ORIGINAL RESEARCH

The Physical and Psychological Experience of Rowing the North Atlantic Solo and Unassisted

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Introduction—The present study followed an individual's successful, record-setting, solo, unsupported row across the North Atlantic Ocean to gain an understanding of the physical and psychological experience of this extreme endurance feat.

Methods—The participant was a 37-y-old male endurance athlete. Over the course of his nearly 39-d row, he provided daily ratings of effort, physical symptoms, and psychological experiences via a self-report questionnaire. Quantitative data were analyzed using simulation modelling analysis to examine within-day and cross-lagged correlations between perceived exertion and all other variables. Qualitative data were examined via thematic content analysis.

Results—Results showed that, on average, the participant experienced low levels of pain intensity, pain interference, fatigue interference, sleepiness, loneliness, boredom, anxiety, and frustration, in contrast to moderate scores for fatigue, restfulness, positive emotions, calmness, and confidence. There were statistically significant correlations between higher levels of perceived exertion and higher same-day levels of pain interference, fatigue, and fatigue interference, as well as lower same-day levels of calmness, loneliness, and boredom. Qualitative responses revealed 3 primary stressor types (internal physical, internal psychological, and external stressors) and 5 coping responses (acceptance/mindfulness, active response/problem solving, adjusting expectations/goal setting, distraction, and resignation).

Conclusions—Study findings indicate that the extreme athlete experienced physical and emotional challenges, but he demonstrated positive adjustment via the frequent experience of positive emotions and proficient use of a broad set of coping strategies matched to the daily stressor being addressed.

Keywords: survival at sea, positive psychology, resilience

Introduction

Each year, a small number of individuals attempt uncommon physical feats, such as traversing continents by foot or bicycle or crossing oceans via human- or wind-powered boat. Because of the infrequency of these feats and the difficulty of conducting research on these

accomplishments, relatively little is known about the physical and psychological experience of these athletes. The limited available literature^{1–3} is consistent with anecdotal reports that these endeavors are ripe for physical and psychological challenges. Research on the coping strategies these athletes use to deal with these challenges provides unique insight into how humans can succeed in the face of adversity.

A very small subset of studies has examined the physical and/or psychological experiences of participants in real time as they engage in atypical physical feats. Research on physical and psychological symptoms has shown that moderate or higher levels of pain, fatigue,

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depression, tension, and confusion paired with the deployment of adaptive or helpful coping strategies aids the individual in continuing toward the goal despite the unpleasant symptoms.¹⁻⁴ These studies have also demonstrated that symptoms often increase in the middle of events and improve as individuals near the finish. Although these studies describe the evolution of symptoms over the course of the athletic event, less is known about the relationship of symptoms to performance outcomes in extreme athletic events. The role of psychological symptoms is more widely studied in conventional sports, but the findings are inconclusive; some studies suggest that mood states traditionally viewed as “positive” or “adaptive” are associated with positive outcomes, whereas others suggest that temporary “negative” mood states can be beneficial.⁵

Important research from within and outside of sport has demonstrated that the impact of symptoms on outcomes is often moderated by the individual’s deployment of coping strategies that modify the impact of the symptoms. For example, research shows that successful completion of round-the-world sailing events requires a diverse set of coping strategies to address a broad set of stressors.⁶ The largest body of relevant research has examined ultramarathon runners. For example, 24-h ultramarathon runners have been observed to experience a broad combination of stressors that were similarly met with a diverse set of coping strategies, which affected successful race completion.⁷ Another population of ultramarathon runners was noted to use both adaptive and maladaptive pain coping strategies, with maladaptive coping strategy use having the strongest effect on performance outcome.^{1,2}

The purpose of this study was to gain an understanding of the physical and psychological experience of an endurance athlete who completed a solo, unsupported, west-to-east row of the North Atlantic Ocean. This row has been completed by a mere 16 individuals; an additional 31 embarked on unsuccessful attempts (including 3 rowers lost to sea), for a 34% success rate.⁸ Oceanic rows are filled with numerous extreme physical and psychological obstacles, including prolonged physical exertion, exposure, and isolation. We had 3 study aims: (1) to understand the rower’s experience in terms of both his overall psychophysical profile and day-to-day evolution of ratings of perceived effort, pain, fatigue, sleepiness, positivity, calmness, confidence, loneliness, boredom, anxiety, and frustration; (2) to understand the association of study variables with perceived effort; and (3) to understand the primary types of challenges, the coping strategies that were deployed in response to challenges, and the associations between the 2 to gain a more thorough understanding of the challenges and coping repertoire of an individual completing this feat.

Methods

PARTICIPANT

The participant was a 37-y-old male from the United States. He had prior experience in rowing as a collegiate rower, but no prior ocean rowing experience. He did have experience in endurance events through the completion of numerous endurance running events. These notably include one of the most difficult and competitive single-stage ultramarathons in the world (246 km, 2014 Spartathlon in Greece), as well as the 2015 Race Across USA, a 4989 km (3100 mi) running stage race across the USA (1 marathon per day for 6 d · wk⁻¹ over 4 mo).

PROCEDURE AND DATA COLLECTION

Data collection was designed as a repeated series of daily assessments that were to be conducted for the duration of the participant’s transoceanic crossing, which started on June 27, 2018 and continued for 39 d. The original data collection plan was for the participant to log responses to a daily questionnaire (described in the following) in a password-protected file stored on his onboard laptop. On Day 5 of the crossing, the participant endured an unexpected capsizing while his laptop was not in its waterproof case, rendering the laptop useless and the first days’ data lost. He contacted the study team and offered to proceed with data collection by sending daily responses via secure email from his satellite phone. Thus, starting on Day 6, the participant sent a daily email to the research team; the data were transferred to a database stored at the lead researcher’s institution. As a result, this study includes data from Day 6 through the final day of his row (Day 39). Data collection procedures were reviewed by the lead investigator’s institution’s human subjects division and were determined to be exempt. The participant provided written consent to reporting of his data, with the understanding that confidentiality could not be protected.

MEASURES

The participant completed a daily questionnaire that included 15 quantitative self-report items, adapted from standardized surveys, and 2 qualitative self-report items.

Effort

The participant provided a daily rating of perceived exertion (RPE⁹) detailing how hard he felt he was working while rowing over the prior 24 h. The RPE is a 15-point numeric rating scale that ranges from 6 (no exertion) to 20 (maximum exertion) and has been shown to be a valid method of measuring effort in male competitive rowers.¹⁰

Table 1. Descriptive statistics

Variable	Mean	SD	Minimum	Maximum
Rating of perceived exertion	11.1	3.6	6	17
Worst pain	2.6	2.0	0	9
Average pain	1.3	1.2	0	5
Pain interference	0.8	0.9	0	2
Fatigue	4.3	2.7	0	8
Fatigue interference	2.8	2.6	0	8
Sleepiness	2.2	2.3	0	7
Restfulness	6.9	2.0	3	10
Positive emotions	5.7	1.9	2	10
Calmness	6.4	2.2	1	9
Confidence	5.5	1.9	1	9
Loneliness	1.3	1.5	0	5
Boredom	2.7	2.8	0	8
Anxious	3.5	3.0	0	10
Frustration	2.2	2.7	0	9

Perceived exertion is scored 6 (no exertion) to 20 (maximal exertion); all other variables are 0 (least/never/not at all) to 10 (most/always).

Physical experiences

The participant provided daily ratings of his worst pain, average pain, the extent to which pain interfered with his performance, average fatigue, the extent to which fatigue interfered with his performance, sleepiness, and the extent to which he felt rested after sleeping. All were rated as the average experience of the prior 24 h using a 0 to 10 scale, where 0 was the least/never/not at all and 10 was the most/always; these were adapted from existing, validated questionnaires.^{11–13}

Psychological experiences

The participant provided daily ratings of the extent to which he felt happy/excited/enthusiastic, calm/relaxed, confident/proud, lonely, bored/unenthused, anxious/nervous/jittery, and frustrated/angry (adapted from the Positive and Negative Affect Schedule).¹⁴ As with the physical experiences, these were each rated as an average experience over the prior 24 h using a 0 to 10 scale, where 0 was the least/never/not at all and 10 was the most/always.

Qualitative coping questions

The participant concluded the daily questionnaire by answering 2 qualitative questions in 1 to 3 sentences each. These questions asked him to describe the greatest challenge or stressor he experienced over the past 24 h and how he coped with that challenge.

STATISTICAL ANALYSIS

Basic descriptives were calculated (Table 1). To determine the day-to-day evolution of study variables, the course of perceived exertion was plotted alongside the course of all other variables (Day 6, July 2, 2018 to Day 39, August 4, 2018). To aid visual clarity, variables are presented alongside the course of perceived exertion in 4 groups: pain-related variables (worst pain, average pain, and pain interference); fatigue variables (average daily fatigue and fatigue interference); sleepiness and restfulness; positive emotions, calmness, loneliness, and confidence; and boredom, anxiety, and frustration. Histograms of all variables were visually inspected and, due to nonnormal distributions, Mann-Whitney U tests were conducted to determine if there were statistically significant differences in variables on rowing and nonrowing days ($P < 0.05$ used as the threshold to define statistical significance).

Simulation modelling analysis (SMA) was used to analyze within-day correlations and 1-d cross-lagged correlations between perceived exertion (RPE) and all other variables in separate analyses. SMA uses a bootstrapping procedure and takes into consideration autocorrelation within variables over time.¹⁵ One thousand simulations were used and, owing to nonnormal data distribution, Spearman's rho was calculated for all correlations. Three associations were examined for each variable: within-day correlation and 1-d cross-lagged correlations, with perceived exertion leading (ie, the day before) or lagging (ie, the day after) the examined variable. A Bonferroni correction was applied that took into consideration multiple testing for each variable. A P value of < 0.017 was therefore used to define statistical significance in SMA.

Finally, to examine the participant's qualitative descriptions of daily stressors and the associated coping strategy, 2 members of the research team independently conducted a thematic content analysis^{16–18} of the daily qualitative responses, with additional researchers collating, collapsing, and reconciling. The goal was to identify overarching themes regarding types of challenges and coping responses. The initial coding scheme was shared with the entire research team and was revised until inter-subjective consensus on the final themes was reached. The resulting data were coded as 3 types of stressors (internal/physical, internal/psychological, external) and 5 types of coping responses (acceptance/mindfulness, active response/problem solving, adjust expectations/goal setting, distraction, resignation). A Chi-squared test was conducted to assess for a significant association between the types of stressors and types of coping responses used.

Figure 1. The course of perceived exertion and pain variables on rowing and nonrowing days.

Figure 2. The course of perceived exertion and fatigue variables on rowing and nonrowing days.

Results

DESCRIPTION OF THE OCEANIC CROSSING

The participant departed St. John's, Newfoundland, Canada, on June 27, 2018 and covered approximately 3218 km (2000 mi) over 38 d, 6 h, and 49 min, ending at St. Mary's Harbor in the Isles of Scilly, England (see <https://my.yb.tl/brycerows> for an interactive map). At the time of completion, he was certified by the Guinness Book of World Records' delegate (Ocean Rowing Society International)⁸ as having completed the fastest west-to-east solo and unsupported crossing of the North Atlantic (the prior record was 53 d, 8 h, 26 min).

Given the multiday effort, the rower planned to spend portions of each day rowing and resting. However, he also encountered adverse weather (including Hurricane Chris), which resulted in his not being able to row on $n=8$ d. On the average rowing day, the participant rowed approximately 10 to 11 h between 0800 and 2000, with the nonrowing time attributed to eating or short rest breaks. Nonrowing days were dictated entirely by the weather and occurred when wave height was >3 m (10 ft). During all nonrowing times (planned or unplanned), the participant would either set his rudder and let his boat drift if the wind was blowing west-to-east or use a sea anchor to try to eliminate drift.

OVERALL PROFILE AND DAY-TO-DAY EVOLUTION OF STUDY VARIABLES

Distribution scores for the 15 study variables are presented in Table 1. The scores are notable for low ratings of pain intensity, pain interference, fatigue interference, sleepiness, loneliness, boredom, anxiety, and frustration, in contrast to moderate scores of fatigue, restfulness, positive emotions, calmness, and confidence.

The courses of perceived exertion and all other variables are depicted in Figures 1 to 5 (Day 6 to Day 39). Of 33 d of data collection, 8 were nonrowing days. Seven variables exhibited statistically significant differences on rowing days compared to nonrowing days. Perceived exertion, fatigue, fatigue interference (all $P<0.001$), and pain interference ($P=0.005$) were all significantly higher on rowing days. Loneliness ($P=0.009$), anxiety ($P=0.05$), and boredom ($P=0.017$) were significantly lower on rowing days.

ASSOCIATION OF PERCEIVED EXERTION WITH STUDY VARIABLES

SMA identified statistically significant correlations between higher levels of perceived exertion and higher levels of pain interference on the same day ($r=+0.44$, $P=0.005$); higher levels of fatigue on the same day ($r=+0.63$, $P<0.001$), and higher levels of fatigue on the following day ($r=+0.50$, $P<0.001$); higher levels of fatigue interference on the same day ($r=+0.53$, $P=0.001$) and higher levels of fatigue interference on the following day ($r=+0.45$, $P=0.006$); lower levels of calmness on the same day ($r=-0.41$, $P=0.01$); lower levels of loneliness on the same day ($r=-0.51$, $P<0.001$); and lower levels of boredom on the same day ($r=-0.41$, $P=0.005$). There were no significant relationships (either same-day or lagged) between perceived exertion and worst pain, average pain, sleepiness, restfulness, positive emotion, confidence, anxiety, or frustration.

PRIMARY STRESSORS AND ASSOCIATED COPING RESPONSES

Examination of qualitative responses revealed 3 primary stressors and 5 coping responses (Table 2). The stressors

Figure 3. The course of perceived exertion and sleepiness and restfulness on rowing and nonrowing days.

were internal physical stressors (eg, poor sleep, injury, gastrointestinal upset); internal psychological stressors (eg, boredom, loneliness, anxiety); and external stressors (eg, storms, rough seas, equipment failure). He coped with these using acceptance/mindfulness (eg, “I focused on what was near at hand and controllable,” “just had to accept it”); active response/problem solving (eg, “I called the weather guys and talked with them about it, put a plan together,” “I analyzed the situation...and made the best logical decision”); adjusting expectations/goal setting (eg, “reframed my expectations,” “today I released the anxiety of finish expectations and decided I’d finish whenever I finish and I’ll be ok with that”); distraction (eg, “found productive things to do: wrote a blog post, chatted with girlfriend via text,” “found little things to occupy my mind,” “read my Kindle”); and resignation (eg, “recognized there’s nothing I can do about what’s happened”). There were statistically significant differences in coping strategy use by stressor ($\chi^2=26.88$, $P<0.01$). Post hoc analyses

Figure 4. The course of perceived exertion and positive emotions, calmness, loneliness, and confidence on rowing and nonrowing days.

Figure 5. The course of perceived exertion and boredom, anxiety, and frustration on rowing and nonrowing days.

were notable for the fact that the participant relied primarily on active response/problem solving for external stressors, used equal parts acceptance/mindfulness and active response/problem solving for physical stressors, and used primarily adjust expectations/goal setting and distraction for psychological stressors.

Discussion

This study provides unique, prospective data describing the experience of an athlete who completed an extremely rare feat—the solo, unsupported crossing of the North Atlantic—in record time. Although limited in terms of generalizability, his experience provides important insight into the characteristics and experience of an individual who successfully pushed the limits of human performance in a potentially threatening natural environment.

The data suggest that rowing and nonrowing periods presented distinct challenges. On rowing days, physical challenges (eg, perceived exertion, fatigue, and fatigue interference) were higher. On nonrowing days, psychological challenges (eg, loneliness, anxiety, and boredom) were higher. These findings may be applicable to other multi-stage endurance events (eg, multistage ultramarathons, bicycle races, sled races), where sustained athletic activity is interrupted by periods of rest. Findings suggest that athletes who engage in this type of prolonged endurance event may face a wide range of physical and psychological challenges that, based on the findings from this athlete’s data, may call for diverse coping strategies. For this athlete, exertion was associated with both benefits and challenges. Although pain and fatigue increased with increased exertion, feelings of boredom, loneliness, and calmness decreased. This could be due to an increase in vigor/excitement with exertion rather than an increase in negative emotions (anxiety). Notably, the rower reported that his highest

Table 2. Coping strategy use by type of stressor

	<i>Acceptance/ Mindfulness</i>	<i>Active response/ Problem solving</i>	<i>Adjust expectations/ Goal setting</i>	<i>Distraction</i>	<i>Resignation</i>
External stressor (n=14)	2	12	0	0	0
Physical stressor (n=7)	3	4	0	0	0
Psychological stressor (n=11)	1	1	4	4	1

exertion was often associated with sustained rowing with few breaks (to sustain course and direction). The correlation between increased exertion and higher levels of positive emotion and lower levels of negative emotion is consistent with other endurance athlete case studies.⁴

Examination of daily challenges and coping identified different stressors related to different coping strategies. Adjusting expectations, distraction, and resignation were most often used in response to psychological stressors; these were not reported in response to external or physical stressors. For these, the athlete primarily used active/problem solving coping; in cases in which the problem was not directly solvable (eg, weather/rough seas), mindfulness/acceptance-type approaches were used. Such flexible coping has been described as a critical characteristic for adaptive coping and has been shown to increase as athletes age.¹⁹ The pattern of different stressors mapping onto different types of coping suggests that this athlete demonstrated good “strategy-situation fit,” characterized by deploying strategy/demand-specific coping rather than a nonspecific or “one-size-fits-all” coping response.^{20,21} His use of mindfulness/acceptance-based approaches to coping with unchangeable situations, combined with his overall positive affective profile, indicates high emotional intelligence and an ability to “self-soothe” during adversity.^{22,23} The increased use of mindfulness-based interventions in sport is built, at least in part, on the premise that being more mindful not only increases the likelihood of positive emotions and coping and decreases the likelihood of negative emotions and coping, but also increases the ability to monitor and adapt to an emotional experience in any given circumstance.⁵

With regard to limitations of this single-subject self-report study, we recognize questionable generalizability. Given the rare nature of the feat, it is virtually impossible to collect additional data, but this does leave open the question of whether other athletes who accomplish similar feats would describe similar symptoms and coping strategies. Additionally, the loss of the first 5 d of data because of damage to the study equipment meant we were unable to report on the initial days of the journey. Another unique limitation was the fact that weather conditions created unrowable seas, causing unevenness in days spent rowing and days spent in the cabin. Rowing and nonrowing days were included in our analysis. Given that reasons for not

rowing were largely attributable to external conditions (eg, weather) and not internal experiences (eg, pain), and that, by definition, exertion was 0 on nonrowing days, our results may not reflect direct relationships between effort and other variables. However, our findings are a reflection of the multifactorial and potentially capricious nature of this particular endurance task. Finally, there were limitations to the measures, including their self-report nature. Although this is the standard—and, really, only—way to measure internal experiences, it is important to recognize that it reflects the perception of the individual. We used brief measures to limit participant burden and, although there is precedent for their use, it is important to note that they tend to be less stable than their longer counterparts.

Conclusions

This study was conducted to learn about the ways in which individuals may thrive in the face of physical and psychological challenges while exposed to extreme conditions. A disproportionate majority of research is conducted on disorder and dysfunction. By studying human excellence, we can better understand the extent to which it is dependent on the absence of disorder and dysfunction or on the presence of unique factors. Indeed, here we observed both the relative absence of maladaptive factors and the presence of adaptive factors. We also observed the apparent necessary presence of a diverse set of coping strategies that matched circumstances. These observations may be useful in refining the targets we set for individuals who are striving for improvement.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.wem.2019.12.008>.

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