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To cite this article: Kate Evans & Ryan J. Gagnon (2018): A structural model exploring gender differences in perceived constraints to competition climbing, *Annals of Leisure Research*, DOI: [10.1080/11745398.2018.1534598](https://doi.org/10.1080/11745398.2018.1534598)

To link to this article: <https://doi.org/10.1080/11745398.2018.1534598>



Published online: 17 Oct 2018.



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## A structural model exploring gender differences in perceived constraints to competition climbing

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### ABSTRACT

Competition climbing has recently been thrust into the spotlight with its integration into the Olympics starting in 2020. A growing body of research has focused on the leisure experience of competition climbing and has indicated that it may be a unique setting in which gendered constraints manifest differently than previously understood. The current study seeks to continue building our understanding of leisure constraints by focusing on perceived constraints of competition climbers. Using a questionnaire adapted from White's (2008) structural model of leisure constraints, members of USA Climbing were invited to share their experiences related to competition climbing ( $n = 729$ ). The results indicate that women indicated higher levels of motivation ( $\beta = .140$ ,  $p = .001$ ,  $SE = 0.027$ ) and perceived no difference in constraints to competition climbing ( $\beta = -.023$ ,  $p = .379$ ,  $SE = 0.046$ ). These findings have implications for our understanding of leisure constraints and the potential gender inclusivity of particular adventure sports.

### ARTICLE HISTORY

Received 5 January 2018  
Accepted 8 October 2018

### KEYWORDS

Leisure constraints; structural equation modelling; negotiation efficacy; gender

With the proliferation of artificial rock climbing walls within community recreation centres, schools, playgrounds, universities, and commercial locations, it is important to understand the interpersonal and intrapersonal factors which facilitate continued participation within these facilities (Climbing Business Journal 2017; Gagnon et al. 2017). Further, due in part to the demonstrated differences in the experiences and participation of men and women in adventure sports (Evans and Anderson 2018), it is important to understand the potential differences between male and female climbers as they participate in this emerging sport. Recent research indicates the gendered division in the experiences of men and women typical to adventure recreation sports (e.g. Ghimire et al. 2014; Clayton and Coates 2015; Evans and Anderson 2018) may be more nuanced in the setting of climbing as sport (Gagnon et al. 2017). Thus, given these emerging challenges, the purpose of this study was twofold: first, to examine the factors that inhibit or promote participation within competition climbing (i.e. constraints and the constraints negotiation process) and second, to understand the potential differences male and female participants

experience related to these constraints. As such the current study was guided by the following research questions:

- (1) Does participation level differ significantly between male and female competition climbers?
- (2) Do perceived constraints to competition climbing differ significantly between males and females?
- (3) Does the constraints negotiation process differ significantly between males and females?

## Literature review

### *Rock climbing*

Rock climbing as a sport has been growing rapidly and consistently for nearly ten years with a steady 9% annual growth in commercial climbing gyms since 2009 (Climbing Business Journal 2017). Most recently, the International Olympic Committee announced that climbing was officially approved as an Olympic event, starting in the 2020 Tokyo Summer Games (Climbing 2016). Furthermore, rock climbing is an emerging topic of scholarly investigation. A review of literature indicates a wide range of research investigating rock climbing as serious leisure (Wood 2016; Dilley and Scraton 2010), rock climbing as a tourism sport (Caber and Albayrak 2016), the risk associated with rock climbing (Young et al. 2014), rock climbing sites and the meanings associated with them (Kulczycki and Hinch 2011), outcomes related to rock climbing (Aras and Ewert 2016), and injuries associated with rock climbing (Jones, Llewellyn, and Johnson 2015; Pierpoint, Klein, and Comstock 2017). Beyond these studies, research has also emerged exploring rock climbing as sport, specifically competition climbing (e.g. Garst, Stone, and Gagnon 2016).

### *Competition climbing*

Competition climbing has only recently emerged as a formalized sport within the United States, with the sport's national governing body, USA Climbing, founded in 1998. That said, USA Climbing has been formally recognized by long standing oversight committees such as the International Olympic Committee (IOC), International Federation of Sport Climbing (IFSC), and the United States Olympic Committee (USOC). USA Climbing serves both youth (19 years old and younger) and adult (20 years old and over) climbers (USA Climbing 2016) and as cited in Gagnon et al. (2016, 4):

Indoor competition climbing typically takes places in purpose built facilities and consists of three primary sub-sports: bouldering, sport (or lead) climbing, and speed climbing (USA Climbing, 2016). USAC competitions take place at the local, regional, and national levels. Advancement to the next level (e.g. from the regional to the national level) requires a high placement at a competition; typically, the top five competitors in one or more sub-sports advance. These competitors are then invited to participate in higher levels of the sport due to their success in prior competitions both nationally and internationally. For USAC competitors to win an event, they must complete the most difficult climbing problems in the most efficient way possible (e.g. completing a bouldering route in only one try without falling off route) in comparison to their competitors.

Research focused on competition climbing has indicated that the sport may be more gender-neutral than traditionally recognized in other outdoor recreation pursuits (Ghimire et al. 2014; Evans and Anderson 2018). This may be due to the nature of competition climbing and the unique ethos of competing against climbing routes rather than against other climbers (described by climbers as ‘us against the wall instead of us versus each other’; Gagnon et al. 2017). Similarly, Dilley and Scraton (2010, 137) concluded that climbing (including various forms of indoor and outdoor climbing, bouldering, and mountaineering) provided a ‘collective and social space where women felt that their difference was accepted’. These findings raise interesting questions about how leisure constraints may be experienced and negotiated by men and women generally in the sport of climbing and within competition climbing.

### **Leisure constraints**

Leisure constraints research is focused on the factors that inhibit or prevent individuals from forming leisure preferences, participating in leisure and recreation, and/or enjoying leisure activities (Jackson, Crawford, and Godbey 1993; Zanon et al. 2013). These factors are generally theorized as three distinct but interconnected mechanisms that inhibit or prevent leisure participation, referred to as intrapersonal, interpersonal, and structural constraints (Crawford and Godbey 1987). *Intrapersonal constraints* reflect those factors that are germane to the individual including their own fears and attitudes towards an activity, *interpersonal constraints* reflect social relationships with others such as a lack of companions to participate in an activity with, and *structural constraints* include aspects such as geographic distance, monetary costs, and cultural taboos towards an activity (Kleiber, Walker, and Mannell 2011). Constraints not only impact participation (or lack thereof), but can also impact the formation of preference(s) for specific leisure activities (Crawford and Godbey 1987), and can influence the leisure experience itself, including how often one participates in an activity and the level of specialization he/she achieves (Crawford, Jackson, and Godbey 1991).

Constraints are not generally conceptualized as insurmountable barriers to leisure participation. Rather, participation in and the experience of leisure is dependent upon an individual’s ability to negotiate through specific constraints in pursuit and execution of a leisure or recreation experience (Jackson, Crawford, and Godbey 1993). For instance, if an individual lacks the fundamental skills to participate in rock climbing, she/he could negotiate this constraint by taking a course on knot-tying and belay techniques. Individuals’ *negotiation-efficacy*, or the extent to which they believe they are able to successfully negotiate constraints, plays an important role in the constraints negotiation process (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007; White 2008). In a study testing a structural model of leisure constraints negotiation within outdoor recreation settings, White (2008) concluded that this negotiation-efficacy was not only positively related to constraints negotiation, but also reduced the extent to which individuals perceived constraints in the first place. Beyond negotiation efficacy, an additional factor theorized to influence an individuals’ negotiation of constraints relates to their motivation for participating in a leisure activity.

Participants’ motivation for participating in an activity has been shown to play a role in ‘both the initiation and outcome of the negotiation process’ (Jackson, Crawford, and

Godbey 1993, 9). However, the research literature is ambiguous on the precise role of motivation in recreation participation and constraints negotiation. For instance, in a study examining the leisure constraints negotiation process in a corporate employee recreation setting, Hubbard and Mannell (2001) found no direct relationship between individual motivation levels and perceived constraints. However, the authors concluded individual motivation influenced the constraints negotiation process by indirectly increasing the amount of effort highly motivated individuals were willing to expend in negotiating constraints (Hubbard and Mannell 2001). More recent research (e.g. Alexandris et al. 2003; Alexandris, Kouthouris, and Girgolas 2007) indicates individuals' motivation levels are generally, negatively related to their actual perceptions of constraints. Conversely, these motivation levels are positively related with successful utilization of negotiation strategies to overcome constraints to participation within a leisure or recreation activity. Furthermore, Loucks-Atkinson and Mannell (2007) and White (2008) both concluded motivation can directly and positively influence constraint negotiation and recreation participation levels. The sources and types of motivation measured vary in leisure research, but White (2008) drew on the work of Driver (1983) in operationalizing motivation as potential achievement, enjoyment of nature, escape, and socialization. Because of the relatively small amount of existing literature and the ambiguity in results exploring this connection, researchers have indicated the need for deeper exploration of the potentially complex relationship between motivation and leisure participation (Chen and Pang 2012; Hubbard and Mannell 2001; Loucks-Atkinson and Mannell 2007).

Some of the most recent additions to the fields' understanding of leisure constraints and motivation comes from research exploring the relationship(s) between constraints negotiation and serious leisure (e.g. Kennelly, Moyle, and Lamont 2013; Lamont, Kennelly, and Moyle 2014). In a study of triathletes, Kennelly, Moyle, and Lamont (2013) focused on the cognitive (e.g. those related to the athletes' mindset) and behavioural (e.g. planning and time management) negotiation strategies employed by triathletes and their cyclical levels of commitment (e.g. intense periods of participation followed by prioritization of other aspects of life). Through this focus, the authors suggested the constraint negotiation process was inherently individualistic, where each athlete had unique strategies to balance available resources against competing priorities (Kennelly, Moyle, and Lamont 2013). This research provides additional contextualization for the nuances involved in the constraints negotiation process, especially for those with continued durable participation in a leisure pursuit (Kennelly, Moyle, and Lamont 2013).

### ***Constraints to adventure recreation***

For the purposes of this paper, competition climbing is conceptualized as adventure recreation. While competition climbing generally takes place within an indoor context, it also falls within the realm of adventure recreation, as defined by Little (2002), in that it is both physically and intellectually challenging. While adventure recreation 'predominantly' takes place in the outdoors, it is not limited to this realm (Little 2002). Based on this conceptualization, in building an understanding of the unique contexts, constraints, and background of adventure recreation, literature on outdoor recreation – a common venue for adventure recreation – is drawn upon heavily in the current study.

Within outdoor recreation, leisure constraints have been a focus for some time, dating to the work in the 1960s conducted by the U.S. Outdoor Recreation Resources Review Commission (ORRRC 1962). In the research completed since, a variety of constraints have been identified as normative to outdoor and adventure recreation pursuits including a lack of time, difficulty accessing outdoor recreation sites, over-crowding, cost, and a lack of knowledge (Walker and Virden 2005; Little 2002). This research also indicates a number of demographic factors may influence participation within outdoor recreation and related constraints processes (e.g. motivation and negotiation levels). These include socioeconomic status (SES) (Johnson, Bowker, and Cordell 2001; Lee, Scott, and Floyd 2001), age (Floyd et al. 2006), race and/or ethnicity (Ghimire et al. 2014; Gómez 2002), and gender (Little 2002; Evans and Anderson 2018).

### ***Gender, adventure recreation, and constraints***

There are multiple macro (e.g. Socio Economic Status) and micro (e.g. expertise) level factors that promote or inhibit participation within recreation, sport, and leisure activities (White 2008). Among these factors, the empirical research suggests women often face unique constraints to their participation in recreation, sport, or leisure activities (Evans and Anderson 2018; Little 2002; Culp 1998). These frequent gender-centric constraints are due to multiple elements, including gender role expectations (Evans and Anderson 2018; Little 2002), a lack of role models and activity partners, a lack of exposure to the outdoors (Culp 1998), a lack of knowledge/skill (Culp 1998; Warren and Loeffler 2006), and fear (Clark 2015). For instance, women are more likely to be prevented from participating in adventure recreation because of gender-normative expectations relating to their role within the family (e.g. as caretaker for family members, children, significant others) and the guilt associated with abandoning these gender specific and socially constructed responsibilities (Little 2002; Clayton and Coates 2015). Additionally, females often lack 'recreation role models' in adventure recreation. Females are rarely represented recreating in adventure sports or in the outdoors in popular media. For example, in a study of the representation of female rock climbers in *Climbing* magazine over a 15-year period, Vodden-McKay and Schell (2010) found that the range of women represented was very narrow (e.g. able-bodied, feminine, white, and thin) and women were typically portrayed in traditional gender roles (e.g. wife, mother, girlfriend), with an emphasis on their physical appearance. This gendered depiction potentially constrains how women view their own ability to participate in these types of recreation. Further, gendered expectations can impact the way males view females in recreation settings, potentially reinforcing gender role expectations and marginalization of females (Vodden-McKay and Schell 2010; Huybers-Withers and Livingston 2010).

Additional research exploring women's (non)participation in the both adventure and outdoor recreation includes a lack of activity specific knowledge (Little 2002; Warren and Loeffler 2006) and fear (Wesely and Gaarder 2004). Due in part to socialized gender expectations and a lack of female role models, females are less likely to be exposed to adventure recreation and the outdoors at a young age (Culp 1998). This gendered socialization is illustrated within typical youth programmatic opportunities for such exposure (e.g. Boy Scouts vs. Girl Scouts) where these programmes tend to adhere to gendered norms. For instance, Boy Scouts tend to focus on outdoor skill-building and outdoor

activities, Girl Scouts are more likely to focus on traditionally feminine activities with badge options including those focused on childcare skills and sewing (Denny 2011; Warren and Loeffler 2006). Thus, without this early exposure, females often lack the necessary opportunities for fundamental outdoor skill building and in turn, are more likely to experience self-doubt and fear that they may embarrass themselves when they do participate in outdoor recreation (Evans and Anderson 2018; Warren and Loeffler 2006; Dingle and Kiewa 2006; Culp 1998). This fear and self-doubt can manifest in several ways; first, females may fear rejection by males in adventure recreation contexts. Even if females have a strong base of skills, they are more likely than males to have an incongruent view between their perceived competence and actual competence (Warren and Loeffler 2006). Specifically, a female's actual competence (i.e. ability) may be equivalent to or exceed her male counterparts, but paradoxically she may be more likely than her male peers to question her skills (Evans and Anderson 2018). The fear that females experience in outdoor recreation settings often goes beyond embarrassment or rejection, and into the realm of fear of physical and psychological harm due to the social construction of females as weaker and more vulnerable than males (Clark 2015). Compared to males, females tend to report greater levels of fear related to the seclusion often associated with outdoor recreation. This includes encountering wild animals, getting lost, physical injury, and/or the physically and sexually violent/harassing behaviour of others (Coble, Selin, and Erickson 2003; Wesely and Gaarder 2004).

For the purposes of this study, and due to the prior research illustrating a potentially more gender integrated nature within competition climbing (Gagnon et al. 2017), gender was selected as the primary variable in data analysis to further develop understanding of how males and females experience constraints in recreation and sport pursuits. More simply, emerging research suggests that many of the gendered constraints germane to other recreation and sport pursuits, may not be present within the sport of climbing.

### ***Measuring leisure constraints***

Building on the work of Hubbard and Mannell (2001) and Loucks-Atkinson and Mannell (2007), White (2008) proposed a new model to further examine the constraints negotiation process within the context of outdoor recreation, testing eight specific hypotheses related to motivation, constraints negotiation, and negotiation-efficacy, White sought to extend the theoretical understanding of the constraints negotiation process. In his study, White tested a conceptual model with a larger random sample, with a more diverse population, than had previously been used to test the generalizability of earlier models (e.g. Hubbard and Mannell 2001). This approach allowed White to analyse his hypothesized model using confirmatory factor analysis (CFA) to evaluate the measurement properties of the proposed model and structural equation modelling (SEM) to evaluate his guiding hypotheses. The results of White's (2008) study provided support for this conceptual model and shed additional light on the interaction of motivation and negotiation-efficacy in the constraints negotiation process. Building upon this investigation, the purpose of the current study is to examine the factors that promote or inhibit participation within competition climbing and to explore potential differences between men and women in perceived constraints and constraint negotiation through an application of White (2008) conceptual model.

These purposes were explored by 10 hypotheses presented in [Table 1](#) and [Figure 1](#). Secondary to this hypothesis testing, the current study aimed to further test and validate White's (2008) model through replication of the CFA and SEM.

## Method

### Data collection and sample

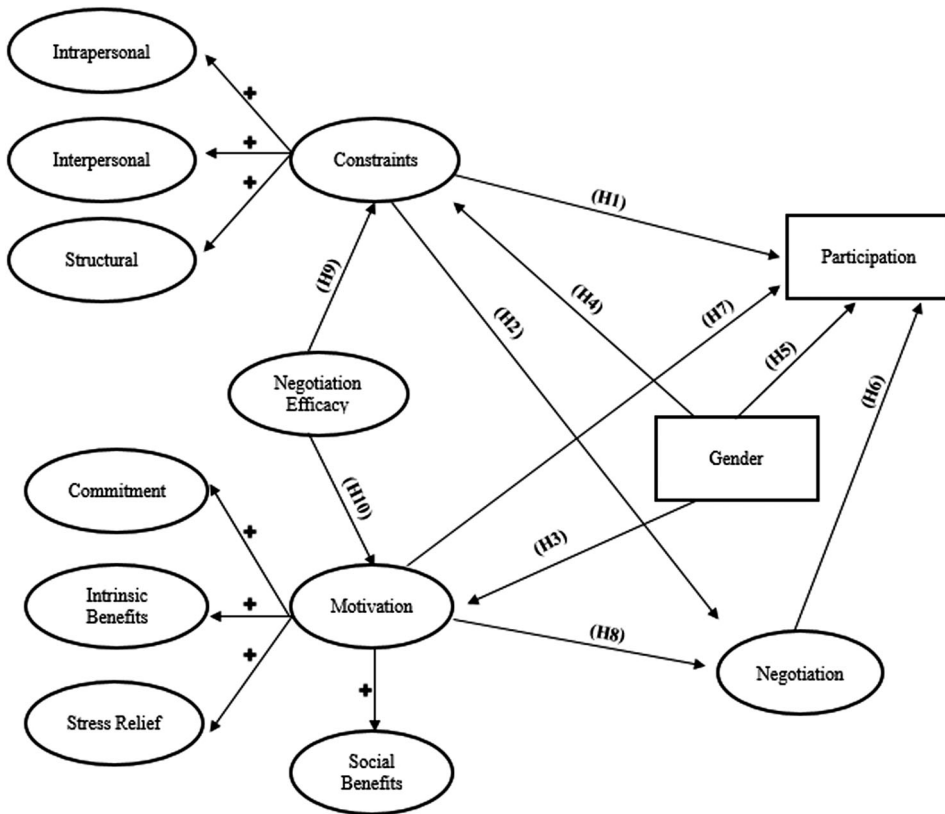
In partnership with USA Climbing, the national governing body for competition climbing in the United States, study data were collected over 45 days in Winter 2016, as part of a larger investigation exploring the motivations and behaviours of competition climbers and related stakeholders. The questionnaire was implemented via Qualtrics online survey software in the form of a link provided through USA Climbing's Facebook page, totalling three announcements, and through USA Climbing's member email list also totalling three announcements over the 45-day time-period. Incentive for participation was provided in the form of entry to win one of three climbing equipment packages valued at US\$175.00. The combination of these strategies resulted in 6,710 unique viewings of the email or Facebook post. Of those who viewed the questionnaire, 1,463 respondents started the survey and 1,171 completed the full questionnaire, resulting in a 17.45% response rate to the overall questionnaire.

Through skip-logic embedded within the questionnaire, respondents were asked to identify their primary role (e.g. active competition climber, volunteer, coach, parent of climber) within the climbing community. Those who identified primarily as an active competition climber were redirected to demographic questions (see [Table 2](#) for description of sample) and the focus of this study, perceived constraints to competition climbing. This skip-logic within the questionnaire process led to a sample of 743 respondents. A power analysis revealed that the minimum sample size necessary to reject the null hypotheses ( $R^2 = .10$ ,  $\lambda = 16.75$ ,  $\alpha = .01$ ) was 156, indicating that the minimum sample was exceeded for the purposes of this study (Cohen et al. 2003). Prior to analysing the

**Table 1.** Hypotheses listed by model path.

Hypothesis number	Hypotheses
H <sub>1</sub>	Perceived constraints have a direct, negative effect on participation in competition climbing (Jackson, Crawford, and Godbey 1993)
H <sub>2</sub>	Perceived constraints have a direct, positive effect on constraints negotiation in competition climbing (Jackson, Crawford, and Godbey 1993)
H <sub>3</sub>	Females are less motivated than males to participate in competition climbing (Culp 1998; Little 2002; Vodden-McKay and Schell 2010)
H <sub>4</sub>	Females perceive more constraints to competition climbing than males (Culp 1998; Little 2002)
H <sub>5</sub>	Females participate in competition climbing less than males (Little 2002; Crawford and Godbey 1987)
H <sub>6</sub>	Constraints Negotiation has a direct, positive effect on participation in competition climbing (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007)
H <sub>7</sub>	Motivation has a direct, positive effect on constraints negotiation in competition climbing (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007)
H <sub>8</sub>	Motivation has a direct, positive effect on participation in competition climbing (Alexandris et al. 2003; Alexandris, Kouthouris, and Girgolas 2007)
H <sub>9</sub>	Negotiation efficacy has a direct, negative relationship with perception of constraints in competition climbing (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007)
H <sub>10</sub>	Motivation has a direct, positive relationship with negotiation efficacy in competition climbing (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007)





**Figure 1.** Hypothesized model of constraints to participation in competition climbing.

samples descriptive information and exploring hypothesized relationships data were screened for outliers utilizing Mahalanobis Distance and the Chi-square distribution function ( $p \leq .001$ ) in SPSS 24, which resulted in the removal of 14 respondents. After removing these outliers, the ‘cleaned’ dataset contained 729 respondents who completed the

**Table 2.** Respondent demographic information ( $N = 730$ ).

Gender	Female = 325 (44.5%)	Male = 402 (55.1%)	Non-binary = 3 (.4%)
Ethnic group	White = 603 (82.7%)	Asian origin = 60 (6.7%)	Hispanic = 28 (3.8%)
	Multiple race = 48 (6.6%)		
Age	$M = 20.40$ years, $SD = 7.589$ , range = 10–49 years		
Education level	Less than high school $n = 89$ (12.2%)	Some high school $n = 172$ (23.6%)	High school $n = 97$ (13.3%)
	Some college $n = 176$ (24.2%)	Bachelor’s degree $n = 132$ (18.1%)	Master’s degree or doctorate $n = 62$ (8.5%)
Annual household income level (US\$)	0–25,000 $n = 88$ (21.1%)	25,001–50,000 $n = 62$ (14.8%)	50,001–75,000 $n = 59$ (14.1%)
	75,001–100,000 $n = 67$ (16.1%)	100,001–150,000 $n = 56$ (13.4%)	150,001–200,000 $n = 41$ (9.8%)
	200,001–250,000 $n = 12$ (2.9%)	250,001–300,000 $n = 15$ (3.6%)	300,001 and over $n = 19$ (4.5%)

adapted constraints scale (provided in the measurement model section below). After screening for outliers, the data were screened to determine if they were Missing Not at Random (MNAR) or Missing Completely at Random (MCAR) utilizing Little's test of MCAR within SPSS 24 (Little 1988). Descriptive tests indicated that complete information was available for 627 respondents (86.01% of total sample) and no item (i.e. question) had a level greater than 10% of missing values (0–7.82%). Further, the non-significant results of Little's test of MCAR [ $\chi^2(1, 283) = 1290.450, p = .436$ ] indicated that the data was MCAR. Given this evidence, missing data simulation was conducted utilizing a full information maximum likelihood (FIML) technique for the development of the measurement and structural models presented below. Due to an indication of a multi-variate kurtosis within the data a robust estimation technique was utilized (e.g. MLR estimators) within the EQS 6.3 software to mitigate potential non-normality (Byrne 2006) for later latent hypothesis testing.

Respondents were primarily male ( $n = 402, 55.1\%$ ), white ( $n = 603, 82.7\%$ ), educated, with 50.8% of the sample reporting at least some college attendance, and relatively affluent, with 50.2% of the sample reporting household income greater than US\$50,000 per year. The sample consisted of both youth (ages 10–19) and non-youth climbers (ages 19 and over). Regression analyses with individual items did not indicate statistically meaningful ( $p \leq .05$ ) differences in response choice based upon age. Respondents 17 years of age and under were prevented from responding to the household income question, as such this information was not utilized in those groups.

### **Questionnaire and scale development**

As noted earlier, the questionnaire was adapted from the work of White (2008). The questions were adjusted to reflect the context of the current study, competition climbing. For instance, a statement referring to structural constraints was changed from 'it is too expensive' to 'climbing gear is too expensive'. Additionally, statements were adjusted to address constraints specific to climbing (e.g. 'climbing sites are inaccessible') and specific to women (e.g. those related to a lack of technical skills or activity partners). In other instances, the statements from White's (2008) model were used, but the instructions prefacing each set of statements were adapted to ask participants to focus their answers on their experiences related to rock climbing. For example, when asked about constraints, the stem of the question read, 'Sometimes I haven't climbed because ...' Upon completion of adapting the questionnaire, a Qualtrics survey was created using the modified questions and items. For additional quality assurance, the Qualtrics-based questionnaire was piloted with 27 undergraduate students at a Midwestern, American regional university who provided feedback on question clarity, skip logic patterns, and overall survey design. Final changes were made to the survey based on these recommendations resulting in the version used for data collection with the larger climber sample.

### **Measurement model analysis**

Prior to exploring relationships between constructs through SEM, the questionnaire was analysed to ensure that it was psychometrically valid and reliable utilizing confirmatory factor analysis (CFA) in EQS 6.3 software. SEM and CFA (a special case of SEM) were

selected for analyses in this study as they replicate the approach of White (2008). Additionally, with an SEM approach, variables (i.e. question and/or items) are modelled with measurement error included. With alternative approaches (e.g. path analysis, multiple regression, MANOVA) the analyses assume that all variables are measured perfectly (i.e. without error, see Brown 2015; Kline 2011). Specifically, a multi-stage CFA was utilized, where the original measurement model was specified with all items orientated towards their theorized factor. Then through multiple stages the model was re-specified for issues such as error, poor unidimensionality, and unusually high or low covariances (Brown 2015). Beyond item level analyses, the quality of model fit was examined with the comparative fit indices (CFI), Bentler-Bonnett non-normed fit indices (N-NFI), the root means square error of approximation (RMSEA), and the scaled Yuan-Bentler chi-square ( $S/B\chi^2$ ) (Hu and Bentler 1999; Marsh, Hau, and Wen 2004).

### **Measurement model results**

The final CFA of the scale resulted in the removal of 6 items from the original 39-item scale as proposed by White (2008), for a total of 33 items in the final measure.<sup>1</sup> These six items were removed due to poor factor loadings within their theorized factor (i.e.  $\lambda \leq .400$ ) or evidence of loading onto multiple factors within the model (e.g. analyses suggesting shared error variance across factors as indicated by LaGrange Multiplier test). The final CFA model fit indices indicated that the final-nine factor solution fit the data well:  $S/B\chi^2(459) = 1217.672$ ,  $p \leq .001$ , CFI = .943, N-NFI = .935, RMSEA = .045 (90% CI .042–.048). Furthermore, as evidenced within Table 3, the nine factors demonstrated good convergent validity as indicated by factor loadings, average variance extracted (AVE) scores, and reliability (i.e. Joreskog's Rho ( $\rho$ ) and Cronbach's Alphas ( $\alpha$ )). Discriminant validity (e.g. factors measuring distinct constructs) of factors is evidenced in Table 4 with between factor correlations and  $\sqrt{\text{AVE}}$  scores. Specifically, the low between factor correlations (e.g.  $r \leq .505$ ) in combination with the high  $\sqrt{\text{AVE}}$  scores (e.g.  $\sqrt{\text{AVE}} \geq .648$ , see Table 4) indicates the nine factor 33-item measurement model measured distinct constructs.

## **Results**

Given the evidence of acceptable measurement properties, the hypotheses were tested through SEM. The final structural model also demonstrated acceptable model fit:  $S/B\chi^2(540) = 1443.947$ ,  $p \leq .001$ , CFI = .935, N-NFI = .928, RMSEA = .046 (90% CI .043–.049). A visual representation of relationships and hypotheses is provided in Figure 2. The hypothesized relationships between the variables were largely confirmed and the results are outlined below.

### **Constraints negotiation**

As hypothesized, as participants reported higher levels of perceived constraints, they also reported lower levels of participation ( $\beta = -.195$ ,  $p = .011$ ,  $SE = 0.523$ ) (Crawford and Godbey 1987). Additionally, as the participants' perceived constraints increased, so did their use of negotiation strategies ( $\beta = .289$ ,  $p \leq .001$ ,  $SE = 0.049$ ). Providing further support for the propositions put forth by Jackson, Crawford, and Godbey (1993) and the

**Table 3.** Confirmatory factor analyses results ( $N = 729$ ).

Construct/variable	<i>M</i> ( <i>SD</i> )	$\beta$	$\rho$	$\alpha$	AVE
<i>Intrinsic benefits</i>			.833	.833	.624
Gain a sense of accomplishment	4.89 (1.11)	.787			
Experience excitement	5.05 (1.03)	.773			
Gain self-confidence	4.80 (1.11)	.810			
<i>Stress relief</i>			.937	.933	.790
Get away from life's demands	4.72 (1.22)	.812			
Relieve stress	5.11 (1.05)	.904			
Escape the strain of the day to day	4.91 (1.16)	.933			
Reduce tension	4.83 (1.14)	.901			
<i>Social benefits</i>			.887	.885	.724
Be with friends	5.13 (1.06)	.865			
Spend time with people who share my values	4.92 (1.11)	.796			
Maintain friendships	4.76 (1.14)	.889			
<i>Intrapersonal constraints</i>			.794	.768	.573
I didn't have the physical skills	2.53 (1.33)	.645			
of a lack of information	2.11 (1.20)	.623			
I didn't have the technical skills	2.49 (1.36)	.956			
<i>Interpersonal constraints</i>			.841	.838	.569
my friends prefer other activities	2.87 (1.44)	.733			
I didn't have partners to go with	3.57 (1.55)	.757			
my friends live too far away	2.68 (1.45)	.759			
my friends don't like climbing	2.65 (1.41)	.768			
<i>Structural constraints</i>			.866	.858	.620
climbing equipment is too expensive	2.74 (1.39)	.665			
competition fees are too high	3.19 (1.50)	.894			
travel to climbing competitions costs too much	3.24 (1.50)	.822			
climbing gyms are too expensive	3.30 (1.46)	.751			
<i>Constraint negotiation strategies</i>			.788	.782	.437
found people who have similar interests	4.70 (1.09)	.564			
set aside money to make sure I can climb	4.38 (1.22)	.819			
helped to organize trips to the climbing gym	4.14 (1.39)	.563			
gone to the gym when it is less crowded	4.69 (1.20)	.497			
saved up money to go climbing	4.24 (1.38)	.795			
<i>Negotiation efficacy</i>			.703	.672	.446
I have been successful getting around barriers to go climbing	4.88 (.810)	.527			
I admire people who find a way to go climbing	5.27 (.783)	.744			
I enjoy overcoming obstacles to go climbing	5.19 (.933)	.711			
<i>Commitment to sport</i>			.883	.875	.661
Others recognize that I identify with climbing	5.33 (.812)	.652			
It would require a major change for me to stop climbing	5.47 (.848)	.638			
I am often recognized as one devoted to climbing	5.07 (1.07)	.948			
Others identify me as dedicated to climbing	5.12 (1.01)	.956			

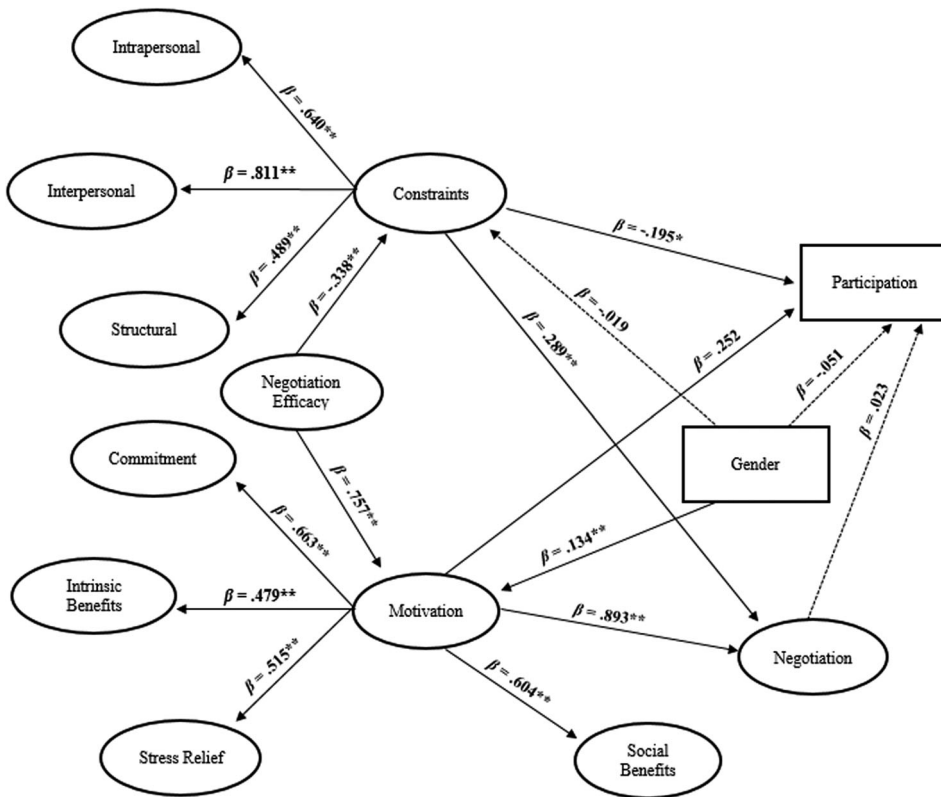
Note:  $\beta$ : standardized coefficient (factor loading);  $\rho$ : Joreskog's Rho;  $\alpha$ : Cronbach's Alpha; AVE: average variance extracted.

**Table 4.** Between factor correlations ( $N = 729$ ).

Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1. Intrinsic benefits	<b>.789</b>								
F2. Stress relief	.444*	<b>.888</b>							
F3. Social benefits	.381*	.410*	<b>.850</b>						
F4. Intrapersonal constraints	-.022	.046	-.070	<b>.756</b>					
F5. Interpersonal constraints	.009	.073	-.054	.505*	<b>.754</b>				
F6. Structural constraints	.098*	.156*	.028	.304*	.414*	<b>.787</b>			
F7. Negotiation strategy	.287*	.441*	.405*	.032	.049	.261*	<b>.648</b>		
F8. Negotiation efficacy	.366*	.328*	.271*	-.113*	-.239*	-.064	.392*	<b>.667</b>	
F9. Commitment to sport	.142*	.126*	.280*	-.349*	-.327*	-.099*	.323*	.426*	<b>.813</b>

Note: Bold indicates  $\sqrt{\text{AVE}}$ .

\* $p \leq .05$ .



**Figure 2.** Structural model of constraints to participation in competition climbing. \* indicates  $p \leq .05$ ; \*\* indicates  $p \leq .001$ ; Individual items, errors, and covariances excluded for parsimony of presentation.

findings of Loucks-Atkinson and Mannell (2007), participants’ negotiation efficacy was also related to their perceived levels of constraints with escalating levels of negotiation efficacy translating to lower levels of perceived constraints ( $\beta = -.338, p \leq .001, SE = 0.099$ ). Higher levels of negotiation efficacy were also related to higher levels of motivation ( $\beta = .757, p \leq .001, SE = 0.104$ ). Paralleling this finding, the more motivated participants indicated they were, the more likely they were to report successfully negotiating constraints ( $\beta = .893, p \leq .001, SE = 0.110$ ). However, there was no statistical influence of constraint negotiation ( $\beta = .023, p = .887, SE = 1.132$ ) or motivation ( $\beta = .252, p = .071, SE = 1.703$ ) on participation level.

**Gender**

The findings related to gender did not support the proposed hypotheses. Current literature related to females’ participation in outdoor recreation points to higher levels of constraints, lower levels of motivation, and lower levels of participation among females in outdoor adventure sports (Crawford and Godbey 1987; Little 2002; Vodden-McKay and Schell 2010). Contrary to this research, the results of the current study indicated no significant difference in levels of perceived constraints between males and females ( $\beta = -.019, p = .654, SE = 0.076$ ) and no significant difference in participation levels between male and

female respondents ( $\beta = -.051, p = .156, SE = 0.438$ ). The findings also suggest that rather than being less motivated than males ( $H_3$ ), female climbers reported significantly *higher* levels of motivation ( $\beta = .134, p \leq .001, SE = 0.042$ ).

## Discussion

The results of this study provide support for some existing research and additional insights into previously unexplored areas of leisure constraints. First, the findings address the study purpose by providing insight into the constraints and constraint negotiation process experienced by competition climbers. For competition climbers, these processes parallel those hypothesized by Crawford and Godbey (1987) and Jackson, Crawford, and Godbey (1993). The results also confirm the important role of negotiation-efficacy in the constraints negotiation process as hypothesized in the current study and suggested by previous research (Jackson, Crawford, and Godbey 1993; Loucks-Atkinson and Mannell 2007; White 2008). It is not enough for individuals to be able to identify negotiation strategies to overcome leisure constraints. They must also believe that they have the ability to implement those strategies successfully. Moreover, as hypothesized by Bandura (1994) and supported by Loucks-Atkinson and Mannell (2007), individuals' efficacy directly relates to their level of motivation for taking on and working through challenging situations. The results of the current study also support the positive association between negotiation-efficacy and motivation, as participants with higher levels of negotiation-efficacy also had higher levels of motivation. Further, the findings indicate that motivation has a positive relationship with participation and affects participation in competition climbing through its influence on negotiation strategies. While this contradicts Hubbard and Mannell's (2001) findings, it builds upon the findings of later research (e.g. Loucks-Atkinson and Mannell 2007; White 2008) and provides clarification of the role that motivation plays within the constraints negotiation process.

In investigating the second purpose of the study, examining potential differences in the experience of male and female climbers, the results provide two distinct and more novel findings. First, the results indicated that females and males did not significantly differ in their perceived constraints to participation or their reported levels of participation in competition climbing. While a larger body of literature points to the unique constraints females face in outdoor recreation participation (e.g. Evans and Anderson 2018; Vodden-McKay and Schell 2010), in the context of competition climbing within the current study, males and females did not report differing levels of constraints. This finding may relate to the study focus. Competition climbing requires more commitment than non-competitive rock climbing (e.g. time, commitment to competitions/teams, resources). Because of this, participants may simply no longer recognize constraints with which they may have been faced before more fully committing to rock climbing as their chosen sport (Jackson, Crawford, and Godbey 1993). More simply, climbers may not only fail to report perceived constraints to leisure if they do not experience them, but also discontinue reporting if they have already successfully negotiated them. While the male and female climbers in this study may have encountered varying levels of constraints early on, both groups have found mechanisms to negotiate said constraints in committing to competition climbing. Thus, they may no longer recognize these constraints. This successful

use of negotiation strategies would also explain the lack of variability in participation levels between males and females.

While research on the media's portrayal of climbing presents a highly male-dominated sport (Vodden-McKay and Schell 2010), there is a growing body of research that suggests that once embedded in the sport, this gender divide is less conspicuous. Based upon this research, another potential reason for the lack of variation in constraints and participation levels between male and female climbers could be that the nature of climbing itself limits the typical gendered constraints. This may be due to the gender-integrated nature of climbing and the unique ethos described by competition climbers as 'us against the wall' instead of 'us versus each other' that has been demonstrated in previous research (Garst, Stone, and Gagnon 2016). The inherent sense of belonging the climbing community ostensibly provides for women, may facilitate a more gender inclusive space to which the constraints typically experienced by women in outdoor recreation (typically viewed as highly male dominated) may ease.

Furthermore, this finding may suggest that as women move to higher levels of skill and competence in the outdoors, the less salient the gender divide becomes (Evans and Anderson 2018). While historically, research on women's experiences in the outdoors would lead many to anticipate women to be most comfortable (or least uncomfortable) in all-female settings (McDermott 2004), this expectation may not always be true. For example, Evans (2018) suggested that female mountain guides were not in favour of all women's experiences. Rather, female guides saw not only the necessity, but value in co-ed experiences in the outdoors, which may indicate that the interpersonal constraints related to the dynamic between males and females may have waned for these female guides. Similarly, the guides played down the gender divide in terms of disparate treatment at the hands of male clients and guides. Rather than blaming the way they were treated on gender differences or discrimination, they identified these interactions as endemic to their own actions or the nature of the sport. What this may tell us is that these women no longer (or maybe never) recognized mixed sex environments for their gendered nature. This may help to explain why not only the women in this study do not perceive the level of constraints we hypothesized, but also why mixed gender environments at higher competence levels may not have the same effect as in more casual or novice levels of participation.

The second distinct finding is that females reported significantly higher levels of motivation than males. This finding sheds light on the lack of variation in perceived constraints in this study. As discussed earlier, some research has demonstrated that motivation has a negative relationship with the perception of constraints and a positive relationship with constraint negotiation strategies (e.g. Alexandris et al. 2003, 2007). If female climbers did face a greater level of constraints in their adoption of competition climbing, this higher level of motivation could potentially make females less likely to perceive constraints to their participation and simultaneously allowed them to overcome constraints through successful negotiation strategies. Thus, females' higher level of motivation may not only have dampened their perception(s) of constraints they face in competition climbing, but also made them more adept at negotiating these constraints.

The findings of the current study not only provide more insight into the constraints negotiation process and the role that motivation and negotiation-efficacy may play, but also provide important implications for our understanding of women's participation in

recreation. While research tends to point to heightened constraints to participation, competition climbing seems to foster an environment in which women do not perceive the same types of gendered constraints reported elsewhere in the recreation literature. Similar to prior climbing studies (Dilley and Scraton 2010), there are potentially factors within the competition climbing setting buffering women from experiencing constraints as hypothesized in other leisure contexts. Dilley and Scraton's (2010) qualitative study of female climbers pointed to both individual factors (e.g. the climbers challenged traditional gender roles in many aspects of their lives) and factors related to climbing (e.g. a sense of acceptance) in attempting to explain female climbers' experiences. While this study is limited in its ability to further explain why climbing may be a unique recreation setting for the mitigation of gendered norms and constraints, it does provide empirical support for the notion that it does mitigate some of these challenges. It is important that when exploring women's experiences in recreation, sport, and leisure, we continue to evolve in our understanding and recognize that there may be certain settings that are inherently more gender inclusive than others.

### ***Limitations and future directions***

As with any research, there are limitations to the current study. First, the negotiation efficacy factor demonstrated low internal consistency relative to other measured factors as part of this study (i.e.  $\alpha = .672$ ;  $\rho = .703$ ). Future research using this structural model should expand the number of questions used to measure negotiation efficacy to determine potential reasons for this low consistency. As with many quantitative investigations, a logical next step would be to apply qualitative techniques to dig more deeply into understanding the relationships suggested by the model. Understanding why women reported similar levels of constraints as men and significantly higher levels of motivation than men could provide valuable additional insight into understanding constraints and the constraint negotiation process in competition climbing. As suggested by prior investigations of constraints and gender (Evans 2018), experience may act as a moderator, diminishing the strength of relationship between these two variables. However, in the current study the influence of prior experience level within the sport of climbing and related activities was not examined as a potential moderator. As such, future research exploring similar relationships should consider the moderating influence of experience on the relationship between gender and constraints to recreation. Additionally, future research would allow for the consideration of individual life circumstances and the related additional nuances in constraints negotiation as proposed by recent research (e.g. Lamont, Kennelly, and Moyle 2014).

A secondary purpose of this study was to replicate the work of White (2008) through a validation of the measurement and structural models. Thus, a similar approach was utilized in the current study (e.g. CFA and SEM). The findings indicated further verification of the psychometric reliability and validity of the measurement model (i.e. CFA) in addition to support for the structural model (i.e. SEM) of White. While promising, these findings illustrate the necessity of future investigations to continue drilling down into the models proposed here and of White (2008) to determine where further between group differences may lie (e.g. configural, metric, and structural invariance testing).

Next, the sample was overwhelmingly white (82.7%). The underrepresentation of diverse populations, while seemingly representative of competition climbers within the



United States (Gagnon et al. 2016), may be missing those individuals who have been unsuccessful in overcoming constraints to competition climbing. For instance, the majority of the current study sample consisted of individuals that were higher than the median income and education levels within the United States (US Census 2015), where less educated and affluent individuals may have differing experiences in their perception and negotiation of constraints. Future research should also focus on more potential gender differences (beyond the constraints negotiation process) to provide additional information to USA Climbing to help inform their operational strategies. Additionally, as the competition climbers were drawn from USA Climbing, the findings may be generalizable only to US competition climbers. There may be important cultural differences in the experience of competition climbers outside of the US that may influence the relationships hypothesized in the current study model. While this study provides support for the relatively gender inclusive nature of climbing, future research should continue to focus on the reasons why this level of gender inclusivity is present within competition climbing to provide a more complete understanding of what makes climbing apparently unique. Finally, the gender inclusive environment of competition climbing should be further examined to see if other typically gendered experiences may also be affected. For instance, future research should focus on body image concerns (which are typically more salient for women (e.g. Tylka 2013) to investigate if competition climbing may provide a buffer for women's body image beliefs as it does for their perceived constraints.

## Note

1. Final CFA covariance matrices are available upon request from the first author.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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