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Optimal experiences in exercise: A qualitative investigation of flow and clutch states

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ABSTRACT

Objectives: Understanding how to promote rewarding exercise experiences is important for attempts to help individuals be physically active. This qualitative study aimed to investigate the optimal psychological states experienced during rewarding exercise activities. Specifically, participants were interviewed as soon as possible after recent, rewarding exercise experiences in order to maximise detail and accuracy of recall.
Design: Event-focused qualitative study.
Method: A sample of 18 individuals (M_{age} = 32.94 years) participated in event-focused, semi-structured interviews soon after a rewarding exercise experience (M = 2 days later). Data were analysed thematically, while strategies were employed to enhance trustworthiness.
Results: Participants reported two distinct optimal experiences during rewarding exercise activities, matching descriptions of flow and clutch states. Flow occurred in contexts involving exploration, novelty/variation, and flexible outcomes, while the experience was described as enjoyable at the time, and involved lower perceived effort. Clutch states occurred in contexts involving achievement and pressure. Exercisers perceived clutch states to be enjoyable afterwards but not at the time, and to involve intense effort. Notable differences were apparent in the outcomes of each state in that flow had an energising effect, whereas clutch states were fatiguing.
Conclusions: This study presents evidence for flow and clutch states in exercise, supporting emerging research in sport. These findings provide insights into the occurrence, experience, and outcomes of flow and clutch states specifically from the exerciser's perspective. Such insights can inform future research on flow and clutch states in this setting, and may provide strategies for reliably inducing each state during exercise.

1. Introduction

The field of positive psychology advocates studying the best experiences that individuals have, in order to understand how to promote them more frequently (Seligman & Csikszentmihalyi, 2000). These aims are particularly relevant in the study of exercise participation, which is defined as planned, structured, and/or repetitive bodily movement, of which a primary objective is to improve or maintain physical fitness (Caspersen, Powell, & Christenson, 1985; Pink, 2008). For example, despite the well-known benefits of regular physical activity, the majority of adults in most developed countries are not meeting physical activity guidelines (Andersen, Mota, & Di Pietro, 2016). Furthermore, it is estimated that around 50% of individuals drop out of exercise programs (Dishman & Buckworth, 1996; Ekkekakis, 2017; Marcus et al., 2006), with even higher rates in the real world (e.g., 96% of people dropped out of a gym membership in Brazil within one year of joining; Sperandei, Viera, & Reis, 2016). A meta-analysis reported that positive affect during moderate intensity exercise was linked to future physical activity, but post-exercise affect displayed a null relationship (Rhodes & Kates, 2015). That is, even though people typically feel good after exercise (e.g., Fox, 1999), how people feel *during* exercise appears to be more important for determining subsequent engagement. These findings place emphasis on individuals' experience during exercise as an important mechanism for long-term engagement. Therefore, understanding how and why individuals have positive experiences during exercise could provide insights into how practitioners may be able to achieve such experiences consistently.

Optimal experiences, such as "the runner's high" and "the zone", are commonly discussed in exercise-related media (e.g., Fetters, 2014) and research (e.g., Boecker et al., 2008). The concept of flow

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(Csikszentmihalyi, 1975, 2002, 2014) is the most-studied and developed psychological framework for such optimal experiences. Flow is defined as an enjoyable, intrinsically rewarding experience characterised by concentration and absorption in a specific activity, to the exclusion of irrelevant thoughts and emotions, and a sense of everything coming together or clicking into place, even in challenging situations (Csikszentmihalyi, 2002). Understanding of flow generally revolves around Csikszentmihalyi's conceptualisation of this state as including nine dimensions (e.g., Csikszentmihalyi, 2002; Jackson & Csikszentmihalyi, 1999). Three dimensions are proposed to be conditions through which flow occurs (Nakamura & Csikszentmihalyi, 2002): (i) challenge-skills balance; (ii) clear goals; and (iii) unambiguous feedback. The other six dimensions are proposed to be characteristics of the experience: (iv) concentration on the task at hand; (v) sense of control; (vi) loss of self-consciousness; (vii) action-awareness merging; (viii) transformation of time; and (iv) autotelic experience which denotes that the experience is enjoyable and intrinsically rewarding (e.g., Csikszentmihalyi, 2002; Nakamura & Csikszentmihalyi, 2002). Given the desirability of these experiential characteristics, flow is, therefore, a highly relevant construct in the study of positive experiences during exercise. In addition, flow states have been associated with positive, long-term outcomes such as increased engagement (Shernoff, Csikszentmihalyi, Schneider & Shernoff, 2003), self-concept (Jackson, Thomas, Marsh, & Smethurst, 2001), intrinsic motivation (Keller & Bless, 2008), and wellbeing (Haworth, 1993), all of which are desirable consequences of exercise participation.

To date, studies of flow in exercise have adopted a primarily quantitative approach, using measures such as the Flow State Scale-2 (Jackson & Eklund, 2002) and Flow Short Scale (Engeser & Rheinberg, 2008). For example, researchers have investigated flow in exercise in relation to issues such as exergaming (e.g., Monedero, Murphy & O' Gorman, 2017), and use of music (e.g., Karageorghis & Jones, 2014). Somewhat surprisingly, however, it appears that no qualitative studies of flow have yet been conducted in exercise. A range of qualitative studies have been conducted on the occurrence and experience of flow in sport by interviewing elite and professional (e.g., Jackson, 1995, 1996), semi-professional (e.g., Sugiyama & Inomata, 2005) and college-level athletes (e.g., Chavez, 2008) (see Swann, Keegan, Piggott, & Crust, 2012 for a systematic review). Beyond elite athletes, Partington, Partington, and Olivier (2009) defined big wave surfing as a sport when they studied qualitatively "the dark side of flow," and reported how flow can have adaptive (e.g., fulfilment) and maladaptive outcomes (e.g., dependence and compulsion to engage in an activity). Houge Mackenzie, Hodge, and Boyes (2011, 2013) examined flow in outdoor adventure activities (e.g., white water river surfing) using qualitative methods, and reported a dynamic and multiphasic perspective of "telic" and "paratelic" flow states by interpreting the findings using reversal theory (Apter, 1989). Hefferon and Ollis (2006) also studied qualitatively the experience and occurrence of flow in professional dancers, reporting consistencies with Csikszentmihalyi's (1975) conceptualisation of the flow experience and unique facilitators and inhibitors of flow in dance. Overall, therefore, it appears that no studies have yet explicitly explored flow experiences in exercise from a qualitative perspective.

Qualitative research is particularly suitable for researching subjective experience (e.g., Jackson & Kimiecik, 2008), by providing rich, detailed, and context-specific insights into the processes through which states such as flow occur, and how they are experienced. Furthermore, qualitative methods can potentially generate more critical, and progressive (Lakatos, 1970) understanding of flow than psychometric measures (Swann, Piggott, Schweickle, & Vella, 2018). For example, the primary measure in this field, the Flow State Scale-2 (FSS-2; Jackson & Eklund, 2002), was developed based explicitly on Csikszentmihalyi's nine-dimensions; that is, much of the research employing the FSS-2 has implicitly accepted Csikszentmihalyi's dimensions. This issue may prevent the emergence of new ideas and insights into flow by reinforcing the accepted conceptualisation without progressing or evolving understanding of this state (Swann et al., 2018).

Indeed, Swann et al. (2018) argued that flow research in sport and exercise is approaching a 'crisis point' (Kuhn, 1996) following the emergence of new insights generated using qualitative methods. Specifically, a series of studies have employed 'event-focused' interviews (i.e., focused on a specific experience, and interviewing participants within hours/days) rather than the traditional 'career-based' approach (i.e., conducting interviews about general perceptions or experiences that may have occurred years in the past; Swann, Keegan, Crust, & Piggott, 2016; Swann, Crust, & Vella, 2017; Swann et al., 2017a, 2017b; Jackman, Crust, & Swann, 2017). These studies suggest that Csikszentmihalyi's nine-dimensions framework (and accompanying measures, such as the FSS-2) conflates flow with a second "clutch" state (see Swann et al., 2018).

The term "clutch" performance was popularised in the USA in the 1970s, particularly in baseball and basketball (e.g., Cramer, 1977), and refers to improved performance under pressure (Otten, 2009). Clutch states therefore appear to underlie such instances of superior performance under pressure (Otten, 2009), with Hibbs (2010) denoting that the athlete must be aware of that pressure; have the capacity to experience stress; must perceive the outcome to be important; and must succeed largely through effort. Furthermore, athletes describing clutch states reported intrinsic rewards after the experience including enjoyment, pride, and satisfaction (Swann et al., 2017a). As such, clutch states meet the definition of an optimal experience in that they are positive and self-fulfilling experiences, associated with happiness, that result from exerting effort (cf. Jackson & Wrigley, 2004).

Qualitative studies of clutch states reveal overlapping characteristics with flow, as well as distinguishing features of each state (e.g., Swann et al., 2017b). Specifically, both flow and clutch states were reported to involve enjoyment, enhanced motivation, perceived control, absorption, confidence, and altered perceptions (e.g., of time) (Swann et al., 2017a). In terms of distinguishing characteristics, clutch states were described by complete and deliberate focus, heightened awareness (e.g., of the demands of the situation), and intense effort (e.g., "giving everything"); whereas flow was reported in terms of effortless attention, positive feedback about progress (e.g., feeling like everything was "clicking into place"), and an automatic/effortless experience (Swann et al., 2017a, 2017b).

The emergence of clutch states has raised questions over Csikszentmihalyi's nine-dimensions framework and measures (e.g., Flow State Scale-2; Jackson & Eklund, 2002) based on that conceptualisation of flow (Swann et al., 2017). Importantly, Csikszentmihalyi's nine flow dimensions appear to capture aspects of both flow and clutch states, arguably because those dimensions are defined imprecisely (e.g., Kowal & Fortier, 1999). For example, *clear* goals are identified as a core condition of flow (Nakamura & Csikszentmihalyi, 2002) but this dimension does not specify which type of goal is necessary for flow; and studies suggest that flow occurs through 'open' goals while clutch occurs when pursuing specific goals (Swann et al., 2016, 2017a; Jackman et al., 2017; Schweickle, Groves, Vella, & Swann, 2017). Similarly, *concentration on the task at hand* encompasses the 'natural', effortless attention described during flow, as well as the heightened, deliberate concentration reported during clutch states (Swann et al., 2017a). By summarising qualitative evidence, Swann et al. (2018) indicated that athlete descriptions of both flow and clutch states met the definitions for *all nine* of Csikszentmihalyi's dimensions.

Against this backdrop of conceptual uncertainty, a pressing issue is that understanding of clutch states and performances is limited to sporting contexts thus far. Little is known about whether clutch states are relevant in non-competitive settings such as exercise. For example, previous definitions explicitly refer to clutch *performance* (e.g., "any performance increment or superior performance that occurs under pressure circumstances" – Otten, 2009, p. 584), which may not be as relevant in exercise. Conversely, recent findings (Swann et al., 2017b)

on clutch states included participants in activities such as mountaineering, polar exploring, and running, which suggest that such states may also be relevant beyond traditional competitive sports. Indeed, as pressure is typically considered to be a barrier to exercise (e.g., Stults-Kolehmainen & Sinha, 2014), it is important to examine the potential role of clutch states in this setting. Such investigation could provide insights into if/how clutch states may be relevant in exercise promotion, for example, in terms of whether they should be avoided or promoted. This study seeks to address these issues by undertaking an initial examination of clutch states in exercise.

Event-focused interviews seek to interview participants as soon as possible after a specific, relevant event has occurred (Swann et al., 2016), and present an opportunity to capture rich and detailed descriptions of experiences during exercise. The traditional career-based approach to interviews have been criticised for biased, 'rose-tinted' recall (Brewer, Van Raalte, Linder, & Van Raalte, 1991), reliance on memory of events up to years in the past, and risk of forgetting details (Yarrow, Campbell, & Burton, 1970), or merging multiple experiences into one 'blurred' memory (Neisser, 1981). Event-focused interviews seek to overcome these limitations by minimising the delay between the experience and the interview, in order to maximise the detail and accuracy of subsequent recall (Jackman et al., 2017; Swann et al., 2016, 2017a). Furthermore, event-focused interviews enable chronological recall of events in sequence, which can enable understanding of how positive experiences occur and may provide insight into how activities can be structured to achieve such positive experiences. To date, event-focused studies have interviewed participants on average four days after a specific event (Jackman et al., 2017; Swann et al., 2016, 2017a). As "the more recent the event, the better it is recalled" (Reis & Gable, 2000, p. 196), this study aimed to interview participants as soon as possible after a specific event in order to enable potential refinement and advancement of previous work, through more recent and detailed recall.

Therefore, the aim of this study was to explore qualitatively the positive psychological states experienced during rewarding exercise activities. Specifically, this study aimed to address the absence of qualitative studies on flow in exercise, and extend emerging research in sport by conducting an initial investigation of clutch states in exercise. By conducting interviews as soon as possible after the experience, this study sought to maximise the detail and accuracy of exercisers' recall, and enable exploration of the psychological states experienced, processes through which they occurred, and their outcomes. In turn, this study also builds on calls to minimise the delay between interviews and the experience of interest (Csikszentmihalyi, 2014) and work towards refined conceptual understanding of optimal psychological states. Ultimately, such insights may shed light on ways in which researchers and practitioners can help individuals experience such optimal states in exercise more reliably and consistently.

2. Method

2.1. Approach

Similar to previous event-focused interview studies in sport (e.g., Swann et al., 2017a), this study was underpinned by a critical realist ontology (Easton, 2010). Critical realism encourages researchers to seek causal explanations, through examination of mechanisms, process, and contextual influences involved in certain events (Maxwell, 2004). Critical realism, therefore, is particularly relevant for the study of positive/optimal psychological states where explanation is a primary aim in order to help make these states occur more often (e.g., Jackson, 1995). Maxwell (2012) suggested that explanation of complex phenomena lends itself to forms of data that retain the chronological and contextual connections between events, and to the in-depth study of a relatively small sample of individuals. Thus, a qualitative approach is compatible with critical realism (Maxwell, 2004; Wiltshire, 2018) and has been regarded as the most appropriate methodology for exploratory research on psychological states (e.g., Jackson, 1996). As such, we adopted a methodology similar to Keegan, Harwood, Spray, and Lavallee (2009), and Swann and colleagues (Swann et al., 2017a; Swann, Piggott, Crust, Keegan, & Hemmings, 2015). In particular, this approach challenges the researchers to question any pre-existing assumptions, and transparently explain and justify how their data are constructed/presented (cf. Piggott, 2010; see Trustworthiness).

2.2. Participants and sampling

Participants in this study were 18 individuals (9 female, 9 male) who had recently participated in a self-reported rewarding[1] exercise session/activity. These participants (M age = 32.94; SD = 10.18) were from Australia (n = 6), USA (n = 2), Ireland (n = 2), Holland (n = 4), England (n = 2), Canada (n = 1), and Iceland (n = 1). The activities they participated in were yoga (n = 3), duathlon (i.e., swimming and running; n = 3), running (n = 2), treadmill running/walking (n = 2), surfing (n = 2), weight training (n = 2), hiking (n = 2), half ironman (n = 1), and indoor climbing (n = 1).[2] The participants ranged from experienced, committed exercisers (e.g., participating every day) to those who reported engaging in the activity once or twice a week (e.g., going to certain classes at the gym). In line with principles of event sampling (Reis & Gable, 2000), theory-based and opportunistic strategies (Palinkas et al., 2015) were used to purposefully sample and recruit individuals for the study. For example, relevant individuals (e.g., regular attendees at a gym) were identified through personal and professional networks of the research team, and were contacted electronically or in person about the study. After agreeing to take part, they were asked to contact the research team if/when they had a rewarding experience in exercise that they were willing to be interviewed about. Alternatively, participants were approached when members of the research team became aware of individuals who had a rewarding experience in exercise, for example, after organised community-based events such as Parkrun (a timed 5 km walk/run held weekly). Participants were interviewed on average within two days of the specific activity (M = 44 h after the event), with 10 of the interviews taking place within 24 h of the activity. On average, the interviews lasted 55 min (SD = 13.99).

2.3. Procedure

Ethical approval for the study was granted by a university human research ethics committee, and all participants provided written consent after the researchers explained the purpose of the study. After agreeing to participate, interviews were arranged as soon as possible after that activity. All participants provided informed consent after the researcher had explained the purpose of the study, and interviews were conducted until data saturation was perceived (i.e., no new themes were identified; Coté, Samela, Baria, & Russell, 1993). All interviews were digitally recorded and transcribed verbatim. Afterwards, participants were provided with a $20 voucher as a thank you for their time.

[1] "Reward is the positive value ascribed to an object, a behavioural act, or an internal physical state, through multiple neuropsychological components. The "wanting" (or desire) component is the positive value resulting from the relevance of the behaviour for the needs of the individual. The "liking" component is the positive value resulting from the hedonic pleasure associated with the performance of the behaviour" (Cheval et al., 2018, p. 1391).

[2] While some of these activities could also meet the definition of sport (e.g., half ironman), the participants reported engaging in them with the primary intention of achieving improved fitness, rather than competition or winning, and were therefore considered to be exercise (see Caspersen et al., 1985; Pink, 2008).

2.4. Semi-structured interview

A semi-structured approach was employed and the interviewer adopted a conversational and open-ended approach in order to develop rapport and allow new themes and discussions to emerge (cf. Potter & Hepburn, 2005). The interviews were conducted by three researchers (i.e., first, second, and third authors) who had all published studies on flow and clutch states, and had conducted event-focused interviews previously. Before the interview began, and in line with our critical realist ontology, the researcher encouraged participants to challenge and clarify any assumptions or terminology that did not correspond with their experiences (Swann et al., 2015). Similar to previous studies in sport (Jackman et al., 2017; Swann et al., 2016, 2017a), the interview focused on the participants' experience of their recent activity by addressing: (i) general reflections on the activity and outcome (e.g., why they perceived the experience to be optimal); (ii) chronological recall of the event (e.g., "please describe how this activity unfolded, from start to finish"); and (iii) exploration of the psychological states experienced during the event (e.g., "what were you thinking and feeling at that point?"). While addressing these general themes, specific probing questions were also employed, such as "can you describe what your experience was like at that point?" and "can you tell me a bit more about that?" In doing so, the interviews sought to focus on psychological states experienced during the activity that made it rewarding; that is, the focus was on the most positive aspects of the activity rather than sections considered to be average or negative. Interviews took place in person ($n = 12$) at a location of most convenience to the participant, or via phone/Skype ($n = 6$).

2.5. Analysis

Data analysis was conducted through a team approach, and thematic analysis (Braun, Clarke, & Weate, 2016) was used to understand each participant's experience during the activity. Specifically, an abductive approach was used, which is consistent with critical realism (Danermark, Ekstrom, Jakobsen, & Karlsson, 1997). Rather than setting all preconceived theoretical ideas aside during the research project, abductive analysis assumes extensive familiarity with existing theories at the outset and throughout every research step (Meyer & Lunnay, 2013; Timmermans & Tavory, 2012). In doing so, "abductive analysis specifically aims at generating novel theoretical insights that reframe empirical findings" (Timmermans & Tavory, 2012, p. 174), to formulate new ideas, think of something in a different context or identify data that are beyond the initial theoretical premise (Danermark et al., 1997; Meyer & Lunnay, 2013). Thus, an abductive approach was deemed most suitable for an event-focused investigation into flow and clutch states in exercise.

First, the lead researcher (first author) enhanced his familiarity with the data through a process of "in-dwelling" (e.g., by reading and re-reading the transcripts; Maykut & Morehouse, 1994). Then relevant quotes were extracted as initial *codes,* which represented the most basic units of data (e.g., "time went by quickly"). Subsequently, these codes were categorised as broader *themes,* which represented common aspects of the participants' experience (e.g., the previous quote was categorised in the theme *altered perceptions of time*). These themes were categorised into over-arching *general dimensions* (e.g., *altered perceptions of time* was placed in the category *altered perceptions*). Then, the analysis for each participant was compared for similarities, differences, and patterns in the data, which were synthesised to describe the psychological states experienced by these participants, as well as their contexts and processes of occurrence, and outcomes, as reported below. After the lead researcher completed this initial analysis, the other authors were provided with his interpretation of the results and a portion of individual transcripts, and asked to comment critically (see Trustworthiness below). This iterative process led to further refinement of the analysis, as presented below. Participants are referred to by activity, with numbers for participants from the same activity (e.g., Yoga 2).

2.6. Trustworthiness

The term *trustworthiness* describes methods aiming to enhance quality in qualitative research (Smith & McGannon, 2017; Sparkes & Smith, 2014) and a number of recommended strategies were adopted in this study. An important consideration was minimising the delay between the event and data collection, in order to maximise the detail and accuracy with which participants could recall their performance and experience (e.g., while still 'fresh' in their memory; Reis & Gable, 2000). Thus, all interviews were conducted on average within two days of the experience, representing an improvement on other studies in this area (e.g., Jackman et al., 2017; Swann et al., 2016, 2017a). *Peer debrief* was conducted throughout the study via formal meetings between all members of the research team, and regular informal discussions with each member (Creswell & Miller, 2000). Specifically, as discussed in the *Analysis* section, the second, third and fourth authors engaged in a process explicitly aiming to critically review and challenge the lead researcher's assumptions and initial interpretation of the data. Each co-author was provided with a sample of three transcripts (all co-authors reviewed different transcripts) plus the first author's initial analysis. The co-authors were asked to read the transcripts (repeatedly, if necessary) before reviewing the initial analysis. Upon doing so, they were asked to: (i) identify which state(s) they perceived each participant to have reported in their transcripts; (ii) review how well the initial analysis matched the data reported in each transcript; (iii) identify any important or prominent themes in the data that were not captured in the analysis (or vice versa); and (iv) critically review the categorisation reported in the initial analysis for consistency and transparency. This process led to re-labelling and re-categorisation of certain themes and dimensions, and addition of new themes, as reported below.

3. Results

This study sampled participants who reported positive, rewarding experiences in exercise. These participants reported experiencing two distinct optimal psychological states during these activities. Specifically, 13 participants described experiencing *flow*: "Some people talk about getting into a flow and a groove, it rarely ever happens to me. And yesterday was one of those few times" (Duathlon 1). Alternatively, 13 participants described an experience which they often referred to as "grinding": "Just a grind … you're grinding the effort, and you have to grind deep within yourself and … grind to the dark place to get to execute the lift" (Weight training 2). Eight participants experienced both states at different points in the same activity, and were able to articulate differences between both:

> When I'm in the flow, I feel really positive and I really notice the difference in my attitude. But then … especially towards the end of the race when I'm pushing hard, I'm concentrating and … certainly I feel like I'm just doing everything in survival mode, not necessarily enjoying the moment … That's when I feel like I'm making the most difference to my time or the most improvement (Duathlon 2).

Table 1 presents an overview of the state(s) reported by each participant. These states occurred in specific phases rather than being present throughout the whole activity (e.g., these states were preceded/followed by non-optimal phases). They were also experienced by individuals across different types of activity (e.g., group vs individual activities, low-impact gym classes to aerobic endurance activities; see Table 1), and by experienced exercisers as well as participants engaging in the activity for the first time. The following sections describe the experience of these states, the contexts in which they occurred, the processes of occurrence, and the outcomes of each state.

Table 1
Participant demographics and state(s) reported during interview.

Activity	Age	Sex	Duration	State(s) Experienced
Indoor Climbing	25	Female	52 min	Flow
Hiking 1	21	Male	65 min	
Running 1	28	Female	45 min	
Yoga 2	34	Male	63 min	
Yoga 3	28	Female	62 min	
Treadmill Walking	54	Female	45 min	Clutch
Treadmill Running	41	Female	62 min	
Surfing 1	26	Female	52 min	
Hiking 2	34	Female	67 min	
Weight Training 2	26	Male	62 min	
Duathlon 1	48	Male	33 min	Both
Duathlon 2	32	Male	33 min	
Duathlon 3	41	Male	61 min	
Half Ironman	26	Male	83 min	
Weight Training 1	28	Male	56 min	
Yoga 1	26	Female	65 min	
Running 2	52	Female	32 min	
Surfing 2	23	Male	53 min	

3.1. Flow states

Flow states, described as being in "the groove", "flowing", or "on autopilot", were typified by descriptions such as:

> It's effortless and easy and free, it just feels nice. It feels like there's not a care in the world, there's no worries in lifting this weight. It's comfortable, nothing can go wrong and you just feel strong, secure, stable (Weight Training 1).

These states were characterised by a perception that the activity was going well: "In that 6 k's [kilometres] I was going so well I had in my mind that I [wanted] around a 32 k race average, but I was pushing much, much higher numbers than that" (Half Ironman). Similarly, these states were characterised by lower than expected effort: "I didn't run particularly fast … I ran at what I was expecting to run at, but it felt easier" (Running 1). Thus, these exercisers discussed flow in similar ways to participants in previous research (see Introduction).

3.1.1. Contexts for flow states

Flow generally occurred in contexts involving exploration, novelty/variation, and flexible outcomes (see Table 2 in Supplementary Material). A surfer described *exploration* and experimentation:

> You just try, and it's not really a goal but it's just trying to explore … all the different things you can do … When you try and explore a little bit, you try and figure out what's the fun thing and best thing to do at that point with that wave … It's not a goal but it's just a matter of, like, trying and fun and having a good feeling about the board, and if it makes you smile, it works … And it's fun to do because even if you fall down, it's water, so it wouldn't hurt you … Yes, you just try (Surfing 2).

Exploratory contexts combined themes including *novelty,* and *variation,* with examples such as doing the activity (e.g., yoga), or a different version of the activity (e.g., running a new distance), for the first time. These themes were illustrated by the quote:

> I thought "I want to do a beach run because that will be different". I've not run on a beach in ages … That made it really enjoyable … Because it was different … to what I've been doing lately. So it wasn't like my usual run-of-the-mill stuff (Running 1).

Within these contexts the participants reported that they were *not focused on achievement,* and therefore perceived *low pressure/expectation*: "I wasn't feeling much pressure because I didn't know whether I was going to be able to do it or not … No expectations, so anything I did was going to be good!" (Yoga 1). Unimportant or *flexible outcomes* were also discussed:

> I think when I set off running, I felt like anything could happen. I felt like … it might end up feeling like a struggle and I'll turn around at 2½ [kilometres]. Or I could have run and run and run … I wasn't really that sure. I just knew I wanted to run on the beach and I knew that the beach was endless and I could run as far as I felt like I wanted to. So I felt like my goal was quite open to change (Running 1).

Hence, flow occurred when exercisers perceived novel, exploratory contexts within the activity, when low pressure and importance was placed on the outcome.

3.1.2. Occurrence of flow states

Within such contexts, the process of flow occurrence was typically described as a relatively gradual build-up through a series of stages (see Table 3 in Supplementary Material), beginning with an *initial positive event*: "That's my turning point. I put a hundred [kilograms] on, it felt very easy … It flew up, I found that very easy to do. That was the moment where it set the tone for the rest of the session" (Weight Training 1). That initial positive event provided participants with *positive feedback*, as a surfer explained: "It's just a feeling that you have … with your board … because that first wave that you really catch, you're, like, "okay, so this is what I really need to do now"" (Surfing 2). Participants subsequently described an *increase in confidence:* "Your confidence grows throughout yoga … And I suppose with the different levels of poses as well, it allows your confidence to grow …. So yeah, that changed my perception of what I can and can't do" (Yoga 1). This build-up of confidence enabled participants to *challenge* themselves: "If you can build a little bit more confidence … you don't judge yourself, I guess, as much … so it opens up space to just be a little more present and just go for it" (Yoga 2). Through that challenge appraisal, participants then reported *setting open goals*, which did not include specific outcomes: "I was just trying to see how far I could push myself really, and not preoccupied about the time, just for my own self … growth. Just wanted to see how far I could get" (Hiking 1). This relatively gradual process led to the experience of flow in exercise, as described below.

3.1.3. Experiencing flow states

The experience of flow was characterised by 12 categories (see Table 4 in Supplementary Material). These experiences were reported to involve *enjoyment during the activity,* accompanied by *reduced perceptions of effort:* "it just felt so effortless and so fun and enjoyable … So that overall experience was really positive" (Running 1). Participants also described *absorption* in the activity during flow, as illustrated by the following quote: "you're completely absorbed in the moment. So you're not in the past, you're not in the future, so I think that gives you peace of mind" (Yoga 1). These exercisers reported *positive feedback about the present moment,* which related to how the activity was progressing at that point in time, and how the activity had progressed until that point (i.e., rather than about what was required for the remainder):

> I remember thinking "wow this is really nice". Like, there's no one around and I remember thinking "this is the perfect temperature" … it felt really good … And my watch, it got to 2k [kilometres], and I saw that I was running at a decent pace, so I thought this is good … and I just kept going, oh better and better (Running 1).

While receiving such positive feedback, participants similarly described an *absence of negative thoughts* during flow, such as:

> I no longer feel like, "oh, is this going to be a long run? Am I going to be able to push through the whole run?" … when I get into that groove, I'd say it becomes less of a concern. I feel like I'm comfortable now, I can keep going at this pace and I don't have to keep looking at my watch and worrying (Duathlon 2).

Flow states also involved *automaticity* in terms of the movements made by these exercisers during the activity. For example: "it's almost like the brain is not cognitively there … the body's just moving and reacting instinctively, as opposed to consciously thinking about what it's doing" (Yoga 2). Participants discussed *effortless attention* during flow, in terms of feeling like they were focusing on the activity without necessarily trying to: "I was concentrating maybe on running, but it almost felt like I didn't need to concentrate. Like … there was no effort to concentrate" (Running 1).

Individuals experiencing flow states in exercise also described feelings of *confidence* and *control*: "I was running with my arms out and being playful because I felt like I could. If I didn't feel confidence or control, I wouldn't be doing that" (Running 1). Exercisers reported varying levels of *arousal,* in terms of energy, adrenalin, calmness, and relaxation. These aspects could depend on the activity (e.g., weight training was higher-energy than yoga) but in some cases they were reported at the same time: "[my heart] was pounding but I didn't feel it. I felt like I was just really calm, and easy" (Indoor Climbing). *Altered perceptions* were also experienced during flow, relating to time (e.g., slowing down or speeding up), the body (feeling strong, light, warm, loose), a sense of rhythm, and feeling in tune with others. The final characteristic of flow reported by these exercisers was *motivation for more,* in terms of wanting more of the experience, or a desire to keep going: "When you have that [state] … you're just, like … I want to have more of this feeling. I want to go for more of these rides" (Surfing 2). These characteristics comprised the experience of flow, and were reported across varying types of exercise. That is, exercise was reported in a highly enjoyable, effortless, confident manner by these participants during flow.

3.2. Clutch states

A second optimal psychological state was experienced during exercise, which participants referred to using terms such as "grinding" and "survival mode". This state was distinct from flow, for example: "It definitely wasn't that free-flowing feeling by any stretch of the imagination. It is a battle" (Duathlon 1). These experiences matched descriptions of clutch states reported previously (see *Introduction*), and in contrast to flow, participants articulated how such clutch states were more directed towards achievement, with enjoyment derived *after* the experience rather than during it:

> It [flow] feels fine. This is nice, this is comfortable, almost like I'm good at [the exercise] … or, "God I'm strong today" … [When I'm] grinding it's, "I am strong today and I've pushed through that. It wasn't enjoyable but I got what I wanted out of it which is enjoyable." So, the grind is post-enjoyable I guess. That's the definition. When I've got out of the grind, that's, "Wow, that's what I just achieved" (Weight Training 1).

Participants also described how they functioned at higher levels during these states: "It just gives you a feeling of performing better … that's when I feel like I'm making the most difference to my time or the most improvement" (Duathlon 2). Similarly: "I think my pace also picked up for the last kilometre … the last one [kilometre] was I think my fastest one actually … It was six [minutes per kilometre], the other ones were seven [min/km]" (Running 2). Participants described these states as highly positive: "it was out of the ordinary … it was really satisfying … The way I felt this morning … it's the best I've ever felt doing an individual session like that" (Treadmill Running). Therefore, these states were reported to be optimal, but differed from flow, and matched descriptions of clutch states reported previously in sport (see Introduction).

3.2.1. Contexts for clutch states

Clutch states were reported to occur in contexts involving *achievement,* and *pressure,* often at the *end of events* (see Table 5 in Supplementary Material). For example, one participant described a competition held in the gym they attended, which provided a context for achievement:

> What we're doing at the gym is … five different groups, and we've all got to compete - for your group. And they're just keeping score, and seeing who wins … I knew … the fastest time, at that point … so I went there trying to beat that (Treadmill Walking).

Another participant described how they created their own competition within an exercise activity: "another girl came beside me [on a treadmill] … and then I thought 'you know what, I want to run faster than you'" (Treadmill Running). That is, individual appraisal of the situation could lead to a sense of competition, which in turn was a context for clutch states. Similarly, participants reported that clutch states occurred in contexts involving *achievement* of important outcomes, including improvement on personal benchmarks: "The parkrun was a 5 k [kilometre] run … It's just for fun … but … I just had in my mind … why can't I beat it [personal best] again? And I just built something up in my own head that I had to crack it" (Duathlon 1 – see following section for discussion of goals in the occurrence of clutch states).

Clutch states were also reported in situations involving *pressure* and expectation, which was often reported to be placed on themselves rather than externally:

> My expectations in the last one [pose] were purely just to do a wheel [advanced pose] … I suppose I had defined things that I wanted to achieve. So I expected myself just to be able to do that … So I wanted to reach the same level, that was my expectation … I guess it would be a sense of pressure (Yoga 1).

Furthermore, these states were often (but not always) experienced at the *end of activities*. A yoga participant explained: "knowing that there's only one more [pose], you just kind of say,

> "Right, I'll just give it my all for this one," because I know I don't have to do another one after it" (Yoga 1). In contrast to flow, clutch states in exercise were reported in pressurised, achievement contexts, which were perceived through either objective structure of the activity (e.g., gym-based competition) or subjective appraisal of the situation.

3.2.2. Occurrence of clutch states

Within the above contexts, clutch states occurred through a sequence of steps, involving a relatively sudden 'switching on' or 'stepping up' of effort (see Table 6 in Supplementary Material). This process began with initial *feedback* about the situation: "when we were going up the last hill - I think I speeded up a little bit … I was told that I could make my PB [personal best], so that pushed me a little bit" (Running 2). This feedback led to a *challenge appraisal*, for example: "With five k's [kilometres] to go I knew that there was a chance that I could … probably come in under that 5:30 time … [and] that if I held a decent pace that I would make that" (Half Ironman). Similarly, participants articulated how these appraisals were about a sense of challenge: "it's definitely a challenge. It's definitely more about trying to make the most of it and take it on, even though it's painful at the time" (Duathlon 2). Also, the level of challenge was reported to be the highest achievable: "For me … grinding happens … [when] I'm on that edge of not being able to achieve it" (Weight Training 1). At that point, participants reported *setting specific goals*:

> I knew that the fastest time, at that point, was 8.3 [830 m], so I went there trying to beat that … The goal drove the whole thing … To reach the goal … I was determined to make it … [and] I got 8.9 (Treadmill Walking).

In response to these goals, participants described making a conscious decision to *step up their effort*: "it was an intentional decision to step it up … I thought "I'm just going to push myself to that next level" and I

did" (Treadmill Running). This relatively sudden process led to the experience of clutch states in exercise, as described below.

3.2.3. Experiencing clutch states

This state was characterised by 12 categories (see Table 7 in Supplementary Material), four of which were consistent with categories experienced during flow. Similar to flow, clutch states were characterised by *absorption* in the activity, as illustrated by the quote: "you don't have any energy … to use on any other thoughts … you can't think about other things" (Hiking 2). *Confidence* was also reported in a manner consistent with the experience of flow: "I got more confident, as I got closer [to the end], that I wouldn't crack, so I kept lifting my pace as much as I could" (Half Ironman). These exercisers described skill execution during clutch states to be *automatic* whereby they did not need to think about the movements they were making: "Physically I know that I'm grinding, but mentally I'm kind of just executing it … It wasn't effortless in the fact that I was feeling pain, but it was effortless in its execution" (Weight Training 2). *Altered perceptions* were also discussed by participants, relating to perceptions of time (slowing down, being very aware of time, or having no concept of time), and bodily perceptions (feeling stronger).

The other eight characteristics of clutch states were different to those reported in flow. Notably, participants reported that clutch states were not enjoyable during the activity: "it wasn't enjoyable to do because I was running at the hardest that I thought I could run" (Half Ironman). These states were typified by *intense effort* and "giving everything" in order to achieve the desired goal: "It's kind of just putting whatever energy I've got left into that last pose, just to do it" (Yoga 1). Participants also reported *heightened and effortful concentration* on the task, for example: "I feel like I have to maybe work a little bit harder at concentrating … I feel like I need to concentrate a lot more" (Duathlon 2). One participant explained that this concentration was towards the goal at the end of the activity: "It was very much I had to beat that time, that was all I was focused on … I really had to focus … so I could get to the goal at the end" (Duathlon 1). *Feedback towards the goal* was described, whereby progress was judged relative to the demands of the situation, and what was required in order to meet the goal (i.e., future-oriented, rather than present-focused as in flow above). For example: "You can see the distance, you can see the time. So, you're just trying to calculate in your head … whether you're on pace, or not" (Treadmill Walking). These exercisers described *heightened awareness* during clutch states, particularly around the demands of the situation: "I was more in the zone and I was much more aware of exactly how the time was … because … that was the main focus" (Half Ironman). Participants reported *heightened arousal* (e.g., adrenalin) during clutch states, as well as *analytical thoughts*, as the following quote illustrates: "God, this is bloody hard" … I'm just thinking about the exercise, and how hard it is" (Treadmill Walking). However, these exercisers emphasised that such analytical thoughts were not negative: "It's the absence of negativity, there's no thought of, "I cannot lift this" (Weight Training 2). Participants described *motivation to accomplish* as a key aspect of clutch states, for example, in terms of determination to achieve the goal of that situation: "I was really determined to make it to the end of that five k's [kilometres] … I was just determined to up the pace" (Treadmill Running). Attempts at *exerting control* were also reported as the final characteristic of clutch states: "I do have to think really hard about everything and therefore I don't necessarily feel in control, even though I am trying to control myself more" (Duathlon 2). These characteristics comprised the experience of clutch states across various forms of exercise. Thus, a second type of optimal experience was reported in exercise, separately to flow, which was more effortful, less enjoyable, and focused on achieving a goal within the activity.

3.3. Outcomes of flow and clutch states in exercise

These participants were sampled because they reported rewarding experiences in exercise. As such, all participants reported *intrinsic rewards* as an outcome of the activity, regardless of which state they experienced, including a sense of achievement, positive mood and emotions, motivation, and confidence (see Table 8 in Supplementary Material). While clutch states were not enjoyable at the time, one participant articulated how the experience was appraised as enjoyable afterwards: "Enjoyment is kind of a weird thing, like it's all relative. I did enjoy it, but if you put me in that situation now – right now – I don't think I would enjoy it" (Hiking 2). This appraisal of enjoyment may have been dependent on achievement of the goal pursued during clutch states (e.g., reaching the summit on a hike). There were also differences in the outcomes reported between participants who experienced flow and clutch, in terms of being energised or fatigued after the activity:

> You're happy after both of them, definitely. But the … one that happened when I was climbing [flow] is more of an easy feeling, and you can just go straight again to do the next route … [you have] more energy … You're, kind of, drained after the second [state, i.e., clutch] (Indoor Climbing).

Participants experiencing flow reported *energy* afterwards: "You feel uplifted and energised" (Yoga 2); "I felt rested. Yeah. But rested in the way that you did something hard" (Yoga 3). Conversely, participants who reported clutch states described feelings of tiredness, exhaustion, and even nausea after the activity, as a result of high effort and exertion:

> I was very tired. I'd pushed myself so much … And I don't normally do that … But at that particular exercise, because I wanted to achieve that, I knew I had to push
>
> myself … I literally thought I was going to vomit (Treadmill Walking).

Overall, therefore, flow and clutch states were both reported in relation to positive outcomes of exercise, with differences in that flow was enjoyable during the activity but not afterwards, and clutch states were associated with fatigue whereas flow was energising.

4. Discussion

This study aimed to interview participants as soon as possible after a rewarding experience in exercise, in order to explore the psychological states experienced during that activity. Participants were interviewed within two days of the experience on average. In line with similar studies in sport, these exercise participants reported experiencing two optimal psychological states, which corresponded with descriptions of flow and clutch states. Present findings therefore extend the emerging Integrated Model of Flow and Clutch States (Swann et al., 2017a) by providing evidence specifically in exercise. Furthermore, the present study suggests that the psychological state underlying clutch performance can be experienced beyond competitive sport where existing research has been conducted to date (e.g., Otten, 2009). This study also presents refined understanding of the contexts, processes of occurrence, experience, and outcomes of each state (see Figure 1). Finally, these findings present insights into optimal psychological states experienced in exercise, which may be useful for researchers and practitioners seeking to promote rewarding experiences during exercise. These findings are discussed in detail below.

4.1. Integrated Model of Flow and Clutch States

First, this study suggests that rewarding exercise experiences, like excellent sport performances, can occur through two psychological states. Previous research has assumed that rewarding exercise experiences are conceptualised as a single, ideal or optimal state (e.g., 'the runner's high'; Stoll, 2018). Instead, the present study suggests that two states are experienced in such situations, which share certain

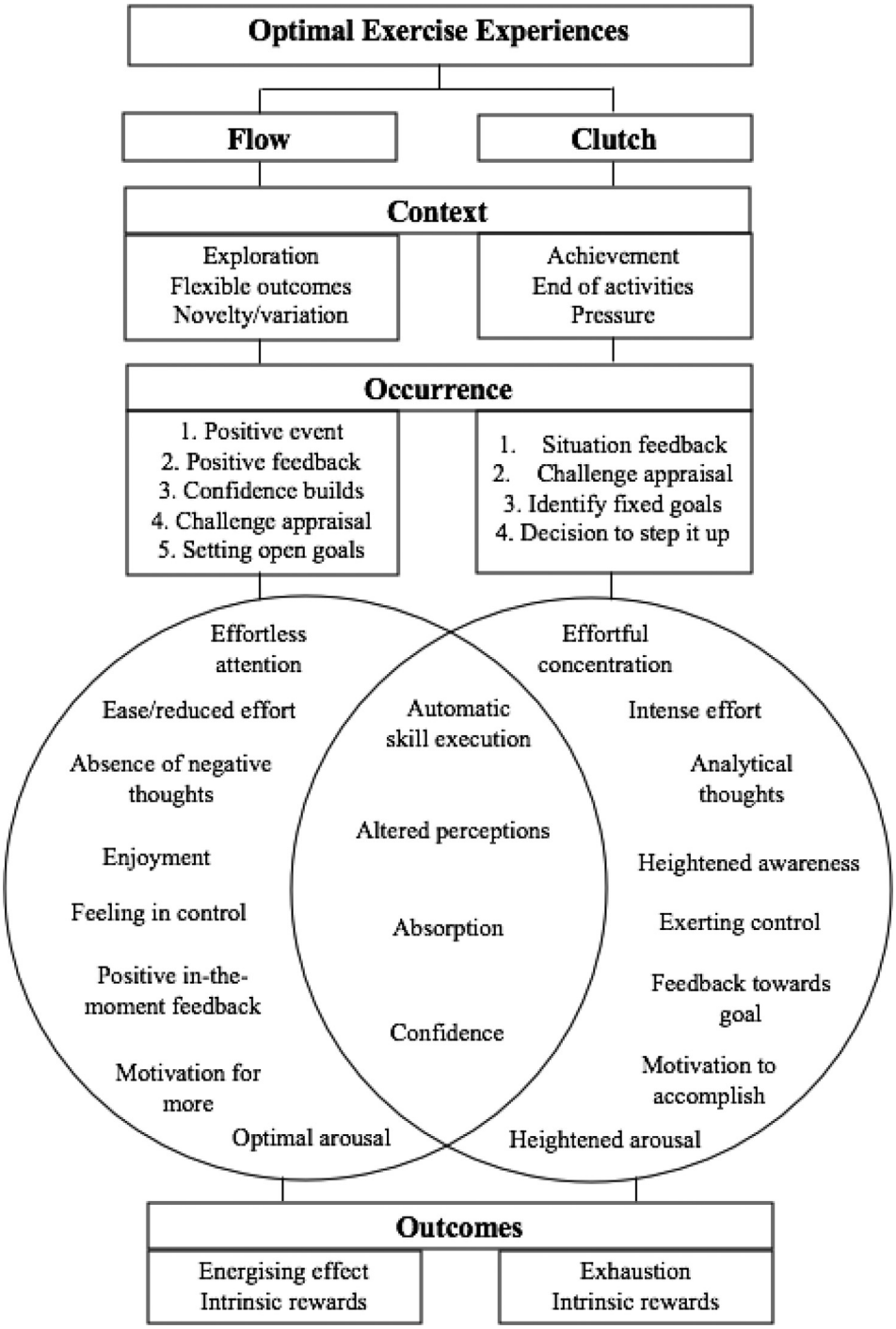

Figure 1. Summary of flow and clutch states in exercise.

overlapping characteristics (e.g., absorption) as well as experiential differences. Importantly, both states were not experienced at the same time (i.e., they were separated by non-optimal phases, or transitioned from one to the other). Furthermore, these states occurred in distinct contexts, through separate processes of occurrence, and - while both were intrinsically rewarding - they led to different outcomes (i.e., energising vs fatiguing). Both states can be considered under the *optimal experience* umbrella term, as they are positive experiences associated with happiness, and self-fulfilling experiences that result from exerting effort (Jackson & Wrigley, 2004).

It is important to note that both flow and clutch states were reported consistently across a range of relatively diverse activities. For example, both flow and clutch states were reported within yoga, running, duathlon, weight training, and surfing (see Table 1). Therefore, these findings suggest that the experience of flow and clutch states depends primarily on the individual's appraisal of the activity that they are engaging in, rather than the objective nature or structure of the activity. This notion is consistent with Csikszentmihalyi's (2002) suggestion that flow is a 'universal phenomenon' experienced in the same way across a wide range of activities (e.g., reading, surgery, chess). Similarly, Lazarus (1991) suggested that people see the world through their own 'lens' and may appraise a given situation in ways that do not necessarily correspond with the objective nature of the situation, for example, two different people may appraise the same stimulus differently (Sylvester,

Jackson, & Beauchamp, 2018). Therefore, these findings suggest that flow and clutch states can be experienced consistently across a range of sport and exercise activities.

Generally, this study supports the tentative Integrated Model of Flow and Clutch States (Swann et al., 2017a), and extends the model by providing evidence of its application/relevance in exercise. However, a number of differences, novel findings, and refinements to the model outlined by Swann et al. (2017a) were identified. First, flow states were reported to be enjoyable during the experience, whereas clutch states were not. Swann et al. (2017a) reported that clutch states involved an enjoyment paradox (e.g., athletes enjoyed experiencing the state), and therefore presented enjoyment as an overlapping characteristic experienced in both states. However, this study suggests that clutch states are enjoyable afterwards, not during exercise, and as such we do not consider enjoyment to be an overlapping characteristic here.

Second, enhanced motivation was considered an overlapping characteristic between flow and clutch states by Swann et al. (2017a), whereas this study found differences in the types of motivation experienced by participants during flow compared to clutch. Specifically, motivation during flow was reported to be about wanting more of the experience, or to get more out of the activity (e.g., wanting it to last longer), which corresponded with intrinsic motivation towards stimulation (e.g., Pelletier, Fortier, Vallerand, Tuson, & Briere, 1995). Furthermore, flow occurred in contexts involving exploration, which is defined as "a deliberate internal or external action of seeking and processing information in relation to the self" (Flum & Kaplan, 2006, p. 100) and corresponds with intrinsic motivation to know (Pelletier et al., 1995). Conversely, clutch states involved enhanced motivation to achieve the goals identified in the activity in a more instrumental fashion, and therefore corresponded with intrinsic motivation towards accomplishment (e.g., Pelletier et al., 1995).

Third, feedback was reported throughout the experience of both states in the current study, whereas this factor was only previously reported in the occurrence of flow and did not feature in clutch states (Swann et al., 2017a). Moreover, the nature of feedback appeared to differ between each state in this study: in flow, feedback was about how well the activity was going at that point in time (i.e., focused on the present moment); whereas in clutch states, feedback was relative to the remainder of the activity and what was required in order to meet the demands of the situation (i.e., future-focused). These insights shed light on specific ways in which feedback supports flow and clutch states, and may do so differently for each state (e.g., adding detail to the *unambiguous feedback* dimension of flow; Csikszentmihalyi, 2002).

These findings also suggest that separating physical from mental effort is important in understanding flow and clutch states. Flow is commonly considered to a state of effortlessness (e.g., Jackson & Csikszentmihalyi, 1999), while clutch is reported to involve intense effort (Swann et al., 2017b). However, these findings suggest it is important to consider physical effort (which is likely be high in many sport/exercise activities) from mental effort, which may be low or high during flow and clutch states respectively. Finally, perceptions of control also appeared to differ in that participants reported feeling in control during flow, compared to attempting to exert control (although not necessarily feeling in control) during clutch states. One possibility is that these differences/refinements are due to more recent event-focused interviews than have been conducted to date. A refined model is presented in Figure 1, and these issues are important for the conceptualisation of each state, for example, in terms of development of questionnaires in future (see future directions below).

4.2. Qualitative understanding of flow states in exercise

Surprisingly this appears to be the first qualitative study with a primary focus of examining the experience and occurrence of flow in exercise. Twelve characteristics of flow were identified, which broadly correspond with Csikszentmihalyi's (2002) conceptualisation, but are arguably more precise – addressing issues raised with the nine-dimensions framework previously (see Swann et al., 2018). Flow states appear to be particularly relevant to exercise promotion. For example, key characteristics of the flow experience in exercise included enjoyment and reduced perception of effort during activities perceived to be performed well, which is noteworthy given evidence suggesting positive affective experiences during exercise are related to long-term physical activity (Rhodes & Kates, 2015). In addition, participants reported feeling energised (rather than fatigued), as well as motivation to experience flow in exercise activities again afterwards. Thus, flow appears to be highly desirable in exercise, and may even be beneficial for facilitating long-term engagement.

This study provided insights into how flow occurs, and may be promoted in exercise, building on research which traditionally considers flow to be rare and elusive (e.g., Aherne, Moran, & Lonsdale, 2011). Specifically, flow states were reported in contexts that were exploratory with novelty/variation and flexible outcomes, and occurred when participants pursued open goals, which were exploratory and did not specify objectives/outcomes. These findings suggest that it is important to consider such contexts in future attempts to induce flow (e.g., in experiments or interventions). Incorporating novelty and variation into exercise may have psychological benefits, such as increasing interest, engagement, autonomous motivation, and reducing boredom (Sylvester et al., 2018). Exploratory behaviour is not inherent in typical exercise programs, which are often planned and structured weeks or months in advance. Given that exploration is linked to desirable psychological outcomes such as engagement and wellbeing (Flum & Kaplan, 2006), and appears to be a context for flow occurrence, it seems important to consider the role of exploratory behaviour in exercise programs in future. For example, incorporating novelty, variation, and exploratory behaviour in exercise may lead to flow, and could even support long-term adherence through the psychological benefits discussed above (Sylvester et al., 2018). Moreover, open goals were reported during flow but differ from the SMART (e.g., specific, measurable, achievable, realistic, time-bound) goals advocated in exercise promotion (e.g., American College of Sports Medicine [ACSM], 2017). Therefore, future research into the potential role of open goals in exercise promotion is warranted.

4.3. Clutch states in exercise

This study provides novel evidence that clutch states can be experienced beyond competitive sport. Clutch performance has been defined previously in sport as any performance increment, or superior performance, in pressure circumstances (Otten, 2009), where individuals have the capacity to experience stress, and succeed primarily due to skill rather than luck (Hibbs, 2010). Although interviewees in this study participated in exercise (e.g., yoga, running, weight training, recreational duathlon) rather than competitive sport, they reported themes consistent with sport such as competition, achievement, and pressure, which led to clutch states. Thus, even though these participants were not objectively competing in sport, it appears that they were able to perceive exercise in similar ways (cf. Lazarus, 1991), meaning clutch states can be experienced in exercise settings depending on the appraisal made by the individual.

Participants reported that clutch states occurred when pursuing specific goals, after appraising the situation as a challenge. These goals were reported as specific process, performance, or outcome goals, in line with those adopted in common exercise prescription guidelines (e.g., SMART goals; ACSM, 2017) and structured programs, which may create pressure or place importance on outcomes (e.g., achieving goals of a specific session in order to maintain incremental progress). One possibility arising from the present findings is that current goal setting practices in exercise programs may be more likely to lead to clutch states. Hence, research (e.g., employing longitudinal designs) is warranted in regard to how current structured exercise and goal setting

programs influence flow and clutch states.

Participants who experienced clutch states reported constructive outcomes such as sense of achievement, confidence, and motivation as a result of achieving specific goals, primarily through increased effort. It is also important to note that clutch states were reported to involve *higher* exertion, fatigue, and pain, and were reported to be enjoyable *after* the activity but not during it. Increasing evidence suggests that positive affective states *during* exercise are associated with long-term engagement, but such states *after* exercise are not (Rhodes & Kates, 2015). Therefore, it is plausible that exclusive or consistent experiences of clutch states could be detrimental to long-term engagement. Instead, clutch states may be more constructive for short-term exercise outcomes; specific sessions requiring more effort, such as fitness testing; or when incorporated at the end of exercise sessions to maximise achievement and corresponding intrinsic rewards (such as the 'end spurt' at the end of a run). These ideas should be examined in future research on the role of clutch states in exercise.

4.4. Limitations and future directions

As with any study, a number of limitations are present. This study described the experiences of a specific sample of exercise participants and, in addition, may have benefitted from examining experiences from other types of activity (e.g., aerobics classes; high-intensity interval training). We recruited individuals with a range of experience, and fitness levels, but there may be benefits in sampling more homogenous groups (e.g., all beginners) in future. Single rather than repeat interviews were used, and more in-depth perspectives may have been obtained by examining multiple experiences from each participant to compare/contrast episodes in the activity and gain greater insight (similar to Jackman et al., 2017). Although all participants reported that the experiences they were sampled for were rewarding, it may have been useful to quantify such perceptions using a questionnaire to enable comparison. While we followed guidance for conducting thematic analysis (Braun et al., 2016), it should be noted that by examining participants' experience of specific psychological constructs we denoted flow and clutch states as overall 'domains' in the analysis (more deductively), with categories and themes developed within each state (more inductively). This approach may not align with the notion of themes and categories in a strict, or typical, sense in other qualitative work.

Future research should seek to challenge (Popper, 1962) or support these findings through experimental methods. In line with recommendations for a progressive program of research in this field (Swann et al., 2018) researchers should address conceptual issues such as which characteristics are necessary and sufficient for flow and clutch states to be experienced. Qualitative studies should seek to further reduce the delay between interviews and the experience, to maximise detail and accuracy of recall (e.g., by striving towards same-day data collection). Such studies should seek to explore issues such as management of flow and clutch states (through psychological skills, for example), and mechanisms for transitioning between states (see Swann et al., 2017a). Researchers should seek to experimentally test whether these states can be induced reliably, for example, by manipulating the factors involved in their occurrence such as open and specific goals. Experimental research may also be able to assess conceptual questions, such as whether clutch states are still intrinsically rewarding when the goal of the situation is not achieved (i.e., are clutch states rewarding in and of themselves, or just when outcomes are achieved?).

Given suggested discriminant validity issues in existing measures of flow (cf. Jackman et al., 2017), development and validation of new questionnaires for flow and clutch states in sport and exercise is an important area for future work. Such measures could enable testing of these findings, and could address discriminant validity issues by examining relationships with existing flow measures (e.g., the FSS-2 and the Flow Short Scale). New measures could also enable examination of relationships between flow, clutch, and other constructs such as enjoyment (e.g., through the Physical Activity Enjoyment Scale; Kendzierski & De Carlo, 1991), and affect (e.g., through the Feeling Scale; Hardy & Rejeski, 1989) as well as similar perspectives such as reversal theory (Hudson, Males, & Kerr, 2016) in future.

5. Conclusion

This study aimed to explore qualitatively the positive psychological states experienced during rewarding exercise activities, by conducting interviews as soon as possible after the experience. Two states were identified within rewarding exercise experiences that matched previous descriptions of flow and clutch states (Swann et al., 2017a). This study suggests that flow and clutch states are experienced in exercise in a manner consistent with findings reported in sport, while this study also identified minor refinements in understanding of how each state is experienced. Moreover, these states were experienced across a range of types of exercise, suggesting that their occurrence is dependent primarily on individual appraisal of the situational context rather than the objective structure of the activity. This study appears to be the first qualitative investigation of flow or clutch states in exercise, and may provide a new perspective to consider in terms of the psychological states experienced during positive/optimal exercise sessions. Future research is necessary in order to test, challenge, and build on these findings. By doing so, researchers can develop more detailed and robust understanding of the role of flow and clutch states in exercise, which could help inform the design of future exercise promotion programs.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.psychsport.2018.09.007.

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