

ABSTRACT

Background and aims: Extreme sports athletes are often labelled ‘adrenaline junkies’ by the media, implying they are addicted to their sport. Research suggests during abstinence these athletes may experience withdrawal states characteristic of individuals with an addiction (Celsi et al., 1993; Franken et al., 2006; Willig, 2008). Despite this notion, no research has directly explored withdrawal experiences of extreme sports athletes.

Methods: Using semi-structured interviews we explored withdrawal experiences of high ($n=4$) and average-ability ($n=4$) male rock climbers during periods of abstinence. We investigated the psychological and behavioural aspects of withdrawal, including craving, anhedonia and negative affect; and differences in the frequency and intensity of these states between groups.

Results: Deductive content analysis indicated support for each of the three categories of anhedonia, craving and negative affect. Consistent with existing substance addiction literature, high-ability climbers recalled more frequent and intense craving states and negative affect during abstinence compared with average-ability climbers. No differences in anhedonic symptoms between high and average-ability participants were found.

Conclusions: Rock climbing athletes appear to experience withdrawal symptoms when abstinent from their sport comparable to individuals with substance and behavioural addictions. The implications of these findings and suggestions for future research are discussed.

Keywords: Extreme Sports; Anhedonia; Negative-Affect; Craving; Behavioural-Addiction.

49 personality traits with drug-users, including sensation seeking and impulsivity
50 (Di Nicola et al., 2015; Robbins & Clark, 2015). Similarities also exist in
51 psychological and behavioural manifestations of drug and non-drug addictions.
52 Both include cravings, high rates of relapse, increased tolerance, and
53 withdrawal states (Aidman & Woollard, 2003; Potenza, 2006). Finally,
54 functional neuroimaging studies indicate brain regions known to respond to
55 drug use are also activated by gambling (Van Holst, de Ruiter, van den Brink,
56 Veltman, & Goudriaan, 2012), appetizing food (Wang et al., 2004), internet
57 gaming (Hoeft, Watson, Kesler, Bettinge, & Reiss, 2008) and shopping
58 (Kuntson, Rick, Wimmer, Prelec, & Loewenstein, 2007), suggesting an overlap
59 with addiction circuitry.

60 Parallels have also been identified between extreme sports participants and
61 those with substance addictions. For example, both groups report high levels of
62 the sensation seeking personality trait (Franques et al., 2003; Goma-i-
63 Freixanet, Martha, & Muro, 2012). Elevated levels of impulsivity, often
64 observed in those with drug and non-drug addictions (Di Nicola et al., 2015),
65 have also been identified in extreme sports athletes. Myrseth, Tverå, Hagtun
66 and Lindgren (2012) compared the impulsivity levels of pathological gamblers,
67 skydivers, and controls, finding both pathological gamblers and skydivers
68 scored higher than controls, with no significant difference between these
69 groups.

70 Similarities in the phenomenology of extreme sports participation and
71 substance-related addiction are also apparent. Extreme sports athletes
72 commonly describe a '*rush*' or '*high*' when participating in their sport
73 (Buckley, 2012; Price & Bundesen, 2005) and liken these experiences to those

74 of drug users (Willig, 2008). For example, a participant in Willig's study
75 described: '*It's like for a drug user, they will take cocaine to get high. For me*
76 *it's my addiction, I have to go to the mountains to get high.*' Similarly,
77 skydivers have described their sport as '*like an addiction*', stating that they
78 '*can't get enough*', and their '*relationships suffer*' as a result (Celsi, Rose, &
79 Leigh, 2003).

80 Traditional definitions of addiction, where the emphasis lies on continued
81 participation in the behaviour despite serious negative consequences, can be
82 successfully applied to extreme sports athletes (Pain & Kerr, 2008; Price &
83 Bundesen, 2005). Indeed, an extreme sports athlete in Pain and Kerr's case
84 study continued to participate despite receiving numerous physical injuries
85 from sky-diving and go-karting. More recently, multidimensional definitions of
86 addiction have been applied to extreme sports athletes (Price & Bundesen,
87 2005). Using a 24-item addiction questionnaire with dimensions including pre-
88 occupation, self-medication and the occurrence of physical injuries, Price and
89 Bundesen found addiction strongly and positively related to skydivers'
90 experiences of their sport. Addiction to skydiving was low in novice
91 participants, moderate in intermediate participants, and high in experienced
92 participants, implying addiction increased with experience and exposure to
93 their sport. This is consistent with studies that suggest the severity of both drug
94 and non-drug addictions are positively correlated with their duration (e.g.,
95 Barrault & Varescon, 2013; Hopley, Dempsy, & Nicki, 2012), supporting the
96 concept of addiction applied to extreme sports.

97 Evidence also exists which suggests extreme sports athletes experience
98 symptoms of withdrawal while not participating in their sport (Celsi et al.,

99 1993; Franken, Zijlstra, & Muris, 2006; Willig, 2008). In medicine,
100 ‘withdrawal’ refers to the cluster of physical or psychological sequelae induced
101 when a drug no longer remains in the body (Craft & Lustyk, 2013). However,
102 withdrawal states such as craving and anhedonia are also observed in
103 behavioural addictions, despite the absence of exogenous psychoactive
104 substances (e.g., Trotzke, Starcke, Pedersen, & Brand, 2014). Consequently,
105 we refer to withdrawal as the negative psychological and behavioural
106 manifestations of abstinence from any stimuli.

107 In substance addictions, periods of abstinence have been associated with states
108 of anhedonia (Sekine, et al., 2003; Zijlstra, Booij, van den Brink, & Franken,
109 2008), a negative mood state characterised by diminished interest/pleasure in
110 response to previously rewarding stimuli (Giannantonia & Martinotti, 2012).

111 Franken et al. (2006) suggested that extreme sports athletes also experience
112 anhedonia during periods of abstinence from their sport. Comparing the
113 prevalence of anhedonic symptoms between skydivers and controls who
114 participated in low risk sports (e.g., rowing), Franken and colleagues found
115 skydivers experienced more anhedonic symptoms than low-risk sportsmen.

116 These findings suggest that frequent exposure to extreme sports that produce a
117 ‘*natural high*’, such as sky diving, can result in anhedonia during periods of
118 abstinence (Franken et al., 2006). Celsi et al. (1993) also noted their
119 participants ‘*lose interest in other activities and things*’ as a result of
120 skydiving.

121 As in drug and non-drug addictions (Grant et al., 2010), extreme sports athletes
122 also display strong urges or cravings for participation in their sport (Celsi et al.,
123 1993; Willig, 2008). In the psychopharmacology literature, craving is defined

124 as a subjective motivational state characterised by an intense desire for the
125 effects of a drug (Marlatt, 1987; Kozlowski & Wilkinson, 1987). Drug craving
126 is believed to underlie the maintenance of addiction and be moderated by
127 factors such as cue-exposure (e.g., Zhao et al., 2012) and abstinence
128 (Roderique-Davies, 2008). Research has not explored the existence of craving
129 in an extreme sport setting, though athletes often report urges which resemble
130 craving. For example, skydiver participants in Celsi and colleagues (1993)
131 research stated '*I love it, man. I just can't get enough of it*', '*it calls you back*
132 *every time*', and '*I suffer withdrawal when I haven't jumped for a while*'. The
133 concept of craving applied to extreme sports may explain the addictive like
134 behaviour displayed by athletes. However, more direct research is needed to
135 explore the role of craving in extreme sports athletes before this can be
136 confirmed.

137 In addition to anhedonia and craving, extreme sports athletes also experience
138 negative affective states during periods of abstinence (Celsi et al., 1993; Willig,
139 2008). Athletes have described the need for extreme sport participation as
140 fundamental, and reported experiencing negative affective states such as being
141 '*stressed*', '*unhappy*' and '*itchy*' when not participating (Willig, 2008). Such
142 states resemble dysphoria observed in abstinent drug users (Newton,
143 Kalechstein, Tervo, & Ling, 2003), suggesting similar emotional withdrawal
144 experiences may be shared.

145 Based on the evidence discussed, extreme sports athletes, like those individuals
146 with behavioural addictions (e.g., Grant et al., 2010), experience comparable
147 withdrawal states to those observed in substance user. Though, like gambling,
148 shopping, or exercise, extreme sports participation lacks the exogenous

149 psychopharmacological agent often assumed to be responsible for withdrawal
150 experiences in drug users. However, psychological factors, such as hedonistic
151 motives, are also known to play a significant role in the development and
152 maintenance of withdrawal experiences in substance misusers (Robinson &
153 Berridge, 2000), offering an explanation for the presence of such states in
154 behavioural addictions. Currently, research on addiction with an extreme sports
155 setting is scant, with none directly exploring the withdrawal experiences of
156 extreme sports athletes. Additionally, extant research has focused on skydiving
157 participants, excluding other extreme sport populations (e.g., Franken et al.,
158 2006; Price & Bundesen, 2005). Consequently, this study aimed to explore the
159 existence of withdrawal states typically associated with addiction (i.e.,
160 anhedonia, craving and negative-affect) in a sample of rock climbers in order
161 to investigate whether these concepts can assist in explaining the comparable
162 psychological experiences of extreme sports athletes

163 Semi-structured interviews were employed to explore participants' experiences
164 of withdrawal when absent from climbing. Deductive content analysis was
165 selected as a systematic method of data analysis (Schreier, 2014) to explore
166 existing concepts of withdrawal, with participants dichotomised into average
167 and high-ability groups. As previous research on substance and behavioural
168 addictions has suggested addiction severity increases with exposure to the
169 stimuli (e.g., Barrault & Varescon, 2013), high-ability climbers were expected
170 to report more frequent and intense withdrawal experiences than their average-
171 ability counterparts.

172 METHOD

173 **Methodology and epistemological assumptions**

174 The methodology used was underpinned by a post-positivist viewpoint. This
175 approach accepts objective knowledge can be gained from observation, though
176 is imperfect and fallible (Willis, 2007). Post-positivism assumes a modified
177 objectivist epistemology which largely abandons dualism accepted by positivist
178 research. Instead data objectivity is judged on external criteria, such as the
179 degree that it “fits” pre-existing knowledge of the subject (Guba & Lincoln,
180 1994). Thus, post-positivist research often assumes a deductive approach that
181 supports existing theories or extends their applications to different
182 environments. In the present study, the aim was to investigate whether
183 concepts of withdrawal from the substance misuse field can explain the
184 psychological experiences of extreme sports athletes. We sought to examine
185 participants’ experiences against pre-defined criteria (i.e., withdrawal states)
186 based on evidence suggesting multiple similarities between the subjective
187 experiences of extreme sports athletes and drug-users.

188 **Participants**

189 Participants were high ($n = 4$, *mean age*: 24.75 [$SD = 3.3$]) and average-ability
190 ($n = 4$, *mean age*: 23.75 [$SD = 6.2$]) male rock climbers, dichotomized into
191 ability categories using the French (Fr.) grading system employed in the UK
192 and Europe (*for information see*: adventurehunter.co.uk). High-ability climbers
193 were classed as those with the self-reported ability to climb at 7c and above,
194 and average-ability climbers as those within the 6a – 7b+ range. Differences in
195 climbing experience between sub-groups are displayed in Table 1.

196 *[Table 1 Participant information]*

197 Participants were recruited via emails to local climbers. Selection criteria
198 outlined in recruitment emails included the length (a minimum of two years)
199 and frequency (at least one day per week) of climbing participation. In total, 15
200 responses were received to recruitment emails. Of these responses, purposive
201 sampling was used to select 8 participants who provided information rich cases
202 from a varied (e.g., ability level/ experience) sample of rock climbers (Kyngäs,
203 Elo, Pölkki, Kääriäinen, & Kanste, 2011).

204 **Data collection**

205 In the absence of specific quantitative measures and previous research in this
206 area interviews were selected as the means of data collection. Interviews
207 offered an effective method of obtaining accounts of participants'
208 psychological and behavioural experiences while not participating in their sport
209 (Rubin & Rubin, 2012). Specifically, Semi-structured interviews were
210 employed as a flexible approach to data collection, allowing researchers to
211 explore pre-set topic areas while pursuing other emerging topics in more depth
212 (Diefenbach, 2009).

213 *Semi-structured interviews*

214 Interviews were conducted by the first and second author. Interviews took
215 place in designated interview rooms at the first author's university institution
216 and lasted between 40 and 72 minutes. Interviews were recorded in their
217 entirety and transcribed verbatim for subsequent analysis.

218 Interviews were conducted using an interview guide based on an extensive
219 review of the relevant research (e.g., Buckley, 2012; Franken et al., 2006;
220 Giannantonia & Martinotti, 2012; Price & Bundesen, 2005). Questions were
221 also informed by the definition of each withdrawal state under study.

222 Anhedonia, for example, can be defined as a diminished interest or pleasure in
223 response to previously rewarding stimuli (Giannantonio & Martinotti); thus
224 questions exploring anhedonic experiences in participants focused on: [1] the
225 influence of climbing on enjoyment of other activities, and [2] their ability to
226 enjoy other activities when abstinent from climbing; for example: How
227 enjoyable do you find other activities during periods when you are not able to
228 rock climb? Relevant findings from the drug and non-drug addictions literature
229 also informed question development. For example, research suggests craving is
230 moderated by factors such as abstinence and cue-exposure (Roderique-Davies,
231 2008). Accordingly, questions were developed to explore participant's
232 emotions when abstinent (e.g., How do you feel when you are not able to rock
233 climb due to injury or other reason?) and their response to climbing-related
234 cues. To avoid leading participants all questions were worded without the use
235 of withdrawal terminology (e.g., craving, anhedonia).

236 Interviews began with questions relating to participants' demographic
237 information and rock climbing behaviour (e.g., How many times per week do
238 you participate in climbing?). In order to establish differences between groups,
239 participants were asked to comment on the frequency of each withdrawal
240 experience they cited (e.g., How often do you experience that?). To supplement
241 the interview guide, pre-planned probes were used to deepen understanding
242 and clarify participant responses (e.g., Tell me more about that experience;
243 Wilson, 2014). Prior to data collection two pilot interviews were conducted by
244 the first and second author with average-ability climbers to assess the
245 effectiveness of the interview guide and provide an opportunity to establish
246 familiarity with the questions (Elo et al., 2014). Based on feedback from these

247 participants and an assessment of the validity of the schedule by the
248 researchers, the interview guide was deemed satisfactory for use in the study
249 and no changes were made.

250 **Data-analysis**

251 Deductive content analysis was selected as a systematic method of analysing
252 interview transcripts (Elo et al., 2014) in line with the post-positivism
253 viewpoint. Each interview transcript was analysed by the first and second
254 author. In order to ensure clarity and transparency in the data analysis process,
255 Zhang and Wildemuth's (2009) eight-step guide for content analysis was used
256 to base each stage of analysis upon.

257 Stage 1 of analysis, the data preparation phase, consisted of the data
258 familiarisation and transcription process. In the second stage of analysis,
259 themes were selected as the units of coding, which were defined as any word,
260 sentence, or paragraph representing a single expression, meaning or idea
261 (Mayring, 2000). In the context of this study, themes represented information
262 pertaining to particular withdrawal experiences.

263 The third stage of analysis focused on the development of categories and a
264 coding scheme. A deductive, or 'directive' (Hsieh & Shannon, 2005), approach
265 to developing categories and coding data was selected as the study aimed to
266 explore concepts of withdrawal well-established in the psychopharmacology
267 literature (Grant et al., 2010; Lynch, Peterson, Sanchez, Abel, & Smith, 2013).
268 In line with the post-positivist epistemology, the directive approach uses
269 knowledge from existing research and theory to develop initial categories and
270 coding rules (Hsieh & Shannon). Thus, an initial matrix was formulated prior

271 to data collection containing three core categories: anhedonia, craving, and
272 negative affect. The process of coding themes to these pre-determined
273 categories was supported by the development of a coding manual containing
274 category names, an operational definition of each withdrawal state, text
275 examples, and rules for assigning codes (Table 2). A systematic approach was
276 taken to test the coding manual (Elo et al., 2014; Schilling, 2006) using a
277 sample of text from one of the pilot interview transcripts (Stage 4). Using the
278 coding manual, both the first and second author analysed the text sample
279 independently, subsequently reconvening to discuss any issues and
280 inconsistencies in the coding and thus ensure inter-coder agreement (Schreier,
281 2012).

282 *[Table 2 Coding manual extract]*

283 The first step of coding data consisted of highlighting all themes that appeared
284 to represent withdrawal experiences. Next, the coding manual was used to
285 assign relevant highlighted themes to the pre-determined categories (Stage 5)
286 with the aim of achieving category saturation. We defined category saturation
287 as the point at which no new information pertaining to the category was
288 identified. If themes could not be assigned to one of the three existing
289 categories, an inductive approach was taken where new categories were created
290 and reviewed at each instance of analysis. Additional categories were removed
291 if little supporting evidence was found across more than one participant.
292 Throughout the coding process each researcher continually reviewed their own
293 and their colleagues coding for consistency between transcriptions and between
294 researchers (Stage 6).

295 Following the initial assignment of themes to categories, stage 7 of analysis
296 involved researchers engaging in data reduction that focused on identifying
297 common themes within each category and removing nonessential themes to
298 produce sub-categories. Nonessential themes were defined as those that
299 demonstrated poor intra and inter-participant reliability. Criteria for sub-
300 category development included sufficient supporting data in the form of
301 multiple themes. Each sub-category was continuously reviewed at each
302 instance of analysis and between researchers to ensure coding consistency and
303 recognise the point of saturation. Although every effort was made to ensure
304 categories and sub-categories were as internally homogeneous and externally
305 heterogeneous as possible, some overlap was expected based on similarities in
306 the constructs of anhedonia and negative affect (Crawford & Henry, 2004).
307 Consequently, it was accepted that units of data might be assigned to more than
308 one category simultaneously. The final stage of analysis, stage 8, involved the
309 detailed reporting methods used and the processes undertaken to consider the
310 trustworthiness of findings.

311 **Methodological Rigor**

312 A number of steps were undertaken to pursue methodological rigor based on
313 guidance for improving trustworthiness in qualitative content analysis (Elo et
314 al., 2014) and in post-positivist research (Morrow, 2005). Firstly, detailed
315 participant information and selection criteria have been presented to enhance
316 the transferability of findings (Elo et al.). In order to further improve
317 transferability, emphasis was placed on the detailed reporting of the research
318 procedures and data analysis process.

319 Researchers enhanced the credibility of the data collection method used by
320 each carrying out pilot interviews with the view of assessing the efficacy of the
321 interview schedule for obtaining relevant information. The pilot interviews
322 served as a form of self-evaluation for researchers who reflected upon their
323 performance, looking to identify areas where they may have been unclear or
324 led the participant. This process of self-evaluation was continued throughout
325 the data collection phase. Based on guidance provided by Elo and colleagues
326 (2014), further improvement in the credibility of the methods was achieved by
327 using a circular approach to participant sampling and data analysis whereby
328 data analysis commenced following the completion of four interviews, as
329 opposed to collecting all data then carrying out analysis. This allowed
330 researchers to recognise the point of category saturation and accordingly cease
331 participant recruitment, thus ensuring an appropriate sample size.

332 To enhance the conformability of findings two researchers were involved in the
333 coding process (Elo et al., 2014). This allowed for ‘double coding’ (Schreier,
334 2012), the process whereby two researchers code data using the same coding
335 manual, subsequently reconvening to assess consistency, remove any
336 ambiguity in coding instructions and ensure no sub-categories overlapped.
337 Regular meetings to assess inter-coder reliability also allowed researchers to
338 identify and remove any biases that may have influenced their coding. To
339 further improve the conformability of findings, particular care was taken when
340 writing and presenting findings. Multiple quotations were used to support
341 categories and the development of sub-categories, demonstrating the
342 connection between interpretation and text (Malterud, 2001).

343 **Ethics**

344 Ethical approval was obtained from the school ethics committee of the first
345 author's university institution. All participants were informed of the purpose of
346 the study and their role as a participant. Informed consent was obtained prior to
347 interviews.

348 RESULTS

349 Systematic content analysis of interview transcripts resulted in the saturation of
350 the core categories of anhedonia, craving and negative affect and the
351 development of several sub-categories depicting participants' experiences, or
352 lack thereof, of each withdrawal state (Table 3). In total seven sub-categories
353 were developed, with only six of these pertaining to high-ability climbers and
354 all seven pertaining to average ability climbers. The following section provides
355 a description of each sub-category with example quotes from participants to
356 support the narrative. Due to the large volume of data, a summary of
357 description within each sub-category is offered.

358 *[Table 3 Summary of categories and sub-categories for rock climbers]*

359 **Anhedonia**

360 Raw data themes suggested climbers of both ability levels experienced
361 anhedonia. Average and high-ability participants reported experiences
362 resembling symptoms of anhedonia during periods of abstinence from their
363 sport, with no difference in frequency of experience between groups.
364 Experiences were subsequently grouped into themes labelled 'nothing
365 compared to climbing' and 'climbing heightens enjoyment threshold'.

366 *Nothing Compares to Climbing*

367 All participants felt climbing was the most enjoyable activity that they
368 participated in and perceived other activities as unexciting by comparison. For
369 instance, one high-ability participant indicated, '*I compare everything I do to*
370 *climbing, and nothing compares*', while an average-ability participant stated,
371 '*Other things don't excite me as much*'. When asked how he felt when
372 abstinent from climbing, one average ability participant noted, '*nothing feels*
373 *positive*'. All participants reported engaging in few other recreational activities
374 when not climbing and that they specifically avoided other activities that they
375 viewed may hinder their climbing performance (e.g., weight lifting).

376 *Climbing Heightens Enjoyment Threshold*

377 Several participants reported that since starting climbing they felt their
378 enjoyment threshold had increased, resulting in the need for more stimulating
379 activities to achieve enjoyment. For example, an average-ability participant
380 stated that he had become '*desensitized*' to other activities as a result of
381 climbing, while a high-ability participant reported, '*it changes your*
382 *expectations of enjoyment*'. Many climbers also stated that their fear threshold
383 had increased and more safe disciplines of climbing (i.e., indoor climbing)
384 gave them little excitement compared to the outdoor climbing they had become
385 accustomed to.

386 **Craving**

387 A high level of motivation to participate in climbing was shared by all
388 participants. Climbers reported regularly experiencing intense urges or drives
389 to climb, supporting the notion of craving. Responses regarding craving
390 resulted in the development of two themes, one focusing on the specific drives

391 experienced and a second on the influence of climbing-related cues upon these
392 drives.

393 *Cravings/urges*

394 All participants reported a strong, overarching need to participate in climbing.
395 Missing climbing sessions or going for several days without climbing was
396 suggested to be difficult and resulted in greater urges or craving: '*You end up*
397 *climbing anything you can get your fingers on*'. Further, climbing was cited as
398 the primary focus of many participants' lives. That is, climbers structured their
399 daily and weekly routines around their training schedules and weather
400 conditions for outdoor climbing, with all other activities coming second.
401 Indeed, participants reported urges to climb so strong that they frequently
402 overpowered other responsibilities. For example, one high-ability participant
403 stated:

404 *I could only think of one other climber who would want to climb as much, or*
405 *would basically not let other things get in the way of climbing, not have*
406 *excuses to not go climbing. He'd do everything to go climbing, which is how I*
407 *feel.*

408 While several statements by average-ability climbers fit the craving category,
409 high-ability climbers related directly to the concepts of cravings/urges for their
410 sport. For example, a high-ability participant stated, '*I just feel like I need to go*
411 *(climbing)*'. One high-ability participant even likened their craving to that of a
412 cigarette smoker: '*Definitely experience a craving to get out... sometimes it's*
413 *just lovely to have that release. I would consider it very similar to having a*

414 *cigarette in the morning or something like that, you know.’* Overall, high-
415 ability climbers reported more statements pertaining to this theme.

416 *Effects of Cue Exposure*

417 All participants reported accessing climbing related materials/cues when not
418 climbing, such as videos, magazines or websites. However, the frequency of
419 use and impact of climbing related cues varied between groups. High-ability
420 climbers reported accessing climbing related material to stimulate and motivate
421 them to climb ‘*everyday*’ or ‘*most days*’. When asked how climbing related
422 cues affected them, they responded with statements including, ‘*I get psyched*’,
423 ‘*I just find it really motivating, I get really inspired*’, and ‘*the adrenaline*
424 *comes in*’. Jealousy was cited as a common result of seeing others climb while
425 they could not, and one high-ability participant even stated, ‘*it would annoy*
426 *me*’.

427 In contrast, average-ability climbers reported accessing climbing materials
428 irregularly or ‘*when bored*’. Two average-ability climbers stated that viewing
429 cues such as climbing movies would motivate them: ‘*You watch a film and*
430 *want to go out climbing*’. However, the remaining two average-ability climbers
431 remarked how climbing materials only served to provide information on
432 climbing locations and routes. These participants indicated climbing cues had
433 little impact on them: ‘*I’d be pretty laid back*’.

434 **Negative Affect**

435 Substantial evidence existed to support the notion that participants experienced
436 negative affect during times of abstinence, with responses grouped into the
437 three themes focusing on negative affective experiences during times of

438 abstinence, the alleviation of negative affect as a result of climbing, and the
439 ability to cope without climbing.

440 *Negative Affect during Abstinence*

441 For all participants periods of climbing abstinence were associated with
442 negative mood states, including feelings of ‘*restlessness*’ and being
443 ‘*miserable*’, ‘*agitated*’ or ‘*frustrated*’. When questioned about how climbing
444 abstinence makes them feel, one average-ability climber stated ‘*I feel wrong*
445 ‘*not going for so long*’ and that as the time they spent not climbing increased
446 ‘*the more of an evil, angry person I become*’. Overall, negative affective states
447 were the most prevalent and distressing during periods of forced abstinence.

448 Times of injury, in particular, were reported as a stressful time for many
449 climbers. Other climbers reported frequently experiencing frustration with non-
450 permitting weather conditions or when work commitments prevented them
451 from climbing.

452 Average-ability climbers reported experiencing such states ‘*after a few days off*
453 (climbing)’ or ‘*when I’m injured sometimes*’. In contrast high ability climbers
454 reported frequently experiencing such states when having ‘*rest days*’,
455 suggesting they more frequently experienced negative affect during abstinence.

456 One high-ability climber even likened their state to that of a drug-user: ‘*The*
457 ‘*general feeling when you’re held off it (climbing) would be exactly the same as*
458 ‘*drug takers, frustrated, driven to get it whatever it is and elation when you*
459 ‘*actually manage it*’.

460 *Alleviation of Negative Affect*

461 All participants reported using climbing to alleviate negative emotional states.
462 Participants specifically related climbing to the alleviation of stress, stating
463 climbing acts as a *'good stress reliever'*, *'When I'm stressed at work its*
464 *(climbing) total escapism'*, and *'If you're in a bad mood, particularly if you're*
465 *stressed about something and you go climbing it can relieve it'*. Other climbers
466 made general statements about how climbing relieved negative affect. For
467 example, one average-ability climber reported, *'Climbing helps me to get away*
468 *from negative things'*.

469 When discussing the impact of climbing on their mood states participants also
470 referred to the positive emotional experiences associated with climbing.

471 Participants reported feeling *'invincible'*, *'excited'*, *'focused'* and *'driven'*, and
472 stated that a good day climbing would positively impacted their overall mood:
473 *'it is a great feeling'*. One average-ability climber described this experience as:
474 *'The relief of reaching the top of something hard is close to elation'*.

475 *Ability to Cope Without Climbing*

476 Despite recognising that climbing abstinence sometimes negatively impacted
477 their mood state, two average-ability climbers made statements suggesting that
478 they were able to cope adequately while not climbing. For example, when
479 discussing climbing abstinence one of the participants stated *'I'm not tearing*
480 *my hair out'* and another *'You really want to get out climbing, but it's not to*
481 *the point where you really, really can't bear to not do it anymore'*. In contrast,
482 high-ability climbers only discussed the negative consequences of climbing
483 abstinence on their mood state.

484 DISCUSSION

485 Deductive content analysis of transcripts from semi-structured interviews
486 found substantial evidence to support each of the three core categories of
487 anhedonia, craving and negative affect. As expected, high-ability participants
488 reported more frequent and intense craving and negative affective experiences
489 compared with average-ability climbers. In contrast, there was little variation
490 between the way high and average-ability participants described their
491 experiences of anhedonia. Findings support the notion that rock climbers
492 experience withdrawal symptoms when abstinent from their sport typical of
493 drug and non-drug addictions.

494 Within the category of anhedonia two themes emerged, labelled ‘nothing
495 compares to climbing’ and ‘climbing heightens enjoyment threshold’. All
496 participants reported gaining less enjoyment from other activities since
497 beginning climbing, congruent with the definition of anhedonia as a diminished
498 interest or pleasure in response to previously rewarding stimuli (Giannantonia
499 & Martinotti, 2012). Climbers indicated that this phenomenon was due to
500 climbing heightening their threshold for enjoyment, making other activities
501 seem mundane by comparison. These findings support previous research from
502 Franken et al. (2006) and Celsi et al. (1993) that identified symptoms of
503 anhedonia in skydivers. As suggested by Franken and colleagues, frequent
504 exposure to the natural high caused by extreme sports may result in the
505 experience of anhedonia when unavailable to the individual. Franken et al.
506 proposed that this is because anhedonia may be part caused by the
507 psychological mechanisms underlying the negative mood state, and not solely
508 resultant from the effects of psychopharmacological substances. No difference
509 was identified between groups in relation to the frequency and intensity of

510 anhedonic experiences, inconsistent with previous literature that has found
511 addiction severity increases with exposure to the relevant stimuli (e.g., Barrault
512 & Varescon, 2013). However, all participants involved in the study had
513 engaged regularly in climbing for a minimum of two years, implying this
514 period was sufficient to engender anhedonic symptoms in participants when
515 not partaking in their sport.

516 Craving as a category was subdivided into two themes labelled
517 ‘cravings/urges’ and ‘effects of cue-usage’. All participants indicated a strong
518 need to participate in their sport, which often overcame other responsibilities.
519 High-ability participants directly related to the concept of craving to a greater
520 extent than their average-ability counterparts, suggesting this group
521 experienced more intense cravings or urges. For example, high-ability
522 participants reported they felt a ‘*need*’ to go climbing and likened their
523 cravings to those of smokers. This difference between ability levels is
524 consistent with previous research exploring addiction in substance users
525 (Barrault & Varescon, 2013) and extreme sports athletes (Price & Bundesen,
526 2005) and suggests addiction severity increases with exposure to the stimuli.

527 Also congruent with previous craving research across other domains,
528 participants described how their cravings were augmented in the face of
529 climbing-related cues such as climbing videos or watching others climb (Zhao
530 et al., 2012). High-ability participants not only reported accessing climbing-
531 related cues more frequently than average-ability participants, but also implied
532 they experienced more intense cravings as a result of such stimuli. Again, this
533 implies withdrawal experiences were greater in high-ability climbers, and is
534 consistent with previous addiction research regarding the relationship between

535 addiction severity and duration (Barrault & Varescon, 2013; Price & Bundesen,
536 2005).

537 All participants reported negative affective experiences during abstinence,
538 including states of '*restlessness*' and being '*miserable*', '*agitated*' or
539 '*frustrated*'. Similar dysphoric states have been identified in drug-users,
540 exercise addicts, and extreme sports athletes during abstinence (e.g., Aidman &
541 Woollard, 2003; Newton et al., 2003; Willig, 2008). In the present study, both
542 groups reported using climbing to alleviate negative affective states,
543 particularly stress. This finding supports previous research that has reported
544 skydivers use their sport in a self-medicating manner (Price & Bundesen,
545 2005). Similarly, psychopharmacology literature has found individuals engage
546 in substance abuse as a means of coping with stress (Hassanbeigi, Askan,
547 Hassanbeigi, & Pourmovahed, 2013), suggesting similar participation motives
548 in both drug-use and extreme sports.

549 Although participants reported experiencing negative affect while abstinent
550 from their sport, two average-ability participants indicated abstinence was
551 tolerable and did not considerably influence their mood state. In contrast, high-
552 ability participants mentioned only the negative impact of climbing abstinence
553 on their emotions. This suggests withdrawal symptoms were greater in high-
554 ability compared with average-ability climbers and is consistent with the trends
555 identified in drug and non-drug addictions research (Barrault & Varescon,
556 2013; Price & Bundesen, 2005). As high-ability climbers have participated in
557 their sport for a longer duration and more regularly engaged in climbing
558 activities, they may have become more dependent on their sport to achieve
559 positive emotional states.

560 The present findings provide a novel insight into withdrawal states in rock
561 climbers, a previously unexplored area of research. There are, however,
562 limitations to the study. Firstly, low-ability climbers were excluded from the
563 participant sample, the inclusion of which may have led to a greater
564 understanding of withdrawal experiences across the spectrum of climbing
565 abilities. However, low-ability climbers may have experienced difficulty in
566 answering questions during the interview due to a low level of climbing
567 knowledge and little experience of the sport. The study also did not consider
568 participants drug-use history, which, if present, may have confounded the
569 findings of the study.

570 Future research on this subject area should use more systematic, quantitative
571 measures to explore withdrawal states in extreme sports athletes, allowing for
572 statistical comparison of withdrawal experiences between climbing ability
573 levels. Existing measures of craving, for example, can be adapted to assess
574 levels of craving in an extreme sport setting. The questionnaire of smoking
575 urges developed by Tiffany and Drobes in 1991, has since been adapted to
576 measure craving for a variety of substances including alcohol (Bohn, Krahn, &
577 Staehler, 1995) and caffeine (West & Roderique-Davies, 2008), suggesting it
578 could also be effectively adapted to assess levels of extreme sports craving.
579 Similar methods can also be utilised to measure anhedonia and negative
580 affective experiences. Such measures would allow for a comparison of the
581 intensity of withdrawal experiences between extreme sports athletes and those
582 with drug and non-drug addictions, providing a better understanding of
583 similarities between the two. Research is also advised to explore withdrawal
584 states in other extreme sports domains (e.g., BASE jumping, downhill skiing)

585 to identify similarities between the experiences of athletes from varying
586 disciplines. Finally, neuroimaging methods could be employed to identify
587 specific brain regions implicated in extreme sports participation and the effects
588 of withdrawal and cue-presentation, allowing further comparison between
589 extreme sports and drug-use.

590 Our findings have potential implications for addiction treatment programmes.
591 If extreme athletes experience similar withdrawal experiences to drug-users,
592 extreme sports may provide an avenue through which drug users can re-direct
593 their drug-taking behaviour and alleviate withdrawal symptoms. It is possible
594 that the risk element and physiological arousal created by extreme sports
595 participation may satisfy the high sensation seeking levels typically found in
596 drug-users (cf. Ersche, Turton, Pradhan, Bullmore, & Robbins, 2010; Franques
597 et al., 2003) and replace stimulation previously sought from drug-use. Slaght,
598 Lyman and Lyman (2004) note that lives of ex-drug-users can be unstimulating
599 compared to their previous drug-taking life, and they advocate the inclusion of
600 adventurous risk taking activities into addiction treatment programmes to
601 maintain stimulation and satisfy sensation seeking traits. Myrseth et al. (2012)
602 advocate similar methods to fulfil the sensation seeking and impulsivity traits
603 found in pathological gamblers.

604 In addition to satisfying personality traits, extreme sports may serve as an
605 affect regulator for recovering drug-users. Difficulties in affect regulation are
606 cited as a key endophenotype for drug addiction (e.g., Goodman, 2008).

607 Research suggests individuals who participate in extreme sports may possess
608 impairments in their ability to regulate emotional states (Woodman, Cazenave,
609 & Le Scanff, 2008) and may be motivated by a need for agency over these

610 states (Woodman, Hardy, Barlow, & Le Scamff, 2010). Indeed, our study
611 suggests rock climbing served as a form of '*escapism*' for participants and
612 alleviated negative affect, supporting the notion that extreme sports may
613 function as a method of affect regulation in recovering drug-users.

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