCA
CI#	SCA-05-JM
Context	Leg Two; J1 sail needing repairs "Before 0800 UTC the team was well into a proper sail repair below decks and, above deck, the team was sailing fast and hard."
Trigger	"In the early morning hours, one of the sailors shone her light on to the front sail, our J1, and noticed a few torn holes in the sail per result of the staysail's clew flapping hard against the J1."
Action	"The team rode it out with the torn sail for a little while longer, until they had a weather window sufficient enough to sail on the smaller (and incorrect) sail, the J2. After luging the sail down the deck and into the boat, Stacey and Abby started to prepare the sail for repair. Both sailors were off watch and began using their vital off watch hours to repair the sail, a job projected to take at least two hours. First, the sail needed to be dried, so the girls used the engine and acetone to dry off the sail. Next, Stacey cut new pieces of 3Di sail for the repair and used 5200 to glue the patches to the sail. Finally, the sewing machine was brought out to put the final touches on the repair. Two-hours and twenty minutes later the sail was hoisted and SCA was on the correct sail again. While the girls below deck fixed one of the more important sails for the leg, the girls above deck were sailing incredibly well and fast."
Consequence	The sail was repaired below deck, while above deck the ladies sailed "well and fast," making fleet-wide gains despite the fact that they were sailing with their smaller J2 sail.

	"... the deck team's performance was so on target that we were the fastest boat in the fleet for the next position report. Furthermore, we made gains fleet wide, miles that later in the day became essential for us. The important thing to note here is that we were sailing on the smaller, incorrect sail. What this morning proved was how Team SCA works as a team. Both Stacey and Abby worked straight through their off watch time in order to better the team's overall performance. Both women did it without batting an eye; in fact they both had smiles on their faces despite working straight for nearly 12 hours once they finished their second watch."
Goal	Continue sailing at a high speed despite using a smaller J2 sail while the broken J1 sail was repaired
Summary	Team SCA had a broken J1 sail that took several hours to repair below deck. During this time, the above deck crew successfully sailed the team at a fast pace while running on the smaller J2 sail. In fact, during this time, they "were the fastest boat in the fleet for the next position report" and "made gains fleet wide."
Source	November 27 - Corinna Holloran, OBR

APPENDIX F: TRIGGER TYPE CODEBOOK

Common Challenges [Triggers]	**Examples**	**Source**	**Trigger Type**
“Crisis” events	Things breaking on the boat Man overboard Someone getting hurt / sick Flooding onboard Loss of food or other resources Crashes Team member washed overboard	Alliger et al. (2015)	Taskwork
Performance/Time pressure	Navigation around iceberg Compressed racing	Alliger et al. (2015)	Taskwork
Insufficient resources	Running low on food / supplies	Alliger et al. (2015)	Taskwork
Challenging conditions	Change in environmental conditions Lack of wind/high wind Variation between high seas/normal seas Extreme temperature Constant wet environment - wet clothes, supplies, etc.	Alliger et al. (2015)	Taskwork
Hazardous work	Cleaning the keel, rudder, and propeller (when weeds get stuck and prevent full speed) while the boat is still moving - entails one member hanging over or swimming underneath the boat and removing the weeds	Alliger et al. (2015)	Taskwork
Interpersonal conflicts within team	Interpersonal conflict within team	Alliger et al. (2015)	Teamwork
Degradation of team resources / “Missing” team members (e.g. vacation, ill)	Team member out for a leg due to injury/illness Team member leaving during the leg due to a death in the family Team member fatality during the leg	Alliger et al. (2015)	Teamwork
Poor results	At bottom of race standings at leg end Backwards movement in doldrums or other poor weather conditions Tactic ended up not paying off Crash requiring retirement from the leg Went from a lead to a deficit in a short period of time	Alliger et al. (2015)	Taskwork

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