


## Research

# “You don’t get resilience overnight”: a grounded theory framework of the A-R-C sporting resilience development

Sahen Gupta<sup>1</sup>  · Paul J. McCarthy<sup>2</sup>

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## Abstract

Resilience in sport is growing as a topic of investigation but comparatively less focus is placed on how resilience develops in athletes. This study explored sporting resilience development in elite athletes over time using grounded theory. Participants included 10 competitive-elite athletes (5 men and women) who scored high, competing in individual/team sports from diverse cultural contexts. Experiential life-story interviews on sporting resilience development over time was conducted. Grounded theory was employed across ideation, data collection and analysis with structured methodological quality criteria to ensure rigour. Findings are synthesised into A-R-C Development Model of sporting resilience indicating that antecedent protective factors (A) enable the engine of sporting resilience (R) which through metacognition-emotion-behaviour produces consequences (C) of positive adaptation or critical adaptation failure. The emergent theory is the first comprehensive outline providing an understanding of how sporting resilience develops over time in competitive-elite athletes. Implications for developing athlete resilience for performance and mental health are discussed.

**Keywords** Sporting resilience · Elite athlete · Antecedents · Consequences · Sport psychology

## 1 Introduction

The past decade has seen a sharp uptake in scholarly publications on psychological resilience in sports psychology (cf. systematic reviews [11, 46]). High-level athletes experience an extensive range of adversities [95] such as injuries [74], performance slumps [29] and other stressors which depreciate athlete mental health and performance [73]. Evidence has suggested that resilience is an important factor for positive mental health of athletes [84] and consistent elite performance [31], cf. review [11, 37, 46, 80].

Resilience research in the wider field of psychology has termed it as “ordinary magic” [66], p. 227). Research has predominantly focused on individuals who are in situations that require them to react to traumatic events in clinical or emergency populations (e.g., [27, 42, 60, 85]). The contextual specificity of resilience (see [59, 80, 91, 103]), however, the findings of this work are not automatically transferable to sport and performance conditions where individuals actively seek to engage with challenging situations and adversity to seek performance [31, 37, 46]. In sport, resilience has been evidenced to be a prerequisite for managing stress, adversity and maintain performance [31], with research indicating that athletes experience loss, adversity, and resilience process differently in the unique sporting environment (see [32, 36, 45]).

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✉ Sahen Gupta, sahen.gupta@port.ac.uk; Paul J. McCarthy, paul.mccarthy@gcu.ac.uk | <sup>1</sup>Applied Sport Psychology, School of Sport, Health and Exercise Sciences, University of Portsmouth, Portsmouth, UK. <sup>2</sup>Department of Psychology, Glasgow Caledonian University, Glasgow, UK.



In sport, there is an underlying consensus that resilience constitutes positive adaptation following adversity [11, 32, 59, 79]. Fletcher and Sarkar [31] defined resilience in sport as “the role of mental processes and behavior in promoting personal assets and protecting an individual from the potential negative effect of stressors” (p. 675). Recently, a large-scale systematic review of 92 articles from various cultural contexts and designs highlighted that sporting resilience includes dynamic trajectories, environmentally adaptable metacognitive, emotional and behavioural capacities to positively adapt [46]. These definitions highlight the existing work in highlighting the process and trait aspects of resilience [31, 32, 79] and contextualise it in a sport context by extending conceptual work through incorporating empirically evidenced components from extant literature (cf. [11, 46]).

The earliest model of resilience in sport is the conceptual model of resilience [36] based on Richardson et al. [76] resiliency model, however, the linear, stage-by-stage framework, the absence of metacognitive considerations and collusion of resilience with coping processes constitute major drawbacks [32, 79, 82]. Building upon this landmark model, later research has used inductive qualitative designs to explore resilience without theoretical bias [31, 111]. Qualitative inquiry into resilience has also included exploring resilience in winter sports suggesting a ‘resiliency package’ [13], p. 105), thematic analysis exploring coach’s role [54], longitudinal exploration of resilience in marathon runners post-Boston marathon bombings [97] and resilience in coaches over time [82]. Initial evidence postulates resilience to be a moderately stable state-like process that is developed through interaction [11, 37].

In the last decade, there have been inquiries into what resilience and its protective factors are in sport (cf. [11, 31, 36, 81]). Fletcher and Sarkar [31] provided the first grounded theory of resilience in sport amongst Olympic champions. This study led to an increase in resilience research in sport (see [7]), however, it limits itself to describe what resilience is, but does not explore the process of resilience development and is limited to a UK-only sample. Gupta and McCarthy [46] systematically reviewed 92 studies on resilience in sport, and proposed an initial model of sporting resilience based on their analysis of empirical studies. Evidence in resilience research (c.f. [37, 45, 46, 80]) supports APA Division 47 suggestion that “the sport context is a unique performance environment that requires specialized training beyond general performance principles... because of the unique culture of sport” [1], p. 14). Resilience is conceptualised as a temporal process determined by socio-contextual determinants [32, 45, 59, 79]. This specificity has bred debate about the transferability of resilience to diverse contexts, specifically within the high-performance context of elite sport [54].

In this study, we explore the short/long-term development of sporting resilience in athletes anchored by the gap in the epidemiological stress/adversity-resilience relationship outlined by Sarkar and Fletcher [80]. We also aimed this qualitative exploration into sporting resilience to investigate potential differences in the development and use of sporting resilience among normative gender, addressing the gap highlighted. In line with recommendations [58], we espouse a pragmatist-interpretative approach to enquiry from study conceptualisation to better guide objectives, rationale, method, data collection, and analysis. This approach will add to the extant knowledge of protective developmental factors by illuminating the process of development of sporting resilience rather than merely study its components. This investigation into ‘how it develops’ rather than ‘what it is’ was achieved using a Straussian grounded theory approach [17, 18], replicating existing studies in sport psychology with similar objective-method congruence [31, 48, 110, 111].

## 2 Method

### 2.1 Research paradigm and methodological congruence

The pragmatic research paradigm steered this study, focusing on uncovering a ‘practical level of truth’ ([39], p. 22) and aligning itself to existing qualitative research on resilience in sport (see [31, 54]). We adhered to a pragmatist-interpretivist premise congruent with conceptualisations of sporting resilience as dynamic and subjectively determined, unfolding over time encompassing metacognitive-emotional-behavioural capacities developed through interaction [46].

Adhering to recommendations of Morse [63, 64], Holt and Tamminen [49], this study strived for “methodological coherence” (p. 419) by establishing consistency throughout the ideation, research question, philosophical orientation, and theoretical perspective [61]. We adopted a realist-interpretivist approach to grounded theory (cf. [92, 109]). This stance drove the rationale for using a grounded theory method [50]. Hermeneutical differences and lived experiences of athletes were prized to authentically gauge how resilience unfolds in a sporting context cognizant of sensitivity to gender, cultural, and environmental differences. Grounded theory was chosen because it is tailored to the aims of the study to determine the process and nature of sporting resilience, in line with endorsements that “in an area where a satisfactory pre-existing theory has not been developed, a particularly insightful approach is

grounded theory” [31], p. 670, cf. [8, 93]. Having conducted a systematic review in the area, it is impossible for authors to be *tabula rasa*, so we adopt a Straussian perspective [17, 18], siding with Dey [28] by approaching the study with an open but not an empty mind.

## 2.2 Recruitment

We undertook purposive sampling to select participants. Competitive-elite and semi-elite athletes from team and individual sports (see [94] criteria) who were injury-free and over 18 years of age were the inclusion criteria for recruitment. Elite level athletes were approached because they were most likely to possess sporting resilience characteristics that enabled them to withstand stressors and be successful in their sport [31, 56]. Potential participants were approached via e-professional networks, email, Twitter, gatekeeping organisations, and professional networks. Participants were informed about the background of the study upon first contact.

Phase I screening was conducted using Brief Resilience Scale [88], in line with recommendations from Windle [112] regarding its satisfactory reliability and validity. Participants who scored above the normal resilience threshold (i.e. 3 and above), were invited for Phase II interviews. We did this in line with the aims of the research (i.e. explore the development of sporting resilience). Therefore, athletes with high self-reported resilience were screened in line with pragmatic philosophy to best answer the research question. Before commencement of research, ethical approval was secured from the Institutional Ethics Committee.

## 2.3 Participants

All elite athletes who were screened at Phase I ( $n = 35$ ), scored above average level of resilience. Athletes who scored high on resilience in Phase I ( $n = 17$ ) were invited to Phase II interviews but were not informed of their psychometric resilience scores. Initial purposive sampling criteria was supplemented by evolving theoretical sampling criteria as theory began to emerge to ensure effective identification of process patterns and variations [17]. Initial stages included a greater number of female elite athletes hence, male athletes were increasingly recruited in the later stages of the study. The final sample comprised 10 competitive elite athletes (5 men and 5 women). Detailed demographics are illustrated in Table 1.

**Table 1** Participant demographic information

Pseudonym/ID	Age/gender	Sport	Representation/level of competition	Experience	Pathway to sport
Steven /P01	21/Male	Frisbee	Australia and Scotland/Competitive Elite	7 years	Performance
Elaine /P02	26/Female	Rugby	Scotland/Competitive Elite	5 years	Non-performance
Harvey /P03	24/Male	Badminton	Team GB/Competitive Elite	20 years	Performance
Rachel /P04	30/Female	Lacrosse	Scotland/Competitive Elite	17 years	Non-performance
Maria /P05	19/Female	Tennis	Scotland & Team GB/ Competitive Elite	14 years	Performance
Louis /P06	22/Male	Canoe Slalom	Ireland/ Competitive Elite	9 years	Non-performance
Alejandra /P07	31/Female	Netball and Basketball	Gibraltar/ Competitive Elite	23 years	Performance
Becky /P08	28/Female	Curling	Team GB/ Competitive Elite	17 years	Performance
Richard /P09	40/Male	Savant	Team GB/ Competitive Elite	20 years	Non-performance
Rahul/ P09	42/Male	Golf	India/Competitive Elite	34 years	Non-performance

## 2.4 Data collection

Phase II participants were invited for an online interview on Microsoft Teams in line with GDPR regulations. Participants were informed that interviews would take approximately 45 min to 1 h of their time, with no payment/incentive for participation. Only online interview option was provided to increase accessibility of global participants (cf. [75]). Interviews were conducted in a secure private room to ensure participant confidentiality, anonymity per ethical standards [6]. Written and verbal informed consent was obtained following which interviews were conducted and audio recorded using a Dictaphone, anonymized, encrypted with AESCrypt and then stored on a secure server with only the researchers having access in line with GDPR and ethical mandates [6, 105]. The first author conducted verbatim transcription of data. Transcripts were anonymised and provided with a participant ID and code name linked to their sport to balance protection of participant identity and integrity of data [83].

### 2.4.1 Interview guide and interview process

A semi-structured interview guide was developed loosely modelled on Galli and Vealey [36], Fletcher and Sarkar [31] and Kegelars and Wylleman [54, 55] to build on existing research and provide continuity to resilience process research. The interview guide had a flexible a priori structure with 10 questions. This guide was not rigid but a flexible navigator, which evolved as per grounded theory method (cf. [17, 93]). The interview guide was reviewed by two specialist scientist-practitioners in sports psychology with experience in qualitative methods.

Interview had open-ended questions and participants were told to be conversational, “have no filters” and encouraged to “share experiences as an athlete and examples from your career”. Since literature has indicated that adversity and positive adaptation are not mutually exclusive [32, 54, 79], techniques from the experiential interview scheme [52] and life story interview [2] were adopted to explore the sporting resilience of participants through their experiences.

Each interview started with the question, “Could you tell me a little bit about your journey as an athlete, focusing on the highs and lows of your career so far?” to build rapport and gather demographic information. Participants were then asked, “What is your understanding of the term ‘Sporting Resilience?’” to reflect on the construct being studied. No definition was provided to reduce bias and leading effect. Their responses were reflected upon through Socratic questions (cf. [62]) and then they were posed with the question “Thinking about how you described sporting resilience, can you describe how you have utilised your sporting resilience in your career so far?”. Questions to delve into the process of resilience included “How do you think sporting resilience develops? What do you think are the factors that build sporting resilience?” and “Seeing how described your sporting resilience and its development, can we go into detail upon how you have activated it/called upon it?”. As the collection progressed, later interviews were guided by emerging theory [17, 93]. Specifically, later questions focused on the trajectory of sporting resilience and the experience of it over time post adversity. For example, participants were asked “What happens if a high-level athlete does not have sporting resilience?” and to reflect on episodes of resilient response in their careers. The interview schedule was used as a reference point and not as a script. Interviews ranged in duration from 56 to 72 min with verbatim transcription yielding 3825 lines and 89 pages of single-spaced text.

## 2.5 Data analysis

Collection of data and its subsequent analysis is a recursive and intertwined process in grounded theory [93, 109]. Pre-planned schedule ensured collection, transcription and preliminary analysis of every interview prior to the next. Post completion of interviews, ‘formal analysis’ [31, p. 671] was conducted where each transcript was read multiple times to develop familiarity and immerse the researcher within the data. Open coding was conducted to identify concepts, perceptions, experiences within the text and develop potential categories that adequately represented the meanings contained within [17, 93]. Categories obtained from open coding were subjected to axial coding to refine into more accurate explanations of the nature and development of sporting resilience [17, 93]. Incidents, experiential anecdotes, similarity patterns and divergence were compared within interviews and across. Experiential anecdotes were compared with experiential anecdotes within and across interviews, information and perception were compared to other similar data in line with recommendations from Corbin and Strauss, who noted constant comparison

to be “the analytic process of comparing different pieces of data against each other for similarities and differences” (2015, p. 85). The constant comparative method [31, 49, 108] was used. Data was also compared with concepts, with comparisons being made between concepts and with existing theory [49].

To ensure rigour and constancy in data analysis, memos were written summarising theoretical underpinnings, concept connections, and interpretations as the grounded theory emerged [17, 93]. In line with best practices of prior research, the memos served as “an analytical tool and record of ideas and insight” [31, p. 671]. This guided the final selective coding through which extant categories and concepts were integrated to form a larger theoretical framework [17, 93]. Data collection was discontinued upon climaxing to theoretical saturation i.e. when data collected provided no new insight and provided repetition of existing codes (cf. [50, 65]). Congruent with the research question, the foci of selective coding were placed on the nature and development of sporting resilience.

## 2.6 Methodological rigor

In line with the ontological stance, we adhered to the notion that knowledge and data cannot be inferred as theory-free due to prior education, applied work and research in sport psychology [21]. To prevent bias, an acknowledgement of this frame was kept in mind to navigate interpretative actions, consistent with cognizance that interpretation is “always informed by our own assumptions, values, and commitments” ([10], p. 285). To acknowledge possible assumptions, memo making included reflective noting throughout conceptualisation, schedule design, data collection and analysis process, emulating bracketing procedure [98]. To ensure objectivity and recognise bias, the authors periodically checked assumptions by making comparisons within data and with memos in line with grounded theory techniques [108] and by striving to achieve methodological self-congruence [14, 15]. These authentication strategies were incorporated within the research process (cf. [65]). Coding at all levels was done independently by the first author and checked by the second author and a third independent researcher for inter-rater reliability [89]. The theory which emerged was critically debated with a focus on investigating the nature and development of sporting resilience in case of asymmetry of interpretations. The final theory was judged via a post hoc evaluation [31] by using quality criteria indicating “fit, work, relevance and modifiability” ([108], p. 509).

The theory generated aligns and “fits” with the extant evidence of nature of resilience; it “works” since it offers an analytical explanation of the development of sporting resilience both in isolated adversity encounters and longitudinally; it is “relevant” to sports psychologists, coaches and athletes aspiring to sustain high performance and well-being despite adversity and; “modifiable” to incorporate evidence and insights from future research akin to how this study extends the initial work by Fletcher and Sarkar [31].

## 3 Results

Synthesised results represent a grounded theory framework consistent with the process conceptualisation of resilience [32, 46, 79, 80] and provides insight into how resilience develops over time. This section is divided into two sub-sections, nature of sporting resilience from the perspective of athletes and A-R-C Development model of Sporting Resilience: a schematic depiction of the emergence and unfolding of sporting resilience long-term and isolated adversity encounters.

### 3.1 Nature of sporting resilience

As such, sporting resilience as a construct leans towards a dynamic process. All participants referred to it as “learned” skill along the lines of “I don’t think it’s necessarily innate... yeah I think it has to be learnt” (Participant, Lacrosse). It is developed from the foundations of one’s interaction with the protective resources and adversities encountered in the environment, which changes through different responses at different points [25, 104], in line with Rutter’s [77] observation that “if circumstances change, resilience alters” (p. 317). Participant ‘Elaine’ an elite female rugby player elucidates “I think I have only learned resilience through experience, like a memory bank of experience, what I have done in my career and in sport”. The following section focuses on the how of resilience development i.e., how is resilience learned and developed. The model A-R-C model is contained within Fig. 1 below.

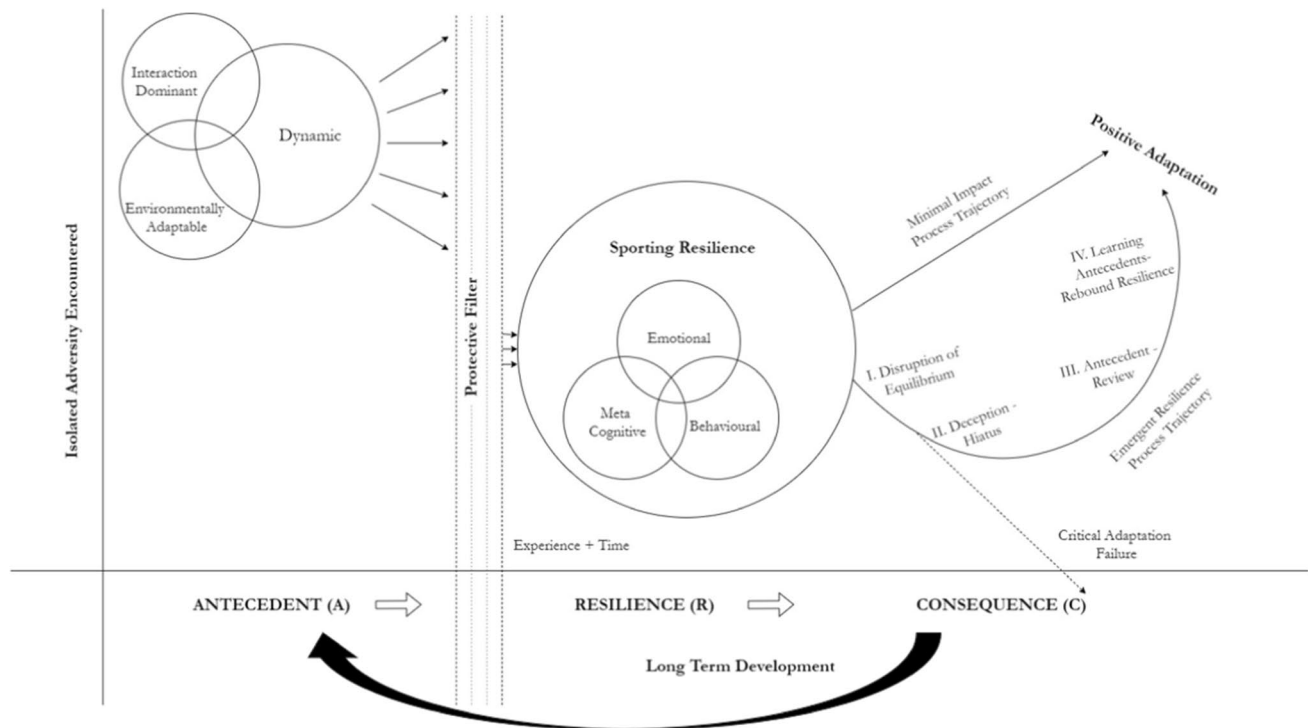


Fig. 1 A-R-C model of sporting resilience development

### 3.2 A-R-C development of sporting resilience

#### 3.2.1 Antecedent (A)

All participants placed great emphasis on how they had “developed” and “learned” sporting resilience. Participants pointed out that they learned to be resilient via interaction with situations and people across multiple environments. Interaction represents the constant interaction of the athlete with players, coaches, sport psychologists, life events and others all contributing to their reflective experience. Every participant labelled this process to be a core developmental factor of sporting resilience “developmental curve... trial and error... failing, succumbing to failure and being unresilient” (Participant Steven). Participant ‘Rachel’ explained this in detail (see Appendix A.1, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)). Participants also highlighted differences in this interaction across team and individual sport confirming that interaction in socially constructed and cultural/sport-specific [102, 106, 107]. For example, Participant Becky stated,

“in a sport like curling, there’s only four people in the team... You work very closely with them... when one of them starts to be less resilient it’s fairly easy to go with and down the hill... you learn to be you with each other... you also deal with failure together and learn from each other in those shit times” (Participant Curling).

According to all participants, development of sporting resilience is also environmentally adaptable, as Participant ‘Harvey’ pointed out “for developing sporting resilience the sporting environments are so important and it’s not like enough people realise how much a good environment can help you improve”. The environment which the athlete is in (physical and psychosocial in training and competitions), labelled as the “psychological atmosphere” (Participant Richard) plays a pivotal role in the development of sporting resilience and its protective factors. For the environment to facilitate dynamic learning of sporting resilience it needs to allow “an ability to be able to do things on their own, train on your own...that would be the sort of foundation, and then guidance and support on top” (Participant Louis). As the following quote illustrates (see Appendix A.2, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

All participants reinforced the importance of exposure to adversity because it is about “learning by doing”. Conclusions from literature regarding the importance of timing, type and impact of the environmental adversity [13, 46] were

confirmed by multiple participants. Participant Louis outlines how learning via interaction with environmental adversity should be a part of athletes' development,

"whenever you get a young person who's just sort of starting out, who does not have that perspective and I am not sure there is any way to accelerate that other than emm... you can be told to the how to put things in perspective but I am not sure you do that until you actually do it yourself... It's almost better to get that out of the way whenever you're younger... like you know you train for eventualities... basically like chickenpox" (Participant Louis).

This active involvement of interaction that comes from experience and the sporting environment facilitates the dynamic nature of sporting resilience. As 'Elaine' succinctly stated,

"you don't get resilience overnight... it's a long-term process gaining it, and it's a multifaceted approach of how you gain it and I think everybody is different... different individuals will be motivated or spurred on by different things... very dependent on time, place and who it is" (Participant Elaine).

However, it must be noted that experience alone is not the endgame of dynamic learning. Rather, athletes must actively learn from this adversity experience both during and after, as Participant 'Louis' pointed out "I don't think it can happen necessarily on its own... I don't think you're just automatically resilient". Participant Becky stressed the importance of this (see Appendix A.3, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)) (Fig. 1).

The dynamic nature of sporting resilience contributes to a building process of Antecedent Protective Filter i.e. biopsychosocial resources that precede the outcome of resilient behaviour and determines to what extent adversities impact individuals confirming theorisation by Gupta and McCarthy [46]. As Participant "Rahul" state (see Appendix A.4, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

### 3.2.2 Resilience response (R)

The antecedent protective filter appears to be consistent across all participants. However, the components or 'makeup' of the protective filter echoes individual differences. As Participant 'Rachel' clarifies,

"I try and build myself as an athlete, who I am as an athlete... and I would say resilience is quite central to that, built into my player identity, try and have resilient in my own way because there is so much other crap around training and competing and all these sorts of" (Participant Lacrosse).

This buttresses literature indicating that the components of the protective filter do not represent a fixed rank hierarchy [46] and are subjectively evaluated to gauge centrality of the biopsychosocial resources [80, 96]. This directly consequents to the "Engine of Sporting Resilience" (see Table 1).

Comparable to typical mechanical engines, the engine of sporting resilience is built of the pistons of Metacognition, Emotion and Behaviour. Participants report resilience responses as combining the metacognitive-emotional-behavioural, with each aspect being permeable and working in synergy rather than isolated components extending the existing grounded theory on resilience by Fletcher and Sarkar [31]. This synergy is seen explicitly as Participant Alejandra illustrates (see Appendix A.5, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

The quote illustrates metacognition "appreciated the setback"; Emotional responses "made me feel... need to be happy with yourself" and behavioural actions "have clear goals and setting clear targets... getting enough of all the stuff I need... have a good routine". Participant Rahul also outlines a similar synergy guiding this engine of sporting resilience,

"game is sometimes frustrating and you keep getting angry and asking 'why why did I hit that bad shot?' over the years having played so much and gathered that experience you develop that resilience mindset by which you are able to control your mind and respond better and positive by letting go because bad shots and imperfect shots keep happening, we are not machines, we are human... shots will go bad, putts will be missed and these will keep happening but the effort is towards minimising them. Research yourself and think reflectively you can learn a lot about yourself... and then be resilient in bad times" (Participant Rahul).

This mutual interaction between emotion, metacognition and behaviour contributes to the engine of sporting resilience and is supported by evidence from clinical neuropsychology into affect-attention links [9, 30, 51]. Established theoretical frames such as Broaden & Build Model [34] also indicate emotions influence thought-action i.e. cognitive-behavioural pathways of information [35]. This is also indicative of the operation of self-regulation in the resilience

propose (cf. [11, 37, 44]). Participants also supported the metacognitive process proposed by Fletcher and Sarkar [31] with Participant 'Elaine' noting,

"what I'd say is my most resilient moment... turning a negative thing into a challenge... the change I went through, talking to myself, my confidence all combined to help me do that" (Participant Elaine).

This engine of sporting resilience produces two process trajectories of sporting resilience to isolated adversity encounters i.e. "minimal-impact trajectory" and "emergent resilience trajectory" [4], p. 380, [46]. Participants noted that the nature of adversity in terms of controllability, severity and their resilience capacity at the time determines the process trajectory. A robust protective filter allows high functioning of the engine of sporting resilience resulting in minimal-impact trajectory where the adversity "things don't faze me as much" (Participant, Tennis). As Participant Becky states

"I don't think the magnitude of it really makes that much of a difference if you're really truly resilient... I think only if you maybe have some weaknesses, you will then start to all the bigger inconveniences overcome you instead of overcoming them... if it's controllable and it's a big thing it can potentially lead to self-reflection learning and all of that and take some time to grow... so that you don't make the same mistake again... But if it's like the ice melted for an ice-based sport, then it's not for your thing or fault... so you're like, it is what it is and move on sort of thing" (Participant Curling).

Every participant reported as having gone through the emergent resilience trajectory highlighted by Participant Alejandra stating "making sure that I know what is creating that setback and trying to always learn from that... in order to prevent it, in the long run". Participant 'Louis' also outlines the experience (see Appendix A.6, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

The evidence echoes the conceptualisation of Gupta and McCarthy [46] who proposed an extension of the diversifying experience model [40] noting sporting resilience as a process occurring when an individual with a strong protective filter appraises adversities as challenge leading to identification of new possibilities [24, 31]. However, evidence does diverge from the theoretically identified components within the emergent sporting resilience trajectory. Comparing participant experiences, four common stages of emergent sporting resilience were identified among elite athletes

I) 'Disruption of Equilibrium' typically caused due to multiple chronic or acute adversities temporarily coinciding (see Table 1);

II) 'Depletion-Hiatus' which is characterised by the athlete stepping away from the sporting environment or disengaging from the triggering adversity due to continuous adversities as Participant Becky recounted.

"It just got too much for me, and I emm...I went to the doctor's and I was like 'I can't sleep I can't think I can't do anything important'.... And probably it's the biggest learning experience I've had in my life and now I can feel myself when I get that level of stress",

III) 'Antecedent-Review' a stage in which participants reported undertaking a critical re-evaluation of their life, meaning of sport, ultimately identifying assistive and debilitating components in their protective factors, as Participant 'Harvey' reflects experience,

"I had to like take a step back a little bit, I did not train, I went home, spent time with parents, relaxed rather than let it consume me and I found that it was quite a lot easier doing that to help cope with the kinda ups and downs" (Participant Harvey),

IV) 'Learning Antecedents-Rebound Resilience' in which the participants undertook an effortful self-development in psychosocial factors of their sporting life to strengthen their engine of sporting resilience and positively adapt to return to high performance over an extended period of time. This whole emergent process of resilience was reflectively narrated by Participant 'Maria' (see Appendix A.7, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

### 3.3 Consequence (C)

Athletes also repeatedly reinforced the "vital" centrality of resilience to the elite level citing "it's quite unlike you'd have a high-level athlete without sporting resilience" (Participant Curling) since "resilience keeps you mentally strong... without which it's difficult, almost impossible to survive... if you don't have strong mindset, if you don't think and behave positively then how will you play? How will you fight?" (Participant Rahul). It was seen that in isolated incidents there was a definite pattern of the consequences of the sporting resilience engine combating adversity. If the athlete was able to



engage in the resilience trajectories due to their strong individual protective filters and high functioning engines they eventually positively adapted to the adversity since “they have a wider set of tools, they’re more resilient to the conditions in front of them and whatever adversity pops up” (Participant Richard). All participants mentioned that without this trajectory of positive adaptation they will not be able to overcome adversity, getting trapped in stage II- ‘Depletion-Hiatus’ leading to a continuous downward spiral [34] eventually resulting in a ‘critical adaptation failure’ [46]. As Participant ‘Steven’ narrates (see Appendix A.8, [https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)). It is important to note that ‘overcoming adversity’ was not directly synonymous with objective success.

### 3.4 Oscillatory long-term development

Relevant to long-term A-R-C development are adverse events and protective antecedents [5]. Results support a conceptualisation of sporting resilience developing and being maintained via stress exposure akin to ideas of systematic desensitization [113], stress inoculation [68], stress exposure training [53] and pressure inurement training [33, 55]. Relevant to the evidence acquired, we propose a preliminary term “Adversity-Inoculation” to signify naturally occurring or imposed adversity circumstances which the individual learns from regardless of positive adaptation or critical adaptation failure. This process of “Adversity-Inoculation” unfolds over time, with individuals engaging in dynamic learning to form new antecedents (A), leading to established or novel resilience responses via minimal-impact or emergent trajectories (R), leading to the consequence (C), which informs the development and maintenance of the oscillatory A-R-C for future experiences. The initial conceptual proposition of oscillation by Gupta and McCarthy [46] by integrating extant theories [11, 36–38], see also [4] stands supported. This study also buttresses initial longitudinal evidence provided by research on this dynamic oscillatory nature of sporting resilience [16, 47, 72, 86, 90, 97, 101].

This oscillatory A-R-C is facilitated by time and experience. As Participant Becky noted,

“take time because you have more opportunity to experience it... Rather than just over time you develop it... I have played with two girls that are the same age as each other and one of them is a lot more mature and a lot more resilient than the other one, because I think their perspective of things like not to worry endlessly about things that really don’t actually affect your performance” (Participant Curling).

Participants note that time and experience is crucial at the elite level since the exposure affords “self-awareness” and a “questioning ability” (Participant Richard) which allows the learning from adversity to occur continuously regardless of positive adaptation or failure. ‘Linear Time’ was often something athletes considered after a few failures in their developmental stage as something that would allow them to develop the protective filter of resilience (cf. [45, 46]). Time allowed them the repetition to ‘fine-tune’ their responses to adversity to figure out adaptive strategies. Participant Rahul also noted “time takes away some difficulties, like an injury is very bad in day one, but on day ten, its not so bad, so its not that big... its about understanding those timescales which is difficult because sport is fast-paced”.

Therefore, the oscillatory A-R-C continues perpetual development in the longer-term regardless of whether the isolated adversity encounter was positively adapted to or not. This evidence contradicts the idea of an individual’s “resilience bandwidth” [33], p. 138). Over long-term, the oscillatory nature contrasts with the idea of an upper limit of resilience since an individual’s resilience is unlikely to be fatalistically predetermined, simply because it is improbable that we can effectively catalogue what adversity they will encounter and how they will learn from it. Almost all participants noted that they are much more resilient now than they were before, noting that sporting resilience develops over “long time not necessarily just the time after an event like as in a lifetime” (Participant Louis).

Furthermore, the conceptualisation of “Homeostatic Resilience” by Gupta and McCarthy [46] which theoretically extended the idea of a stable level of resilience pre-adversity [12, 76]) is critiqued and contrasted by the evidence of the oscillatory nature of the A-R-C of sporting resilience development. Long-term oscillatory learning refused the idea that we can have a stable level of homeostatic resilience. As Participant Richard reflects,

“episodes where I had to be resilient after adversity that I can think of follow the same pattern... I feel that the same strategy has been deployed but at different parts of my career I had different skill sets”.

#### 3.4.1 Gender and nature of sporting resilience

Although gender differences in adaptive outcomes are difficult to interpret since differences in exposure and perception lead to the variances [5, 67], this study utilised experiential interviewing to seek life experiences of adversity and

participant perceptions of sporting resilience development among males and females regardless of their gender. Most participants noted that gender plays a role in systemic selection of the adversities athletes have to face with female athletes encountering sexism as Participant 'Elaine' outlined "it's a contact sport for women because it's not seen as the lady-like thing, but I think together we can deal with a lot of the sometimes everyday sexism that comes across from it". Participant Tennis outlined body image-based adversity typical to females.

"the guys that I know they seem to not care so much about their body image and how do you look for the most part compared to girls. Growing up I always remember certain coaches saying things to me about weight or you know injuries and things like that and they have really stuck with me... and I am like coming up on 20 now and these were said when I was like 14-15 and I still remember them, and I did like a chat about this with J\*\*\* (a senior figure in the sport) and we were discussing about how girls kinda hold onto things a little bit more, whereas I feel like guys maybe brush it off, like take it in but maybe it doesn't last for as long, like I can still remember so many comments that were made, inappropriate things said that maybe was not right for my age, so I think potentially be difference between males and females"

Participant 'Louis' who also coaches noted that in resilience development.

"potentially if male coaches are less likely to engage effectively with female athletes it could play into how they develop... so potentially coaches with more experience, or who work with female athletes exclusively would be better able to deal with and those athletes would develop resilience better"

Interestingly, all participants note that although difference in the behavioural and emotional resilience responses are more prevalent in younger athletes, it recedes significantly with age as athletes grow out of adolescence into elite adult sport. As Participant Alejandra summarises "gender is a more important in the early years for resilient behaviour but as you progress to the elite level of sport and grow older you develop it and it's more about the level, you're in, rather than the gender". Normative differences in adolescence such as males being externalising and females internalising [22] was discussed by Participant Becky who observed "when you watch the juniors... its like immaturity in the junior boys, they don't mature so fast as girls and they get a bit aggressive and sometimes just becomes a habit... the successful teams overcome those emotional barriers". Therefore, although gender has an influence particularly in adversity type, appraisal and resilience response [69], sporting resilience can be fostered, trained and developed regardless of normative gender in alignment with Masten [66].

### 3.4.2 Nature of sporting resilience in individual and team athletes

Resilience has also been conceptualised at the team level with Bennett et al. [3] noting that "resilience may be viewed as much a social factor existing in teams as an individual trait" (p. 225). Participant 'Steven' comments on a "dynamically, continuously involved team structure, even in the play itself". Evidence has supported this view that members of a team are not isolated but rather respond to shared adversity through collective interaction using group resources [70–72]. This is supported in the current study with several participants echoing Participant 'Rachel' who stated, "shared collective responsibility of things". Participants have also noted that in the team environment, individual athletes need to have some precursory level of sporting resilience which fits in and elevates the team resilience. Participant 'Elaine' eloquently summarises.

"I feel like everyone has something to contribute to and learn from... so you have that team resilience that you are adding to and you know you are pulling people up as well because people at times might not be as resilient as you..."

Overall, the interview data notes that participants believe that sporting resilience unfolds in a similar manner but highlights developmental differences of sporting resilience among individual and team sport athletes. All participants noted that sporting resilience first develops for the athlete and then fits within the larger team that the athlete play in contributing to the team resilience. Participant 'Harvey' who has illustrated this process.

"you need bring in your resilience in a lot... you will need to step up, and if you are not in the right mental state for that then it's not going to go well... so I kinda think that there is more important for individual sport and individual athletes to be more resilient than it is in a team"

The participants of the study consisted of an equal number of participants from individual and team sports, with some individual athletes also competing in team events for sports such as Tennis and Badminton. Interestingly, when asked about the differences between the development of sporting resilience in team and individual athletes, all participants responded that individual sport athletes have a much harder sporting resilience development process with Participant 'Steven' explicitly stating "people who play individual sports are much more resilient as an athlete since it's only them". This is supported by Participant 'Maria' who recounts "from an individual point of view that everything is on you, the wins and losses are on you, you don't get picked for funding it's on you". Participant 'Louis' also echoes this.

"It's all on you, isn't it? you know it's on the athlete... there are people to support you and able to help you make decisions and sort of guide you, but ultimately it's me putting the paddle in the water and I that does hold you a bit more accountable, you know there's no escaping it when things go wrong you know it's you might point..."

This difference in the development of sporting resilience between team and individual sports was highlighted by Participant 'Rachel' who stated that "little less pressure for team athletes, and you know there is a lot more things that you can improve on, you have got like game sense and the tactics and then you have your conditioning and fitness". This is further extended by Alejandra who is a team sport athlete now but used to run track. She notes.

"I was a track athlete. I did run 100 metres. And I can say that resilience there for me was a lot tougher for me because... like, the goals that you set, and the targets that you have to meet are a lot more specific and, like for example 100 metre sprint milliseconds can be the difference between qualifying for tournament and not... and to improve those like three milliseconds, it takes a lot of training just to improve that much"

## 4 General discussion

### 4.1 Implications for research and practice

The findings of this study render a theoretical framework charting the development of sporting resilience in athletes providing applied practitioners and researchers' directions to stimulate development of sporting resilience. First, findings provide bona fide evidence that sporting resilience is learned, developable and not gendered. Sporting resilience is thus a temporal and situational process which aligns with current finding [32, 54, 59, 79] with clear antecedents (A), resilience responses (R) and consequences (C) both in isolated adversity encounters and over long-term giving credence to future research on interventions.

Second, it is imperative to include both the personal and environmental factors to effectively facilitate development of sporting resilience. Findings uphold extant evidence of challenge-support [78] within a facilitative environment [23, 33] as a potential avenue, although future confirmatory research is needed. Authors postulate the sport psychologist as having a role in fostering a positive "psychological atmosphere" in the environment and engaging in interventions to promote emotional regulation and metacognitive cognitive dialogue [43, 46, 100].

Third, when developing sporting resilience practitioners should look to facilitate the interaction-dominant and environmentally adaptable dynamic learning to strengthen the protective filter and thereby strengthen the engine of sporting resilience. Although participants have identified strategies such as self-talk, social support, reflective mastery experiences mediated by a positive challenge appraisal as identified by previous research [31, 46], it must be noted that the subjective component of the filter and engine necessitates an individualised need analysis rather than a 'one size fits all' approach (cf. [97]).

Fourth, all participants reported certain core components of sporting resilience suggesting rudimentary universality since extant evidence also reports this. Challenge-appraisal [31], critical self-reflective awareness [19], training under simulated adversity [33, 37] are avenues which could warrant inclusion in interventions as explored in the systematic self-reflection intervention for resilience [20] and the self-compassion oriented intervention 'RESET'[57]

Fifth, the A-R-C conceptualisation of the development of sporting resilience also lies congruent with initial research on the use of REBT and credos to enhance resilience qualities in athletes [26, 99, 100]. Future research is recommended to use single-case and/or intervention designs to investigate and apply theory to guide practice [41]

## 4.2 Limitations and future directions

This study aimed at naturalistic transferability [87] by providing detailed experiential accounts, wide age range, equal representation of sex and a variety of sports. The richness of this data could be improved by incorporating an ethnographic case longitudinal design with multiple interviews over a time period and behavioural observation. Triangulation research via focus groups with individual and team athletes, coaches, and sports psychologists is another potential direction. Finally, this study only provides preliminary findings on gender and cultural differences in the development of sporting resilience since it was a secondary objective. Future research can use the A-R-C development framework to guide study development to investigate gender and cultural differences.

## 5 Conclusion

This study provides preliminary evidence supporting operationalisation of sporting resilience provided by Gupta and McCarthy [46] which could be used to unify research. The A-R-C Model enables practitioners to chart out the development of an athletes' sporting resilience and gives research a frame to further investigate. We echo the sentiments of Participant Rahul "how can sporting resilience develop without doing the sport?" and welcome future research to build upon and refine components of the A-R-C Model, much like this study builds itself upon extant research.

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**Data availability** Associated detailed qualitative narratives are available in Appendices found in Open Science Forum Open Access repository ([https://osf.io/cak5z/?view\\_only=59e1b6fd715b4c13878cd3c83f575fcb](https://osf.io/cak5z/?view_only=59e1b6fd715b4c13878cd3c83f575fcb)).

**Ethics approval and consent to participate** Informed consent was obtained from all individual participants included in the study. The authors affirm that human research participants provided informed consent for the interview data to be anonymously published via transcripts. The studies involving human participants were reviewed and approved by the PSWAHS Research Ethics Committee of Glasgow Caledonian University (HLS/PSWAHS/19/197).

**Competing interests** The authors declare no competing interests.

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