A Mixed-Methods Study of International Talent Development Environments in Elite Sport Climbing

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1. Introduction

Talent Development Environments (TDEs, Martindale et al., 2005) 'aim to provide the appropriate conditions for young athletes to realise their full sporting potential' (Sargent Megicks et al., 2022, p. 2533). If successful, TDEs play a crucial role in the establishment of athletic performance (Martindale et al. 2010; Henriksen & Stambulova, 2019; Henriksen & Stambulova, 2023; Taylor, MacNamara, & Taylor, 2022) and are integral to the longer-term aims associated with high performance (Abbott and Collins, 2004; Collins, MacNamara, and McCarthy, 2016). Martindale, Collins & Abrahams (2007, p. 188) note that while coaching and other factors (e.g., parents) influence athletes, 'the TDE is certainly the most consistent and immediately controllable factor in the life of a developing elite. The significance of TDEs is borne out in studies across sporting domains (e.g., Baker, Cobley, Schorer & Wattie, 2019), national boundaries (e.g., Röger, Rütten, Heiko and Hill, 2016) and multiple levels of competition sport (e.g., SargeMegicks et al., 2022).

Despite the recognised significance of TDEs, however, there has been a scarcity of research in English in relation to Sport Climbing, a sport of increasing popularity having completed its second Olympic cycle. With the exception of research in Japan that is mostly untranslated, the sport's swift evolution means that competition climbing is largely unstudied, with previous research tending to focus on physiological measurements and abilities of climbers (i.e. Puletic and Stankovic, 2014; Anderson, 2018; Winkler et al., 2022). Despite the fact that Sport Climbing athletes tend to come through youth pathways, and, indeed, that many athletes competing at Senior World Cups are youth climbers, there has been no exploration of their TDEs. Consequently, this study explores the needs and experiences of athletes, coaches, and parents across international talent pathways in elite-level Sport Climbing.

2. Literature Review

TDEs are high stakes environments, tasked with ushering high-performing youth athletes through a developmental process that results in senior success (e.g., Henriksen, Stambulova and Roessler, 2010; Drew, Morris, Tod and Eubank, 2019). However, that single goal is far from a simple one, encompassing multiple and overlapping factors (e.g., Tucker and Collins, 2012). Martindale, Collins and Daubney (2005) demonstrated that successful TDEs are integral to the longer-term aims of high performance, and involve many factors. The shift in critical discussion from talent identification to talent development that resulted from the work of Martindale, Collins, and others means that in recent years talent is rarely considered something obvious, fully fledged, or straightforwardly identifiable (Bloom, 1985; Abbott and Collins, 2004; Till, 2020). Instead, talent is seen to require a range of biopsychosocial supports, since 'innate talents are not automatically transformed into elite performers' (Li et al. 2014, p. 3; see also Howe, Davidson and Sloboda, 1998; Tranckle and Cushion, 2006). The emergence of the biopsychosocial model in relation to elite youth athletes (e.g., von Rosen, Frohm, Kottorp, Fridén and Heijne, 2017) takes into consideration biological, psychological and social perspectives on athlete development. Thus, as Martindale et al. 2005 conclude, it is important that TDEs consider holistic and ecological circumstances of individual athletes within systems that have the capacity to respond to them. Consequently, the role of TDEs is vital to the development of athlete and personal potential, particularly since TDEs involve young athletes who are in crucial stages of not merely athletic but also social, psychological

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and physiological development. With this in mind, successful TDEs take account of long-term athlete development as a matter of course, and should also deploy frameworks that protect against the possibility of a 'potential conflict between the goals of talent development (i.e., optimal performance), and youths' overall healthy development (i.e., positive youth development; PYD)' (Fraser-Thomas et al., 2019, p. 377).

Research of the past two decades tells us that successful TDEs are likely to be marked by:

- **Wide-ranging and coherent messages**: that is, messaging that is consistent from multiple points of contact in the athlete's environment, that reflects consistency of the organisational structures within which an athlete trains, and which provide an athlete with strategies for technical, tactical and physical performance;
- **Long-term athlete development and methods**: that is, less emphasis on short-term training and performance results and strategic planning for the transition to senior level, taking account of biopsychosocial needs;
- **Strong and coherent organisational culture**: that is, a TDE with clear structures and policies in place, defined roles and pathways, and the allowance for different entries into and progressions through a pathway;
- **Appropriate development as opposed to early success**: that is, an emphasis on the possibility for different developmental pathways and opportunities for that development aligned with athletes' biopsychosocial needs;
- **Integrated, holistic, and systematic development including psychosocial supports**: that is, coherence across the pathway that allows athlete access to appropriate and relevant expertise.
  (Martindale, Collins and Daubney, 2005; Martindale, Collins and Abrahams, 2007; Henriksen and Stambulova, 2019; 2023)

The success of TDEs cannot be assessed simply on athlete competition performance, for several reasons. First, as research has found, 'the majority of athletes selected onto a talent pathway do not ultimately succeed in that sport at the highest level' (Williams and MacNamara, 2020). Second, success at youth level does not consistently serve as a predictor for senior success (Bezuglov et al., 2022). Third, successful performance does not always mirror a successful environment: USA Gymnastics, with its high-profile achievements at successive Olympic Games and the equally high-profile court cases against a team doctor charged with hundreds of counts of sexual abuse (Fisher and Anders, 2020), is a case in point, as would be 1980s Eastern Bloc sport systems that produced medal winners but often masked athlete misery and abuse (e.g., Green and Oakley, 2001; Ungerleider, 2001). Third, the environment – in which athletes are provided with age- and stage-appropriate opportunities, are supported to develop over time and in a system that has consistent and coherent organisation and direction – requires assessment of the ways in which it follows through in the different areas identified as crucial to the developing elite beyond externalised success (e.g. Güllich and Emrich, 2006).

One platform from which TDEs can be assessed has been through the Five-Factor Talent Development Environment Questionnaire (TDEQ-5), developed originally by Martindale et al. (2010) and further by Li et al. (2015). This key survey monitors athlete – and more recently coach and parent/ guardian (Sargent Megicks et al., 2022) – responses to questions in five areas that reflect the concerns of TD researchers:

1. Long-term development
2. Holistic Quality Preparation
3. Support Network
4. Communication

5. Alignment of Expectations (Martindale et al., 2010)

The TDEQ-5 has been deployed across team and individual sports, from golf (e.g., Henriksen, Larsen, and Christensen, 2014) and football (e.g., Mills, Butt, Maynard, and Harwood, 2014) to athletics and gymnastics (e.g., Martindale, Fountain et al., 2023), across many cultural contexts (for example: Korea: Wang et al., 2016; Sweden: Ivarsson et al., 2015; the US: Mills et al., 2014); and in multiple languages (for example: Spanish: Braza-Sayavera et al., 2016; French: Gesbert et al., 2021; German: Alfermann et al., 2023; Chinese: Li et al., 2018). It has proven robust in translating athlete, coach and parent perspectives in these five core areas. The TDEQ-5 is not only validated in many cultural, linguistic and athletic arenas, but, crucially, is also repeatable, thus offering the possibility for considering TDEs at specific moments in time and over long durations.

Despite the fact that Sport Climbing has rapidly grown as a competitive sport and is now entering its second Olympic cycle, there is a dearth of research into its talent development systems. The vast majority of research into climbing has involved analysis of parametrics or performance indicators but rarely at elite level or in competition settings. Research ranges from, for example, determinants of success in climbing (Saul et al., 2009) to behaviour analysis of outdoor rock climbing from an ecological dynamics perspective (Fleming and Horst, 2010). Seifert et al. (2017) considered the role of route reading and its impact on achievement, but in average- to mid-level climbers; similarly, Whitaker et al. (2010) considered expertise effects in sport climbing, but in mid-level climbers. Other studies have focused in on specific parameters, considering optimal strength to weight ratios in sport climbing (Anderson, 2018); load structure in international climbing (Winkler et al., 2022); and climbing-specific performance testing (Draper et al., 2021). Occasional studies have looked at elite-level climbing: for example, Sanchez et al. (2009) analysed pre-performance psychological states of a small group of elite-level climbers, while Vrdoljak et al. (2022) performed fitness profiling in elite climbers by gender.

What is striking is the absence of focus on youth or developmental athletes, with only rare research considering the area: Meyers et al. (2020) examined growth plate fractures in youth competition climbers, and McMullen et al. (2021) researched coach attitudes to campus board training in adolescents. Recently, some qualitative research has begun to appear about elite sport climbing (Beiskjaer et al., 2022), but not focused on youth development or on TDEs. The result is that, as of 2024, no quantitative or qualitative studies in English have been undertaken that consider TDEs in national, regional, or local contexts of Sport Climbing.[2]

3. Methods

Given the lack of information about TDEs in Sport Climbing, this research set out to address the gap with an exploratory probe aimed at identifying and opening further research avenues. The research thus took a pragmatic approach, seeking to produce knowledge that might be acted upon usefully in TDEs. A two-part, mixed-methods approach with quantitative and qualitative elements was deemed most appropriate in the context of a young sporting context with a limited history of research, and with the aim of producing practical insights. Surveys provide key insights, with quantitative data allowing for a consideration of various factors simultaneously (de Vaus, 2013); an explanatory sequential design was adopted, whereby qualitative data was used to assist in explaining the quantitative data. Qualitative data in the form of interviews complemented the quantitative data by providing in-depth insights. The approach allowed the researcher to draw a baseline for research

[2] It is worth noting that a significant amount of research is produced in Japan, a leading climbing nation, but is largely untranslated. The *Japanese Journal of Mountain Medicine* (1981-), for example, has published work since 1983 focused on climbing; the same is true of work in the *Journal of Mountaineering Training*, and the *Coaching Studies* journal. The author used Google Scholar to identify a body of this research and Google Translate to roughly translate key work. While this work is ahead of the curve internationally, there is still an absence of work on Sport Climbing TDE.

in the field, providing a snapshot into Sport Climbing in the present moment while also indicating areas for future research and attention.

3.1 Part 1: The TDEQ-5

The TDEQ-5 plays a key role in successful TDEs by providing feedback by individual athletes that also provides critical insights into broader systems. It also, however, serves as a critical tool that encourages the kind of reflective practice, focus on long-term development and goal setting that successful TDE encourage in their athletes. Thus the deployment of this questionnaire on a regular basis can serve to inform athlete, coach, and managerial practice in TDE. Martindale et al. conclude that the TDEQ 'makes it more important to consider the aims of the environment and the characteristics of the athlete, rather than their placement on a theoretically defined model' (2010, p. 2). For this reason the TDEQ-5 can serve as a key practical component of successful TDE.

The TDEQ-5 has a proven robustness as a tool for measuring the success of TDEs, yet has never been deployed in Sport Climbing. Ethics approval was sought and received from Dublin City University, and permission was sought from Martindale to use the survey in this context. The survey included participation information sheets, consent and assent forms, and the TDEQ-5. Martindale et al.'s latest iteration of the TDEQ-5 was used for this project; the survey thus had the now-standard 28 questions over 5 factors, and included two open-ended questions asking participants to name three strengths of their environment and three areas for improvement. Questions were added that sought to collect data on gender; climbing-age category; discipline(s) in which athletes competed (Lead, Speed, and/or Boulder); national affiliation; cost of competition participation; cost of coaching; and affordability of competing. While the inclusion of additional questions created the risk of drop off of answers (see Martindale et al. 2010, p. 4), the hope was that respondents would fully participate since the cohort had not been previously surveyed about their practice and environments before.

3.1.1 Survey Distribution

The IFSC, the international governing body of the sport, supported the research through distribution, emailing international federations with an explanation of the research provided by the author and including a link to the survey, which was housed on Dublin City University's secure QualtricsXM account. The research explanation and survey link was also distributed via email by Mountaineering Ireland, the Irish federation responsible for oversight of Sport Climbing. Finally, the research explanation and survey was distributed directly by the researcher to relevant contacts. The survey targeted developing-elite-level youth athletes, defined as those athletes selected by their national federations to represent their countries on Youth Teams[3] at international competitions run by the IFSC and in the age categories in use by the IFSC (Female and Male Under 16; Under 18; Under 20/Junior)[4], which require passport for proof-of-age and nationality; it also targeted coaches of these youth athletes and their parents/ guardians. Including coaches and parents allowed for a view-in-the-round of TDEs, since athletes, coaches and parents report from distinct perspectives (Sargent Megicks et al., 2022; Martindale et al., 2023), and all have stakes in the TDE.

3.1.2 Survey Responses

The survey received responses from 101 international athletes representing 35 countries; 72 coaches representing 34 countries; and 52 parents representing 22 countries, making it the largest study of Sport Climbing TDEs to date, with a total of 225 respondents across the three groupings over a period of approximately 10 weeks.

[3] Federations use different names to refer to their selected youth athletes: 'Youth Team' or 'Development Team' are the most common, but 'Youth Squad' is also sometimes used.

[4] As of 2025, IFSC youth categories will change to U17, U19, and U21/Junior in Male and Female. This follows the organisation's decision to disallow youth competitors under the age of 17 from competing at Senior level as of 2025.

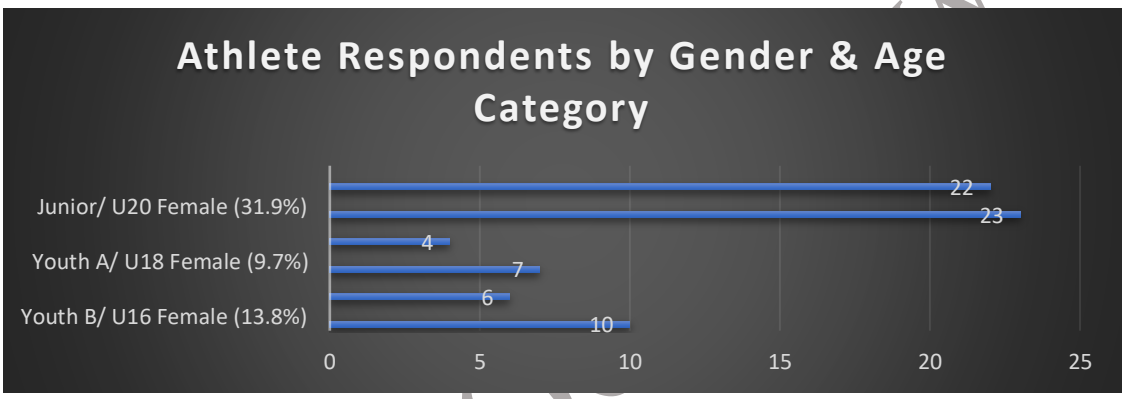
Table 1: Geographical Distribution of Respondents

	Athletes	Coaches	Parents	Totals by Country
Europe				
Austria	4	2	2	8
Belgium	3	2	1	6
Bulgaria	1	0	0	1
Croatia	2	1	0	3
Czech	2	2	1	5
Cyprus	0	0	1	1
Denmark	1	2	0	3
Finland	0	1	2	3
France	3	0	2	5
Germany	4	2	1	7
Great Britain	3	3	6	12
Greece	9	2	1	12
Hungary	0	2	0	2
Iceland	1	2	1	4
Ireland	17	5	13	35
Italy	4	1	1	6
Latvia	0	1	0	1
Lithuania	4	1	2	7
Norway	1	1	1	3
Poland	0	1	0	1
Portugal	2	1	4	7
Romania	1	1	1	3
Slovakia	2	1	1	4
Slovenia	1	0	0	1
Spain	1	2	0	3
Switzerland	2	2	0	4
Ukraine	2	1	0	3
Subtotal	**71**	**39**	**41**	**(Europe: 150; 74%)**
Pacific				
Australia	1	1	0	2
New Zealand	1	2	1	4
Subtotal	**2**	**3**	**1**	**(Pacific: 6; 3%)**
Americas				
Bolivia	0	1	0	1
Brazil	1	0	1	2
Canada	5	3	1	9
Chile	1	1	0	2
El Salvador	0	1	0	1
Peru	2	0	1	3
USA Climbing	3	6	3	12
Venezuela	1	1	0	2
Subtotal	**13**	**13**	**6**	**(Americas: 32; 15%)**
Africa				
South Africa	1	0	0	1
Uganda	0	1	0	1
Subtotal	**1**	**1**	**0**	**(Africa: 2; 1%)**
Asia				
Hong Kong	1	0	0	1
India	1	0	0	1
Japan	0	1	0	1

Pakistan	5	2	0	7
Singapore	0	1	0	1
Subtotal	**7**	**4**		**(Asia: 11; 5%)**
Middle East				
Israel[5]	3	0	0	3
Subtotal	**3**	**0**	**0**	**(Middle East: 3; 2%)**
Total Responses	**96**	**60**	**48**	**204**

Of 72 athlete responses to the competition age category responses, the majority were in the upper bands, as seen in Table 2.

Table 2: Athlete Respondents by Gender & Age Category



72% of Athlete respondents competed in Lead; 73% in Boulder; and 13% in Speed. Of 71 coach respondents to the question of gender, 51 identified as Male (71.8%), 18 as Female (25.4%), 1 as Non-binary (1.4%), and 1 preferred not to say (1.4%). Of 52 parent / guardian responses, 26 (50%) identified as Male and 26 (50%) as Female.

3.1.3 Open-ended Responses

The TDEQ-5 optional open-ended questions elicited sizeable response numbers. Approximately 20% of athletes filled in responses: 19 athletes responded to the question 'name three strengths of the environment you train and compete in', while 21 athletes responding to the question 'name three areas for improvement of the environment you train and compete in'. Coach response numbers were considerably higher, with 55 'strengths' responses and 61 'areas for improvement' responses, or response rates of approximately 76% and 85%. Parents also responded in high percentages to these questions, with 43 'strengths' responses and 43 'areas for improvement' responses, or response rates for each of approximately 83%.

3.1.4 Data Analysis

Survey data, housed on Dublin City University's secure QualtricsXM account, was uploaded to IBM SPSS Statistics Version 29.0.1.0 (171). Negatively phrased questions were reverse scored and string data was recoded to allow responses to be sorted by both country and gender for all cohorts. Reliability tests are regularly run for TDEQ-5 results; Cronbach's Alpha tests were run on this dataset, with the acceptable value of alpha set at .7 as per standard (Tavakol and Rennick, 2011). In keeping with other TDEQ-5 research, reliability tests were run for the entire 28-question set for

[5] For the purposes of demonstrating the geographical spread of respondents, Israel has been listed within the context of the Middle East here, but it should be noted that Israel competes in IFSC European Continental Cups at Youth and Senior level.

each cohort, as well as for each of the five factors: Long Term Athlete Development; Alignment of Expectations; Communication; Holistic Quality Preparation; and Supports. Item-by-item descriptive statistics were produced for the responses of each cohort (Athletes, Coaches, and Parents), and these were then ordered, as per Martindale et al.'s 2023 TDEQ-5 study, by highest to lowest mean. Martindale et al. considered the 7 questions with the highest means to represent 'strengths' of the TDE and the 7 questions with the lowest means to represent 'weaknesses' of the TDE; this was mapped onto the descriptive statistics reported here for comparative purposes. Descriptive statistics were also performed on the following subsets:

- Coach employment
- Male and Female athletes' responses to LTAD-factor questions
- Cost of competition for Male and Female athletes
- Financial cost of competition by cohort (Athletes/ Coaches/ Parents)
- Assistance from federations
- Athlete access to professional supports
- Athlete responses by competition age grade, gender, and competition discipline;
- Irish, Greek, USA and Great British respondents (the federations with the highest rate of response): by factor.

Not all of these categories of statistics are reported on here. Comparators between federations were deemed unlikely to reveal any meaningful data or statistically significant findings, since cohorts were small. Further nation-focused, in-depth research will need to be undertaken in this regard.

3.2 Part 2: Semi-structured Interviews

In order to gain deeper insights into TDEs in elite level sport climbing, this study also comprised semi-structured interviews. These took place with a series of figures who all are currently or were Head Coaches/ Performance Directors involved in the development of talent in Sport Climbing for national federations, with an average of 18 years of coaching experience and drawn from three continents: Europe, North America, and Asia. Given that TDEs are under-researched in Sport Climbing, interviews functioned as a qualitative extension of the TDEQ-5. They were seen as an opportunity to not only gather information from individuals with expertise, but to collate those individuals' experiences for emergent themes and ideas about what 'successful' TDEs look like in the sport. Interviews were recorded and transcripts produced, after which a reflexive thematic analysis was undertaken. 'Reflexive thematic analysis is considered a reflection of the researcher's interpretive analysis of the data conducted at the intersection of: (1) the dataset; (2) the theoretical assumptions of the analysis, and; (3) the analytical skills/resources of the researcher (Braun and Clarke 2019)' (Bryne 2022, p. 1393). The author first became familiar with the transcripts before generating initial codes, which were then grouped into themes. In the case of any discrepancy or confusion arising, the transcript and video recording were both consulted. Themes were then interrogated on a comparative basis across interviews, with subthemes then generated.

Table 3: Participant Profiles

	Gender	**Role**	**Current**	**Years Climbing Coaching Experience**	**Sport Science back-ground**	**Former competitive athlete (climbing or other)**
Coach 1	M	Head Coach	No	30+	Yes	Yes
Coach 2	F	Head Coach	No	20+	No	Yes
Coach 3	M	Head Coach	No	15+	Yes	Yes
Coach 4	F	Head Coach	Yes	15+	Yes	Yes

Coach 5	F	Head Coach/ Federation president	Yes	10+	Yes	Yes

The aim was to include world-leading talent development figures as well as those working with fewer resources / less established teams – that is, those outside of the IFSC top-ten ranking – in order to understand different approaches and challenges faced by associations. An attempt was also made to achieve gender balance, despite the fact that female coaches – as evidenced in coach responses to the TDEQ-5 survey – are in the minority. In the end, due to the availability of invited participants, 3/5 of participants were female. Interviews took place both in person and online as suited individuals, and a semi-structured format was followed with an interview guide prepared ahead of time by the author and approved by DCU's Ethics Committee. Conversations focused on four key areas:

1. Personal background and impressions of TDE.
2. Success of the individual's environment: defining the successful TDE.
3. What makes the TDE work and how does it work?
4. Looking back/ looking ahead: growth of the sport; Olympic impact and future of the sport for youth climbers.

The average interview length was 60 minutes; duration of interviews varied from 35 minutes to 1 hour 45 minutes. Interviewees were informed that their responses would be anonymised, and the author committed to sending participants project results so that they could clarify their responses, especially if they impacted on conclusions drawn (though see Cavellerio et al. 2019). In this sense the interview process was seen as collaborative and a way of creating knowledge.

4. Results

In the following sections, results of Part 1 and Part 2 are presented separately, followed by discussion of the overall results.

4.1 Part I: TDEQ-5 Questions

Internal consistency tests (Cronbach's Alpha) for the entire 28 TDEQ-5 questions was .939 for athletes, .898 for coaches; and .908 for parents, well above the measurement of .7 usually considered indicative of strong reliability. Reliability tests were also run for each of the five dimensions of questions on the TDEQ-5.

Table 4: Reliability scores by factor

Dimension	Athletes	Coaches	Parents
1. Long-Term Development	.818	**.532**	.767
2. Holistic Quality Preparation	.809	.832	.876
3. Support Network	.839	.812	.877
4. Communication	.892	.733	.877
5. Alignment of Expectations	.790	.733	.766

(Wang, Li et al., 2015, p. 22)

The factor of Long-Term Development for Coaches is substantially below acceptable levels. Interestingly, other TDEQ-5 research has reported similar issues with the LTAD factor and AOE factors, with Thomas et al. 2020 concluding that 'the [TDEQ-5] scale be used with some caution' regarding these factors (p. 7), and Lyons et al. 2024 also finding low rates of reliability (.54) for LTAD and AOE (.56), despite other factors reporting at acceptable levels. Implications of this low reliability in relation to LTAD responses by Coaches are discussed further on.

4.1.1 Means and standard deviation of the 28-item TDEQ-5:A,C,P

As with other TDEQ-5 studies and aligning with Martindale et al.'s 2023 mixed-methods study of parental perspectives on TDEs, descriptive statistics were produced in Tables 5-7 showing means and standard deviations of the 28-item TDEQ-5:A,C,P on an item-by-item basis, with 'the highest scoring 25% being considered 'strengths' (light grey), and the lowest 25% considered 'weaknesses' or 'priority areas for improvement' (dark grey)' (Martindale et al. 2023, p. 5).

Table 5: Means and standard deviation of the 28-item TDEQ-5:A

Items	N	Min	Max	Mean	Std Dev
10. I am involved in most decisions about my sport development. **AOE 4**	100	1	6	5.16	1.195
5 My coach allows me to learn through making my own mistakes. **LTAD 5**	101	1	6	4.94	1.182
3. My coach emphasises that what I do in training and competition is far more important than winning. **LTAD 3**	101	1	6	4.92	1.317
2. My training is specifically designed to help me develop effectively in the long term. **LTAD 2**	101	1	6	4.81	1.231
1. My coach emphasises the need for constant work on fundamental and basic skills. **LTAD 1**	100	1	6	4.79	1.233
17. My coach doesn't appear to be that interested in my life outside of sport. **HQP 2**	99	1	6	4.72	1.221
4. I spend most of my time developing skills and attributes that my coach tells me I will need if I am to compete successfully at the top/professional level. **LTAD 4**	101	1	6	4.62	1.156
12. My coach and I regularly talk about things I need to do to progress to the top level in my sport (e.g. training ethos, competition performances, physically, mentally, technically, tactically). COM 1	100	1	6	4.62	1.369
11. I regularly set goals with my coach that are specific to my individual development. AOE 5	100	1	6	4.51	1.389
16. My coach rarely talks to me about my well-being. HQP 1	99	1	6	4.45	1.466
26. My training programmes are developed specifically to my needs. Support 4	99	1	6	4.41	1.370
27. My coaches ensure that my school/university/college understands about me and my training/competitions Support 5	99	1	6	4.41	1.370
15. My coach explains how my training and competition programmes work together to help me develop. COM 4	99	1	6	4.37	1.516
18. My coach rarely takes the time to talk to other coaches who work with me. HQP 3	99	1	6	4.21	1.507
6. I would be given good opportunities even if I experienced a dip in performance. LTAD 6	100	1	6	4.16	1.441
19. I don't get much help to develop my mental toughness in sport effectively. HQP 4	99	1	6	4.12	1.573
20. I am rarely encouraged to plan for how I would deal with things that might go wrong. HQP 5	99	1	6	4.07	1.493
9. My progress and personal performance is reviewed regularly on an individual basis. AOE 3	100	1	6	4.04	1.333
22. I am not taught that much about how to balance training, competing, and recovery. HQP 7	99	1	6	3.95	1.567
14. My coach and I often try to identify what my next big test will be before it happens. COM 3	99	1	6	3.91	1.437
13. My coach and I talk about what current and/or past world-class performers did to be successful. COM 2	100	1	6	3.69	1.447
21. The guidelines in my sport regarding what I need to do to progress are not very clear. **HQP 6**	99	1	6	3.63	1.495
8. The advice my parents give me fits well with the advice I get from my coaches. **AOE 2**	100	1	6	3.63	1.612
24. I can pop in to see my coach or other support staff whenever I need to (e.g. physiotherapist, psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 2**	99	1	6	3.41	1.796

7. My coaches make time to talk to my parents about me and what I am trying to achieve. **AOE 1**	100	1	6	3.29	1.707
28. Those who help me in my sport seem to be on the same wavelength as each other when it comes to what is best for me (e.g. coaches, parents, physiotherapists, sport psychologists, strength trainers, nutritionists, lifestyle advisors). **Support 6**	99	1	6	3.23	1.707
23. Currently, I have access to a variety of different types of professionals to help my sports development (e.g. physiotherapist, sport psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 1**	99	1	6	2.93	1.786
25. My coaches talk regularly to the other people who support me in my sport about what I am trying to achieve (e.g. physiotherapist, sport psychologist, nutritionist, strength and conditioning coach, lifestyle advisor). **Support 3**	99	1	6	2.85	1.606

Table 6: Means and standard deviation of the 28-item TDEQ-5:C

Item	N	Min	Max	Mean	Std Dev
3. I emphasise that what my athletes do in training and competition is far more important than winning. **LTAD 3**	70	3	6	5.59	.648
2. My athletes' training is specifically designed to help them develop effectively in the long term. **LTAD 2**	71	3	6	5.56	.670
1. I emphasise to my athletes the need for constant work on fundamental and basic skills. **LTAD 1**	71	3	6	5.39	.707
5. I allow my athletes to learn through making their own mistakes. **LTAD 5**	71	3	6	5.30	.782
12. My athletes and I regularly talk about things they need to do to progress to the top level in their sport (e.g. training ethos, competition performances, physically, mentally, technically, tactically). **COM 1**	71	3	6	5.30	.800
17. I am not that interested in my athletes' life outside of sport. **HQP 2**	71	2	6	5.25	.982
15. I explain to my athletes how their training and competition programmes work together to help them develop. **COM 4**	71	3	6	5.18	.816
10. My athletes are involved in most decisions about their sport development. AOE 4	71	3	6	5.13	.809
6. My athletes would be given good opportunities even if they experienced a dip in performance. LTAD 6	71	1	6	5.11	.949
16. I rarely talk to my athletes about their well-being. HQP 1	71	1	6	5.07	1.150
11. My athletes regularly set goals with me that are specific to their individual development. AOE 5	71	1	6	5.00	.986
26. My athletes' training programmes are developed specifically to their needs. Support 4	71	1	6	5.00	1.108
7. I make time to talk to my athletes' parents about their child and what their child is trying to achieve. AOE 1	71	2	6	4.99	.949
18. I rarely take the time to talk to other coaches who work with my athletes. HQP 3	70	1	6	4.94	1.153
9. My athletes' progress and personal performance is reviewed regularly on an individual basis. AOE 3	72	2	6	4.92	.996
22. My athletes are not taught that much about how to balance training, competing, and recovery. HQP 7	71	1	6	4.79	1.218
4. My athletes spend most of their time developing skills and attributes that I tell them they will need if they are to compete successfully at the top/professional level. LTAD 4	71	1	6	4.77	1.031
14. My athletes and I often try to identify what their next big test will be before it happens. COM 3	70	2	6	4.59	.970
20. My athletes are rarely encouraged to plan for how they would deal with things that might go wrong. HQP 5	72	1	6	4.53	1.289
21. The guidelines in my athletes' sport regarding what they need to do to progress are not very clear. HQP 6	71	1	6	4.44	1.239
13. My athletes and I talk about what current and/or past world-class performers did to be successful. COM 2	71	2	6	4.38	1.126
19. My athletes don't get much help to develop my mental toughness in sport effectively. **HQP 4**	71	1	6	4.34	1.383
28. Those who help my athletes in their sport seem to be on the same wavelength as each other when it comes to what is best for them (e.g. parents, physiotherapists, sport psychologists, strength trainers, nutritionists, lifestyle advisors). **Support 6**	71	1	6	4.30	1.176

24. My athletes can pop in to see my coach or other support staff whenever they need to (e.g. physiotherapist, psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 2**	71	1	6	4.10	1343
8. The advice I give as a coach fits well with the advice that my athletes get from their parents. **AOE 2**	71	1	6	4.06	1.081
25. I talk regularly to the other people who support my athletes in their sport about what they are trying to achieve (e.g. physiotherapist, sport psychologist, nutritionist, strength and conditioning coach, lifestyle advisor). **Support 3**	71	1	6	3.93	1.457
27. I ensure that my athletes' school/university/college understands about them and their training/competitions. **Support 5**	71	1	6	3.82	1.496
23. Currently, my athletes have access to a variety of different types of professionals to help their sports development (e.g. physiotherapist, sport psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 1**	71	1	6	3.59	1.609

Table 7: Means and standard deviation of the 28-item TDEQ-5:P

Item	N	Min	Max	Mean	Std Dev
5. My child's coach allows my child to learn through making their own mistakes. **LTAD 5**	52	3	6	4.94	.826
3. Coaches emphasise to my child that what my child does in training and competition is far more important than winning. **LTAD 3**	52	1	6	4.94	1.110
10. My child is involved in most decisions about their sport development. **AOE 4**	52	2	6	4.85	1.109
1. Coaches emphasise the need to my child for constant work on fundamental and basic skills. **LTAD 1**	52	1	6	4.83	.964
8. The advice I give as a parent fits well with the advice that my child get from their coaches. **AOE 2**	51	3	6	4.78	.856
2. My child's training is specifically designed to help them develop effectively in the long term. **LTAD 2**	52	1	6	4.69	1.112
4. My child spends most of their time developing skills and attributes that their coach tells them they will need if they are to compete successfully at the top/professional level. **LTAD 4**	52	1	6	4.65	1.153
12. My child and their coach regularly talk about things my child needs to do to progress to the top level in their sport (e.g. training ethos, competition performances, physically, mentally, technically, tactically). COM 1	52	1	6	4.56	1.227
11. My child regularly sets goals with their coach that are specific to my child's individual development. AOE 5	52	1	6	4.48	1.306
17. My child's coach is not that interested in my child's life outside of sport. HQP 2	51	1	6	4.37	1.248
16. My child's coach rarely talks to my child about their well-being. HQP 1	52	1	6	4.33	1.451
9. My child's progress and personal performance is reviewed regularly on an individual basis. AOE 3	51	1	6	4.29	1.486
7. My child's coach makes time to talk to me about my child and what my child is trying to achieve. AOE 1	52	1	6	4.23	1.490
6. My child would be given good opportunities even if they experienced a dip in performance. LTAD 6	52	1	6	4.12	1.676
18. My child's coach rarely takes the time to talk to other coaches who work with my child. HQP 3	52	1	6	4.04	1.521
14. My child and their coach often try to identify what my child's next big test will be before it happens. COM 3	51	1	6	3.98	1.257
26. My child's training programmes are developed specifically to their needs. Support 4	52	1	6	3.98	1.488
28. Those who help my child in their sport seem to be on the same wavelength as each other when it comes to what is best for them (e.g. coaches, physiotherapists, sport psychologists, strength trainers, nutritionists, lifestyle advisors). Support 6	52	1	6	3.96	1.442
20. My child is rarely encouraged to plan for how they would deal with things that might go wrong. HQP 5	52	1	6	3.96	1.468
19. My child doesn't get much help to develop their mental toughness in sport effectively. HQP 4	52	1	6	3.92	1.607
13. My child and their coach talk about what current and/or past world-class performers did to be successful. COM 2	52	1	6	3.88	1.381
21. The guidelines in my child's sport regarding what they need to do to progress are not very clear. **HQP 6**	52	1	6	3.48	1.565
22. My child is not taught that much about how to balance training, competing, and recovery.	52	1	6	3.04	1.468

HQP 7					
27. My child's coach ensures that my child's school/university/college understands about them and their training/competitions. **Support 5**	52	1	6	2.94	1.787
15. My child's coach explains to my child how their training and competition programmes work together to help them develop. **COM 4**	52	1	6	2.88	1.437
24. My child can pop in to see their coach or other support staff whenever they need to (e.g. physiotherapist, psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 2**	52	1	6	2.83	1.700
23. Currently, my child has access to a variety of different types of professionals to help their sports development (e.g. physiotherapist, sport psychologist, strength trainer, nutritionist, lifestyle advisor). **Support 1**	52	1	6	2.69	1.566
25. My child's coach talks regularly to the other people who support my child in their sport about what they are trying to achieve (e.g. physiotherapist, sport psychologist, nutritionist, strength and conditioning coach, lifestyle advisor). **Support 3**	52	1	6	2.69	1.683

Of the highest 25% ranked means of Athlete responses to the TDEQ-5, most focused on LTAD, indicating that of the five factors, this is the one best served by current TDEs.

Table 8: TDEQ-A: LTAD 4

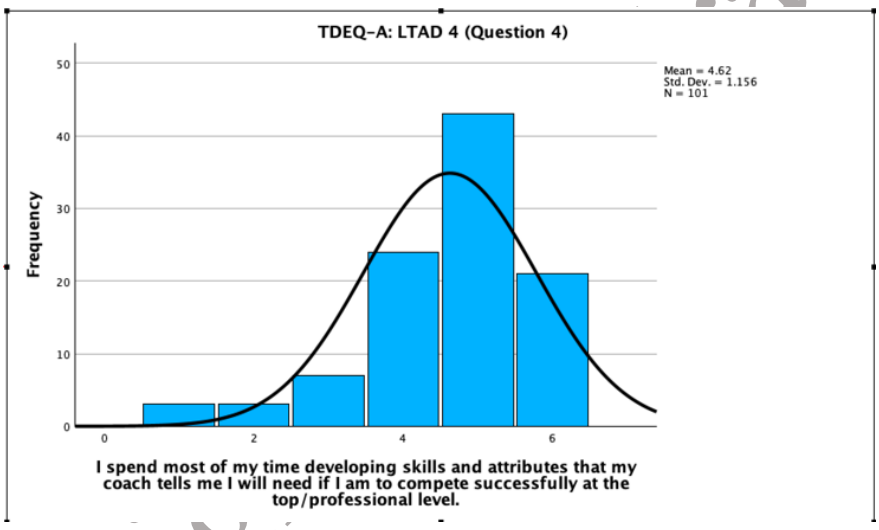
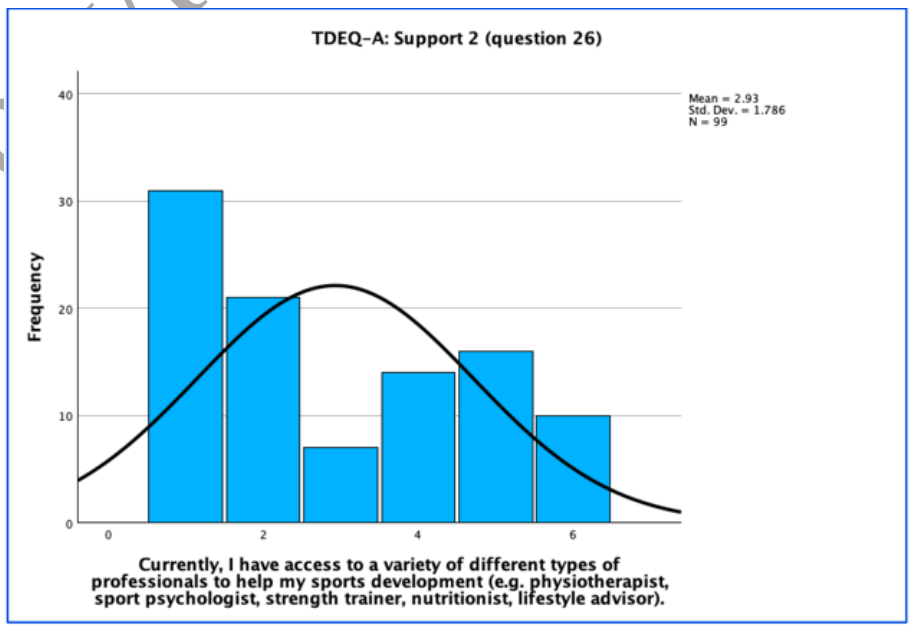


Table 9: TDEQ-A: Support 2



In the bottom quarter, designated as 'weaknesses' in the TDE by Martindale et al. (2023), questions on the Support factor formed more than half of the lowest ranking responses, along with two questions on AOE and one on HQP.

The top 25% responses for Coaches by means was, like Athlete responses, marked by its focus on LTAD (4 of the 7 top-ranked questions), though means were notably higher.

Table 10: TDEQ-5:C LTAD 3

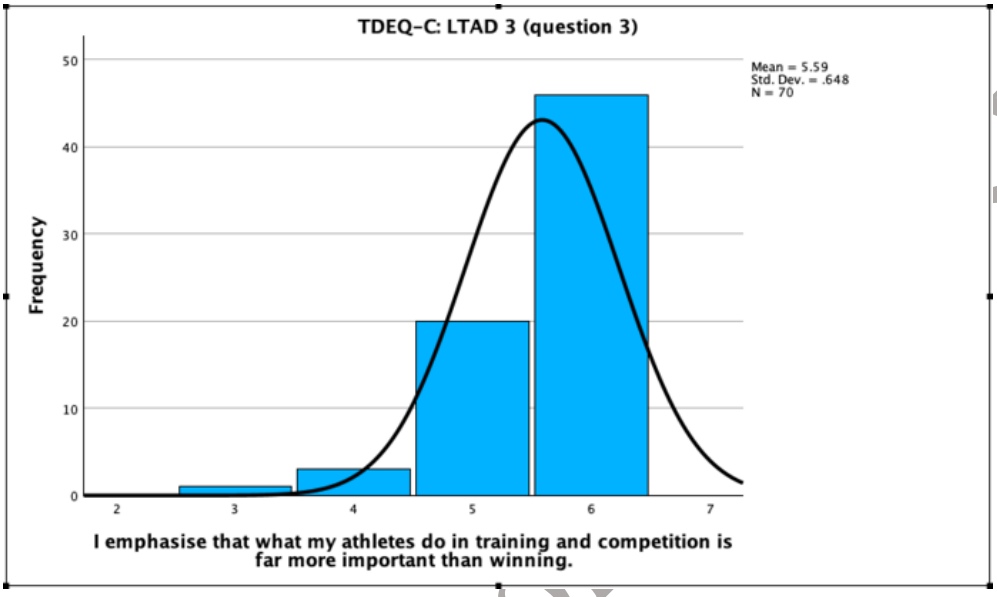
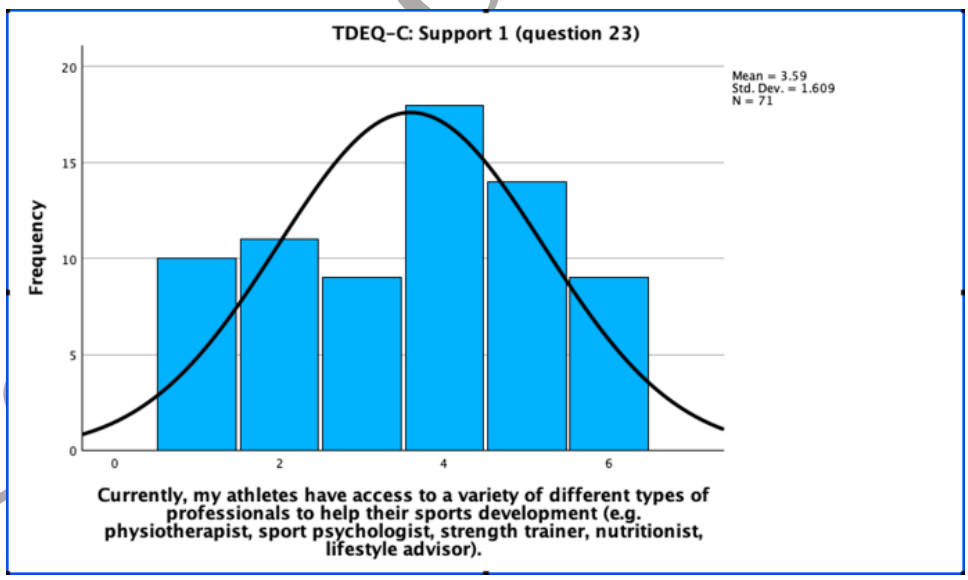


Table 11: TDEQ-5:C: Support 1



In general, Coaches responses to their environments were considerably more positive than Athletes, whose responses were in turn more positive to those of Parents. This finding is consistent with other TDEQ-5 studies, such as Sargent Megicks et al. 2022 (p. 2537). Parent responses, too, reflected general satisfaction with LTAD in the TDE, with 5 of the 7 top ranked responses from this factor, but with lower means than either Athletes or Coaches.

Table 12: TDEQ-P: LTAD 5

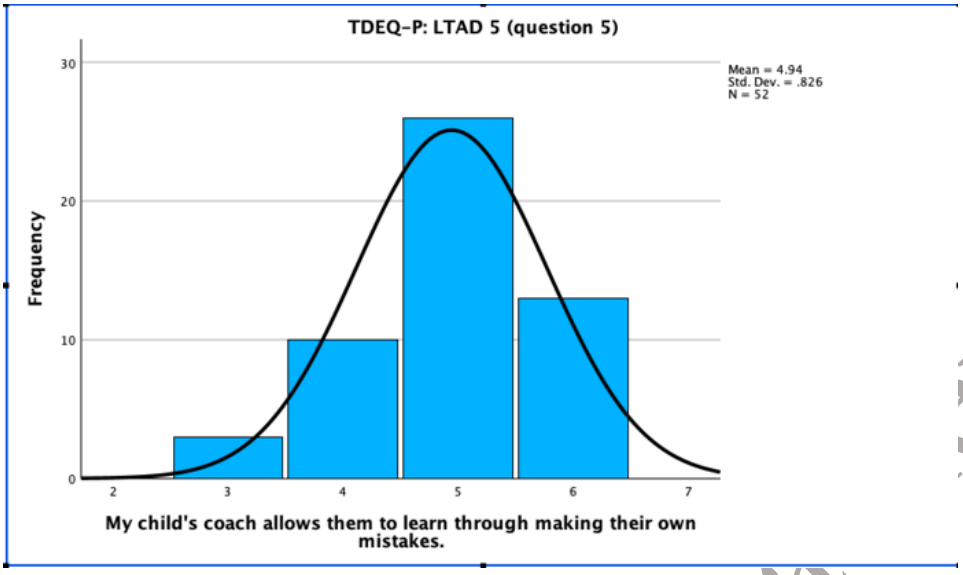
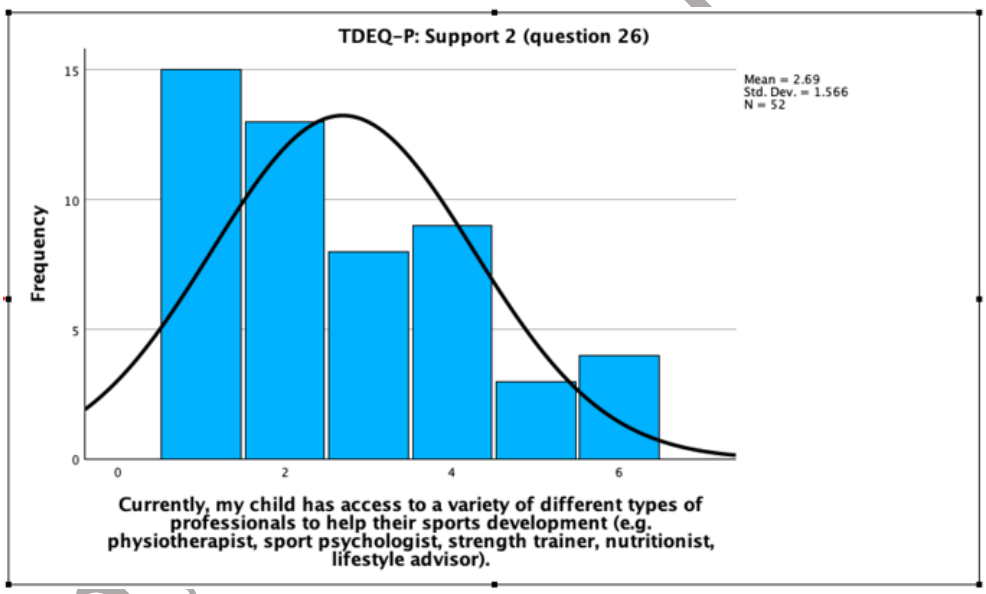


Table 13: TDEQ-P: Support 2



As with Athlete responses, Parents' lowest quartile responses concerned Support (with 4 of the 7 bottom questions concerned with this factor and 2 of the remaining 3 from HQP). However, the distributions in this bottom quartile for Parent responses are considerably lower. Across stakeholder groups, then, LTAD was the highest-ranked subscale, with Support the lowest, alongside HQP. These results are mirrored in the open-ended responses by all cohorts, as will be seen.

4.1.2 Coach Employment and the Financial Cost of Competition

In addition to the TDEQ-5 questions, demographic questions provided insights into Sport Climbing TDEs. Approximately 30% of respondents to the TDEQ-5:C were employed as full-time coaches. However, another 30% were employed only as part-time coaches, and 17% were unpaid and worked as volunteers. This suggests massive challenges faced by a high number of federations and, consequently, by coaches attempting to make a living and by athletes who may have either limited or no access to a coach. By contrast, approximately 7% of Coach respondents were

employed as Performance Directors/ Pathway Managers, indicating that a small number of federations and TDEs have more robust and developed pathways with multiple roles in the TDE.

Table 14: Coach Employment and Financial Commitment for Youth Team Participation

I am employed as: – Selected Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	a part-time Coach	22	4.0	31.0	31.0
	a full-time Coach	21	3.8	29.6	60.6
	a Performance Director or equivalent	4	.7	5.6	66.2
	a Pathway Manager or equivalent	1	.2	1.4	67.6
	Other	11	2.0	15.5	83.1
	I am not paid and volunteer my time as a coach.	12	2.2	16.9	100.0
	Total	71	12.8	100.0	

If many coaches face financial challenges, parents and athletes do as well. 50% of parents estimate that the financial commitment to Youth Team/ Development Squad participation is more than 200 euro/ dollars per month. 47% of parents 'disagree' to varying degrees that the financial cost of competing nationally/ internationally is sustainable for their families, though the cost of coaching is deemed 'sustainable' to different degrees by 45% of respondents.

Table 15: Financial Commitment for Youth Team Participation

The financial commitment required for my child's participation in the national Youth Team/ Development Squad or equivalent is

		Frequency		Valid Percent	Cumulative Percent
Valid	Up to 50 euro/ 50 dollars per month	6		12.2	12.2
	Up to 100 euro / 100 dollars per month	8		16.3	28.6
	Up to 200 euro / 200 dollars per month	11		22.4	51.0
	More than 200 euro / 200 dollars per month	24		49.0	100.0
	Total	49		100.0	

Table 16: Financial Cost of Competing

The financial cost of my child / children competing nationally and internationally is sustainable for our family.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	.9	9.8	9.8
	Disagree	10	1.8	19.6	29.4
	Somewhat disagree	9	1.6	17.6	47.1
	Neither agree nor disagree	6	1.1	11.8	58.8
	Somewhat agree	9	1.6	17.6	76.5
	Agree	9	1.6	17.6	94.1
	Strongly agree	3	.5	5.9	100.0
	Total	51	9.2	100.0	

Table 17: Financial Cost of Coaching

The financial cost of coaching for my child/ children is sustainable for our family.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	.7	7.8	7.8
	Disagree	2	.4	3.9	11.8
	Somewhat disagree	6	1.1	11.8	23.5
	Neither agree nor disagree	3	.5	5.9	29.4
	Somewhat agree	13	2.4	25.5	54.9
	Agree	19	3.4	37.3	92.2
	Strongly agree	4	.7	7.8	100.0
	Total	51	9.2	100.0	

4.1.2 Open-ended TDEQ-5 questions across stakeholders

The TDEQ-5 optional open-ended questions elicited responses from approximately 20% of athletes; 80% of coaches; and 83% of parents. Each set of responses was coded by theme, with themes amounting to over 2% of all phrases recorded in Tables 18-23. Across Athletes, Coaches, and Parents, 'positive environment' (41.8%, 42%, and 61% respectively) emerged as the most common positive notation about Sport Climbing TDEs, followed by 'facilities' (21.8%, 17.8%, and 7.27% respectively). Areas for improvement elicited higher levels of responses from both Coaches and Parents, and all three cohorts emphasised issues with facilities (Athletes: 37%; Coaches: 15.9%; and Parents: 21.5%). In line with the TDEQ-5 survey results, 'Supports' emerged as the most pressing issue for all three cohorts, with 21.7% of Athletes, 47.13% of Coaches; and 55.5% of Parents citing Supports as the key major issue facing athletes. It was notable that for Coaches, who are more involved in organisational structures and politics, what has been identified as specifically 'federation support' was the largest single issue (47.13%). Parents shared similar concerns, but tended to consider lack of access to all additional supports (i.e. access to multi-disciplinary experts) as falling within the purview of the federation, while Coaches – with their close knowledge of the organisation – divided types of supports from one another. These distinctions are seen in the tables below.

Table 18: Athlete Themes: Positive Elements of the TDE

Athlete Themes: Positives of TDE (49 phrases; 19 individual responses)	**Indicative feedback**	**N**	**%**
Positive environment	• 'Friendly people' • 'Positive community' • 'we all know and support each other in every possible aspect' • 'safe'	22	44.9%
Facilities	• 'It's one of the best centres in the country because of the route setting.' • 'The boulders are adapted to our weaknesses and strengths.'	13	26.54%
Individualised attention	• 'training based on my feedback' • 'I am able to give input about my training'	5	10.20%
Coaching	• 'The staff and coaches are very involved in helping athletes' • 'Amazing coach'	4	8.16%
Miscellaneous	• 'There are no' [positive elements] • '[we have] no instruction'	5	10.20%
Total			100%

Table 19: Coach Themes: Positive Elements of the TDE

Coach Themes: Positives of TDE (159 phrases, 55 individual responses)	**Indicative feedback**	N	%
Positive environment	• 'Supportive peer and coaching team' • 'I create a welcoming, constructive and supportive environment for my athletes that focuses on their needs and specific skills for competitions.' • 'good group atmosphere' • 'motivating' • 'coaches who are available and genuinely interested in their development' • 'empathetic coaches and open mindset culture' • 'communication is extremely good in order to adapt their needs at any point'	71	44.65%
Facilities	• 'possibility of quickly adapting training (routesetting) to your needs' • 'Purpose built training facility' • 'varied climbing centres, abundant competition circuits' • 'private training facility'	28	17.6%
Supports	• 'Cooperation of top experts' • 'broad external support (physio, sport psychologist, conditioning)' • 'private grants' • 'synergy between coaches of physical preparation and climbing coach' • 'enough money for doing competitions' • 'Having a dedicated conditioning coach helps build safe, healthy athletes'	25	15.7%
Individualised attention	• 'individual development' • 'working together to achieve individual goals'	12	7.55%
Coaching	• 'Long term coach /athlete relationship' • 'Experienced coaches • 'coaches who are available and genuinely interested in their development'	9	5.7%
Family/ Parental support	• 'strong family support and wish/ability to devote time to what the young athlete needs, incl. travelling' • 'strong rapport between the team of coaches and parents' • 'Committed families'	6	3.8%
Miscellaneous	• 'We do not have our own training facilities. We do not have a sports psychologist. There are no resources to provide you with the support of professional staff and comprehensive training.' • 'Intergender training allows different strengths to shine through and teaches respect of fellow athletes.' • 'N/a. We lack facilities.'	8	5.0%
Total			100%

Table 20: Parent Themes: Positive Elements of the TDE

Parent Themes: Positives in TDE (110 phrases, 43 individual responses)	**Indicative feedback**	**N**	**%**
Positive environment	• 'Camaraderie with peers' • 'Having good friends that work together' • 'Great social arena with good friends' • 'positive and friendly relation with the personal coach' • 'inclusion' • 'safety'	77	70%
Coaching	• 'Every session [the coach] brings enough energy to fuel the group and never, ever gives up on them.' • 'Great, competent and engaged coaches'	9	8.3%
Family support	• 'parental support' • 'Parents interested in sports'	7	6.6%
Facilities	• 'Good S&C Gym' • 'great for lead training'	6	5.6%
Individualised training	• 'Personalised program tailored to individuals needs' • 'every athlete gets individual coaching, training plan and support' • 'Tailored training'	5	4.6%
School support	• 'Cohesion between the sporting universe and the school universe'	3	2.8%
Miscellaneous	• 'Hard to name any [positives] since the coach just quit.' • We need a gym for training. We only have bouldering in [our country] right now.'	2	2%
Total			100%

Table 21: Athlete Themes: Areas for Improvement in the TDE

Athlete Themes: Areas for Improvement in TDE (47 phrases; 21 individual responses)	**Indicative feedback**	**N**	**%**
Supports	• 'Mental side' • 'Focus is always on the best athletes' • 'having better access to physiotherapy/ nutritionists and others' • 'More access to professional coaching and assistance' • 'Better funding support' • 'We do not have our own training facilities. We do not have a sports psychologist. There are no resources to provide you with the support of professional staff and comprehensive training.'	14	29.8%
Facilities	• 'Better modern competition style facilities.' • 'Our federation does not have enough resources to help the climbers or to improve the climbing locations' • 'There is limited access to the training room for people under a certain age'	13	27.7%
Politics / organisational influences	• 'More support from [the federation] rather than politics.' • 'Team structure/politics'	10	21.3%
Routesetting	• 'Sometimes the boulders are set too easy and are not challenging enough' • 'Variety of climbs' • 'Competition climbs are usually altered or taken down for insurance reasons'	4	8.5%
Miscellaneous	• 'The environment I train/compete in is perfect.' • 'Home'	6	12.7%
Total			100%

Table 22: Coach Themes: Areas for Improvement in the TDE

Coach Themes: Areas for Improvement in TDE (174 phrases, 55 individual responses)	**Subthemes**	**Indicative feedback**	N	%
Supports	Multidisciplinary support (31 phrases) Training (10 phrases)	• 'Outside resources (physio, sport psychologist etc)' • 'Nutrition information and guidance' • 'Need more access to support staff like physio and psychologist' • nutritional education' * • 'More training camps at other gyms in Europe' • 'More inter-team interactions (e.g. between regional and performance squads)	44	25.3%
Federation support	Finance (12 phrases) Competition (9 phrases) Pathway (9 phrases) Governance (6 phrases) Health (2 phrases)	• 'Financial plan to support athletes, coaches, routesettters' • 'not enough funding for [athlete] development' * • 'Not enough high level competition domestically' • The federation doesn't really think about the athletes when it comes to organize competitions (they are not easy access, the dates are not really good...) * • '[athletes don't have] access to a clear development pathway for international performance' • The pathway for progress in climbing changes constantly making it hard to plan. * • 'More proactive work between federation and IFSC' * • 'deficient nutrition (athletes usually come from poor communities)'	38	22%
Facilities		• 'National certified training wall • 'National sport science centre' • 'training camps for young athletes' • 'inadequate facilities for world class competitors (lack of holds, old school walls), • 'Training facility in which we can train separately and with a clear focus (spraywall, small boulder area for skill work)'	38	22%
Coaching	Time (17 phrases)	• 'More time to be given to 1-1 coaching, creating development plans.' • 'We need more connectivity with the athletes on a regular basis, session are too spread out.' • 'Access to specifics and movement mechanics on a weekly basis.'	29	17%

	Finance (7 phrases) Experience (5 phrases)	* • 'I can't make a living out of only training athletes, so I have to run a gym and also a club, to earn enough to make a living'. • 'financial aspect of the coach (a lot of work is not paid or not paid accordingly to make a living)' * • 'there is a requirement for professional coaches at all levels to guide and nurture the emerging talent in the sport' *E		
Routesetting		• 'IFSC style routesetting' • 'Route setting (hold selection, number of youth routesetters, female routesetters)' • 'Resource management including more specific routesetting'	13	7.4%
Miscellaneous	Parents (2 phrases)	• 'bad and destructive parental influence' * • 'More life balance' • 'Small pool to develop talent from.'	11	6.32%
Total				100%

Table 23: Parent Themes: Areas for Improvement in the TDE

Parent Themes: Areas for Improvement in TDE (102 phrases, 43 individual responses)	**Subthemes**	**Indicative feedback**	N	%
Supports	Multidisciplinary support (16 phrases) Finance (14 phrases) Training (9 phrases) Pathway (6 phrases) Competitions (3 phrases)	• 'Only access to coaches, not physiotherapists, sport psychologists, nutritionists etc. (unless paid for privately outside the climbing club/National team)' • 'Absence of medical assistance, physiotherapists, psychologists and others' • 'more objective nutritional advice (not focussed on weight loss)' * • 'Climbing does not have much financial resources, therefore the deductible paid by parents of climbers on the national team, for each [IFSC] competition is quite high. All regional and national competitions are fully parents paid. This excludes kids from the sport.' • Inadequate resources to support athlete development * • 'lack of other girls to train with' • 'There are no formal plans for training and competing which parents can help' * • 'Transparency of selection' • 'fairer rules regarding admission to (national) team' * • "setup more domestic competitions for young climbers'	48	47%
Facilities		• 'Lack of lead climbing facilities' • 'National Training facilities (non-existent)' • 'difficult for the ambitious competition climbers to find hard enough routes, since all training is done in commercial centers. As of today no centers for competition climbing exists.' • 'no spray wall, no training boards' • 'The climbing hall is not at the level of international competitions and neither is the layout of the routes.'	17	16.5%
Communication		• 'More communication to parents' • 'No knowledge of the goals set for the climber by the coach' • 'Communication from governing body is terrible'	10	9.7%
Individualised training		• 'More individualised training plans' • 'Would love to see more individualized programming, specifically goal setting for short and long term' • 'Personal Goalsetting' • 'Analysis of performance'	9	8.7%
Routesetting		• 'Setting to match EU standard' • 'no comp-styles setting/movement'	9	8.7%
Coaching		• 'a larger coaching team' • 'inconsistent coaching levels'	7	6.6%
Miscellaneous		• 'Nothing comes to mind, sorry about this.'	3	2.8%
Total				100%

4.2 Part 2: Interview Results

This study involved interviews with five individuals who have all held or continue to hold key roles in their respective national federations regarding TD and the coaching of elite youth climbers. The federations for which the participants have coached vary. Some work in federations with international success in the form of IFSC Continental and/or World Cup podiums at Youth and/or Senior level, Olympic representation or Olympic podia, and which are highly ranked internationally. Other federations have so far experienced lower levels of externalised success, with athletes only occasionally reaching semi-finals or finals at Continental and rarely at World Cup level; such federations' international rankings are far lower. TDE set-ups thus vary significantly between federations, including those in which participants work: some environments and pathways are well-established, while others are newly formed or even in the process of being structured.

Despite often stark differences between federations' achievements and resources, commonalities emerged from interviews. With this in mind, analysis focused on those things that coaches identified as key to their environments' success – or as barriers to success – as well as on details of structures and procedures that revealed the ways in which TDEs operated. Across the interviews, themes emerged. These were:

1. the need for coherent structures and pathways, with support from the national federation;
2. the role of parental support;
3. the need for supports, including access to multidisciplinary expertise, facility and finance;
4. ways to measure success in the TDE.

Table 23: Overview of themes emerging from the thematic analysis: characterising successful TDE

Key theme	Subtheme	Exemplar raw data
Organisation of the TDE	Pathways and structures	• 'When I become a head coach, my federation didn't have a development system. So at the time I became a head coach, I created the foundation for youth support system.' (C4) • '[W]e have a development system for the youth team from 2016…. [T]his is a pyramid with a pathway…' (C4) • '[When] I was head coach, we created a coach's training system… and we wrote a book about [coaching] climbing sports… [W]e are running those courses still, we have four levels. And I think it helps because it grows the coaching levels…' (C5) • 'For the under 13 athletes, we have our online education program for the parents and the children.' (C4) • '[T]here are a lot of competitions at the domestic level, non-national. So, that's why the young athletes are interested in competition.' (C4)
	Lack of structures	*
		• There are so many people who are doing a voluntary job… but it's not the same if you have a structure, … if you have competent people.' (C5) • '… in the end [what made me quit] was just the lack of support from the NGB.' (C3) • 'I had to fight to get paid for what I was doing.' (C3) • '[W]e would have had a great parental support. I think that's really important. [But] we never had any of the NGB members show up to any of the training sessions to provide support…' (C3)
	Selection	*
		• 'For the national [youth and senior teams], we have a selection competition just once [a] year… Maybe 300 athletes join these competitions and we choose… maybe 30 athletes… For each [youth] category.' (C4) • 'So we actually have them practice with the team … for a two week period. And that way they get to know the athletes and the coaches. And then we make a decision…' • '[J]ust before I left, there were some changes [about selection]… I don't mind control being taken away, but … [the new selection policies] totally changed the dynamic of the team' in a negative way.' (C3) • 'We are always changing them [since we started selection policies in 2019). [The national] championships [are] very important but if you are doing well in IFSC competitions, you don't need to go to the championships… We can also do a training camp [and the] head coach decides…[and] he considers all the factors…I like the system now...' (C5)
		*

	The group coaching environment	• '[T]hey also have their same coaches, and those coaches don't change throughout the season. So our lead coaches commit to practicing with their team throughout the season.' (C2) • '[W]e offer more of a group environment, … And we have the highest level of coaches, obviously.' (C2) • '…if you have mixed abilities and the kids bring each other on there's that … sense of progression across the board.' (C1) • 'Very often I just observe what is not tried out, … what's left on the table … and then I suggest…' (C1) • 'That was another reason why I left …because the NGB don't see [coaching] as something that needs to be developed… [They say], it's going to be next year. Oh, it's going to be the year after. Oh, we can't afford another coach. We can't do this.' (C3)
	Regularity of coaching in the TDE	* • '.. we have two training camps a year…. last year we had… a training camp session each month… one day a weekend, one day per month.' (C4) • '[I]f we have an important competition, we have a training camp a month before and we try to simulate a competition. But, [for] other periods, we set the goal for the athletes [and] important moves [to work on].' (C4) • "The head coach, he's just getting them for training camps, so it's like two or three training camps a year.' (C5) • '[S]ometimes … we will plan [international] training camps [with] other countries' teams.' (C4)
	Holistic Quality Preparation and LTAD	* • For us, it's really the whole athlete. …[T]hat's part of our theme, you know, great climbers, great kids… we want them to be the best athlete they can be.' (C2) • '[R]ecently, the young climbers try to do other sports or other training' and this is encouraged. (C4) • 'I'm sure they've grown up knowing that they could, even as a 12 year old, not make the developmental team if they don't keep up: you know, it's a lot of pressure. I feel like we prioritize the human, … and the overall athlete.' (C2) • 'We don't [want to] have … 15, 16 year olds under that kind of pressure because it's body pressure too, isn't it.' (C1) • '[W]e have yet to really figure out how to demote an athlete mid-season. It's never felt right for us.' (C2) • 'I don't see anybody who really cares about Talent Development so much… or even long-term participation of sports. … I see all the mountaineering federations being rather ill-prepared for the task because … the mountaineering federation is taking care of mountaineering … adults, you know.' (C1)
Parental support		• '[W]hen you have children, the parents just must be involved.' (C2)
	Communication	* • 'We try to really communicate with our parents.' (C2) • 'Our hope is that we're doing such a great job that we never have to hear from [parents]. But when that's not feeling right for the parent, we respect that.' (C2) • 'I think there's just an understanding that it's an environment for the athlete and it's not a parent taught class.' (C2)
	Parental over-involvement	* • 'Especially in [a specific country] it's only driven by parents … and then if you look it from the talent development point of view it's devastating…' (C1) • '[The parents] stay away… [S]ometimes parents are over involved with their children.' (C4) • '[W]e had …a lot of parents that were trying massively to push their kids into the program.' (C1) • 'In [a specific country] if you're hired as a climbing coach and you dare to do yoga the parents will be really upset. …' (C1)
	Financial support	* • 'We can't put [parents] out of the equation because they bring their kids to practice, they introduce them to climbing..., they pay the bills.' (C2) • 'For us in … the one good thing …[was] the ground-laying decision of ours that the purse of the parents should never play a role…' (C1) • Athletes do not pay for coaching but pay for 'registration fees' and training camps 'individually'. (C4)
Supports	Facilities	• 'For [us here in this federation] there are a lot of good quality gym and they can climb… good quality routes. That's why the young athletes [are] good climbers.' (C4) • 'We're very, very engaged in making sure that our facility is the safest space for young athletes. That just comes first. So separating the athletes or the young athletes from the adults sort of helps with that equation.' (C2) • '[W]e have our own [training facility].' (C2) • '[W]e have [regional] facilities. [These are not only for the youth team]: we are lent a period [of time].' (C4)
	Lack of facilities	* • '[In a public gym where the team has to train] you're checking the environment, you're making sure … we can use the comp wall, but then when the wall owner manager comes over it's like, …you guys need to be moving shortly. [T]hat's also putting undue stress on your decision-making …we're trying to get guys ready for a competition in here.' (C3) • '[I]t's unfortunate [that parents] have to pay a shed ton of money to be able to take the kids [to a world-class wall], to [other places]' to access adequate facilities. (C3)
	Routesetting	* • '[The route setters here are] not of the calibre yet'. (C3) • 'one of our setters became the IFSC setter this year, that was our very big goal' (C5)
		*

	Lack of access to multidisciplinary expertise	• '[W]e have no special physio, physiologist [or] psychologist for my team, but … in the adult team, we have a physio. [The youth athletes cannot necessarily access that person]: it's difficult because of the budget.' (C4)
Measuring Success in the Sport Climbing TDE	Positive environment	• '… our greatest accomplishment on a daily basis is making sure that the kids come in running so that our athletes… are coming in our door really motivated and eager to see their friends.' (C2) • 'our goal is always that each athlete stands on each other's shoulders to get to the top. That's a really important phrase [here]' (C2) • 'If you really want kids' full engagement you need other kids…' (C1) • '…the environment [is] a lot of really strong athletes in one space at the same time.' (C2) *
	Winning mindset	• '[Certain countries' athletes have a] very clear understanding: what are my skills and compared to the world level. And I think that's a big part of it, you know, the very realistic understanding of performance.' (C1) • '[athletes from more successful federations] are better in the competition environment.' (C5)

4.2.1 Organisation of the TDE

The strongest theme to emerge from interviews was the need for structure within the Sport Climbing TDE. Participants repeatedly described structures or the need for structures, which include pathways, selection policies, consistent and regular coaching at a high level, and a focus on holistic quality preparation: all of which contribute to LTAD. When participants found themselves starting out without structures, they reported either initiating or attempting to initiate them in their environments. For one of the most successful Sport Climbing TDEs, structure was identified as the single most important element and critical to success: 'the important thing is structures. I think we created that structure of development for the young athletes. So that's why [the TDE is] working well' (C4). Participants exhibited a consciousness of the need for clear and coherent selection policies, even if, in starting out, these changed over time, as noted in interviews with C3 and C5. Unfortunately, as recorded in both the interviews and in the open-ended questions of the TDEQ-5 survey, consistent and high-level coaching is not predictably a given in Sport Climbing TDEs. Participant C2 reported that training with athletes took place 2-3 times per week, a gold standard by comparison to all other participants' training possibilities, and reflective of the fact of functioning as a private contractor who also trains Youth Team athletes. For C3 and C4, coaching took place between 10-12 times a year domestically, with C4 noting that in addition to monthly sessions, training camps, sometimes international, took place. For C5's federation, there were 2-3 training camps per year, but athletes relied primarily on private individual or private group coaching throughout the year. Consistent group coaching was deemed critical by C1, C2, C3, and C5. C3 lamented the lack of commitment from the federation not only to consistent coaching, but to developing coaching more generally:

> '[I]n an ideal world [there] would have been a team, say three coaches. That way you would have … a melting pot and a fusion of communication, coaching ideas… approaches.... And that's what I would say would give the kids a better environment in which to thrive. [T]hat didn't happen, obviously. [And as a result the athletes needed to seek additional private coaching.] … I suppose the kids get an idea of what they like as coaching styles… to assist their development, but they shouldn't need to do that.' (C3)

The opposite end of this spectrum is seen in C2's set-up:

> '…certainly the first… 10 years, 15 years [as a head coach] … was built off of myself and my mentality. In the last five years, we really have such an incredible group of coaches, high level coaches, other head coaches besides myself. So I would say that there's just a real team effort…' (C2)

This sense of 'team effort' existing not merely among the athletes but also among the coaches is something that C2 identifies as critical to their TDE's success.

> '… a goal for us is that we provide [coaches] with a career… And it allows them to do their own research, bring in their own philosophy, collaborate with the other coaches, like they have coaches meetings once or twice a week, where they all meet together, about 11 or 12 coaches meet together, and they collaborate, and they do administrative work together, and they work on their plans, and they share ideas, and they present research, they present ideas.' (C2)

The level of coaching is key, too. C1 laments that much coaching in the TDE is not specific to the athlete. 'Basically all the training plans they're getting [are] just a copy and you would be surprised to what level.' (C1) In other cases, athletes are given 'beta' or direction about how to climb a problem, to the dismay of the coaches interviewed here. C3 notes that 'kids especially need to build their own autonomy and their own support systems so that when they're in these [competition] environments that they can thrive.'

For federations who aspire to externalised success in the form of podiums or medals at Youth level, coaches report the lack of training time and the lack of financial support from federations to enable such sustained contact as critical. Rather than investing consistently, such federations are prone to ebbs and flows depending on an individual talent as opposed to building a system to develop talent consistently. As C3 wondered,

> 'is it the case of those other federations that [are] just like ourselves back when [a talented athlete ten years earlier] was the outlier and it's like, Oh, look at this, [X is] doing really well. And then [our federation] just disappeared. Now it's [a particular country] and now it's somewhere [else], you know what I mean? Because they don't have that kind of collective drive to system. Whereas you look at the [top federations] …there're so many athletes that are [elite], and the coaching team's [got a structure].' (C3)

The answer to this issue is to invest in structures, as reported by C4 and C5. Initially hired as a Head Coach, C5 quickly realised that there were bigger issues in the federation:

> 'I became the coach and then at that moment I realized that I can help more not with the coaching … There is a lot of bureaucracy … and [I focused on] how to get money because funding was and is still insufficient and I got more interested in how to create a system which works.' (C5)

Participant C4 also reported that, upon being hired as a Coach, they realised that there was a need for implementing policies and structures on many levels in order to support and develop talented climbers. All participants bar one have a sport science background and drew on that expertise in establishing the necessary structures, pathways, and coaching plans; the participant without a formal sport science background is also the most successful competitive climber of the cohort, and thus had an equally compelling array of expertise to draw on in establishing structures.

With inconsistent funding, facilities are an issue for many federations, as seen in the TDEQ-5 survey data as well as in interview data. C1 and C2 have private training facilities, and thus control their own environments in terms of routesetting, holds, and time spent with athletes. In the case of federations C3 and C5, they are forced to use commercial walls for training that are not of international competition standard. C4 reported using a mix of regional / governmental facilities that are loaned to the Youth Team for periods of time; they also have access to high-end commercial training walls.

4.2.2 Parents and the TDE

All participants highlighted parents as key stakeholders in the Sport Climbing TDE. C2 notes that 'when you have children, the parents just must be involved. We can't put them out of the equation because they bring their kids to practice, they introduce them to climbing…, they pay the bills. There's just so much involvement, both with the family and the parents and the child or the athlete, if you're looking at it more of an elite level.' The relationship with parents is crucial to successful TDE, and a great deal of time and energy is spent on maintaining relationships with parents and communicating with them about their athlete.

C1 observes that parental involvement in the TDE has increased. In his view, '[e]specially in [a particular country] it's only driven by parents', but C1 sees this increase in involvement as being widespread and across federations:

> '… nowadays parents think their genius kids should be just around other genius kids … – I mean we're talking in some cases before puberty which basically means nothing … You would think that from the research and other sports that … if you have mixed abilities and the kids bring each other on there's that … sense of progression across the board.'

The ways in which Sport Climbing TDEs have turned into 'commercial programmes' C1 sees as intensely problematic, since this consumer approach means that no one 'really cares about Talent Development so much… or even long-term participation of sports.' Parents can, C1 suggests, become caught up in the drive for externally validated achievement at all costs. Parents' over-involvement is problematic in the TDE, C1 believes, because it prevents athletes from developing autonomy and critical skills, and can also be damaging if youth athletes are being pushed for inclusion in competitive programmes for which they are not ready or not suitable. 'I'm not sure if the parents understand what a disservice they do. This is a really interesting thing because it doesn't get talked about that much in Talent Development.' Perhaps for this reason, C4 notes that in their federation, parents are often encouraged to 'stay away', both from training and also from international training camps, because 'sometimes parents are over involved with their children'. This applies even for international training camps, when parental presence is not encouraged.

Related themes emerge in the interview with C2, who reflects that most times parents understand

> '… that it's an environment for the athlete… But we will never ask a parent *not* to come into the space. So if we have a helicopter parent,… or a parent that just feels like they need to be more engaged, we just respect that. We … hope that we continue to give them confidence that they don't need to be involved. … [W]e encourage them to reach out to us if something's not feeling right, if they feel like they need to engage or intervene. And… I always use pretty much the same phrase with the families that are like, oh, I'm so sorry I'm bothering you, or I don't want this to feel like, you know, you guys aren't doing a good job. And I'll say, you know, you're here to advocate for your athlete. So we honor that. Our hope is that we're doing such a great job that we never have to hear from you, but your job is to advocate for your athletes. … And at the same time, … we like to keep them a distance, an arm length away so that the athlete can develop without having the parent there all the time.'

On the other hand, in TDEs without full-time, permanent coaching staff or high performance directors, parents play a larger role, traveling with athletes to competitions and even overseeing their training. C5 notes that, under those circumstances, 'What I see is that the most successful athletes are the ones who have very strong parental support…' (C5). C3, also from a federation with less formal structures in place, notes that 'parental involvement is really important… I mean, [parents] are with their kids every day, they're driving them… It's a massive commitment… [If the]

parent athlete relationship [is] healthy, then the kids are going to obviously continue to grow in every way. So I really think it's very important. Although on competition day, if the kids just want to have that space, then … the coaching team got this' – though only if, C3 concludes, there is funding for a coach to be there.

4.2.3 Supports in the TDE

As is the case in the TDEQ-5 data, interviews highlighted inconsistencies in facilities, with some federations having access to private, purpose-built training facilities, and others forced to climb in commercial centres that have obvious limitations, not least of which is that they are most often geared 1) towards adult climbers and 2) towards mid-level climbers. As with responses to the TDEQ-5 open-ended questions, the issue of routesetting arises as a critical factor since, if there is no national training centre with competition-style setting, climbers rely on commercial setting, which is most often inappropriate and too easy. The lack of access to high-level and IFSC-certified routesetters is crucial. For some federations, as for C5, the aim of having a national routesetter certified through the IFSC is a 'big goal'. Not having access to facilities, holds and appropriate routesetting is thus a crucial point of difference. As C3 notes, 'the routesetting has to change' for progress to be made. Lack of access to other supports – such as physios and sports psychologists – is also mentioned, though it is noteworthy that for those federations with clear and coherent pathway structures, that access is far better than for others. Access might be limited, but is a possibility through Senior Team structures, whereas smaller federations still without full- or part-time coaches will not have funding for what would be seen as luxuries.

4.2.4 Measuring Success in the TDE

TDEs aim for athlete success. On one level, then, success is easily measured by the performance of athletes in competition. However, the TDE- asks us to consider how Athletes, Coaches and Parents report on the TDE without an analysis of competition results. Therefore the 'success' of the Sport Climbing TDE is not simply a matter of youth climbers making semi-finals or podiuming at international events; it is also a matter of how the environment contributes to shaping an athlete's progress for future performance. It is striking that despite geographical disparities, cultural differences, and often stark differences in resources and facilities, interviews with head coaches demonstrated that those environments that have a particular focus on the nature of the youth athlete are successful. That is, there is a deliberate focus on the creation of a TDE that accounts for the age and stage of the climbers involved rather than focusing singularly on their performance.

Even when a Youth Team does not have access to national training facilities, it is possible to design TDEs to prioritise the needs of youth athletes, as C1 describes.

> 'I really go differently about these things … If you really want kids' full engagement you need other kids… [I'm] an old [person]. I'm with this young athlete and I [say], look, you really should blah blah … but then he or she sees somebody she identifies with … doing this thing she just told you very eloquently how impossible this is that you're asking of her … and then she jumps back on the wall and does this.'

The conception of the TDE as a space in which young athletes learn from each other is key: C1 is modest about their abilities as a climber, saying, 'I'm the living proof that you can be the worst climber in the room but still contribute something to the process.' That 'something' emphasises the environment as one in which youth climbers learn from one another. C2 describes it this way:

> I believe that our greatest accomplishment on a daily basis is making sure that the kids come in running so that our athletes, whether they're new to climbing or they've been climbing for years or they're headed towards the Olympics, that they're coming in our door really

> motivated and eager to see their friends. That's really important, having an environment where there are other young climbers like themselves…

Successful Sport Climbing TDEs also provide a practice space away from competition. C1 stresses that youth athletes do not think in zero sum games:

> this is not how kids play. They play in infinite games… they play for the sake of playing. … [K]ids up to certain age before puberty are actually not really interested in competing. Yeah they run against each other but the whole thing like medals … this is really not what why kids are doing this… They want to play and … if you see even dogs playing, you have a strong fast dog [and] this dog will wait for the slower weak dog to catch up to make it a fun for the weaker dog, you know, so in a way they're much nicer: they understand play much better than some people.

The creation of environments that allow for *practice* – key to a sport that increasingly demands complex, dynamic and coordinated movement – is crucial. C1's coaching encourages this kind of practice thinking in athletes, too, creating opportunities for 'gradual exposure' to complex movement, allowing athletes to acquire skills not by virtue of direct instruction, but through a process of exchange and play that also fosters autonomy.

At the same time, these Sport Climbing TDEs are developing athletes among whom are future world champions, and whose focus is far from being on simple social enjoyment but on eventual – and often also immediate – performance. Participants C1, C2 and C4 have all had athletes podium at not only Continental events but at Youth World Championships *and* Senior events. The mindset of such athletes is necessarily different than those from smaller federations without that consistency of result. As C5 describes it, their federation needs to get better at the 'winning mindset', which involves competition practice. For federations without a developed Sport Climbing performance culture, then, consideration needs to be given to development opportunities. C1 notes one international competition for which

> 'parents were traveling 600 kilometres for the kids to climb three boulder problems at best. [I]n some cases it was 10 climbing moves they did for 1200 kilometres of travel. This is not good regardless of how valuable this experience is. You might do this once, but after a season … maybe it's time to reconsider if this is really such a valuable experience.' (C1)

Some federations have a 'realistic understanding of performance' (C1). Yet C5 feels that athletes must be exposed earlier and more consistently if they are to improve. 'There are experience factors', so C5's federation now looks to send their athletes in the youngest possible category – currently Under 16 – and to have them compete consistently (C5).

> 'I would say that they have to feel like they are enjoying climbing and I think results will come because they need to just feel confident in that environment… And from the coaches who are going to competition they said that it's very changed from [the first IFSC Youth Cup of the year] to [the third] because [by the third] they know how to do a warm-up; they definitely know that in the [home] context, but [at] the first competition, they are kind of lost.' (C5)

C3 notes that historically in their federation, as in C5's, athletes were held back from attending IFSC international competitions too early, with the consequence that athletes didn't gain experience or develop the mentality to perform at those events. 'I wouldn't feel it would be appropriate in that I'd be putting unnecessary pressure on them as individuals' (C3).

> '[U]nfortunately the only measure of success is the big tables, you know, podiums, and in the background, the kids are all aware of it, but you know, the podiums matter because it helps with the profile of [the country] … but for me, I've always tried to say it is important in the grand scheme of things, but where we are right now, I don't feel it is as important. What's more important is having a really good environment for kids/adults to interact and thrive… and that's not happening at the minute.' (C3)

C5 reports that they 'decided to invest in the youth more. … two of the best from each group are funded' (C5), with the goal of building experience, exposure, and developing competition expertise since, as C5 concludes, athletes from successful federations 'are better in the competition environment.'

5. Discussion and Implications for Practice

This mixed methods study drew on three sets of data: 225 responses to the TDEQ-5 across Athletes, Coaches and Parents involved in elite-level Sport Climbing; 117 individual responses by Athletes, Coaches and Parents to open-ended questions of the TDEQ-5; and 5 semi-structured interviews with Head Coaches/ federation presidents who work with elite youth climbers. As an exploratory attempt to understand Sport Climbing TDEs, the results present challenges and questions to those working with elite and developing elite youth climbers and their TDEs.

The question of reliability in Coaches LTAD-factor questions

While reliability of the TDEQ-5 was overall in the acceptable range of .7 or higher, reliability for LTAD factor questions was, at .532, considerably below this threshold. Other researchers have reported a similar issue with LTAD factor questions (most recently, Lyons et al. 2024, but also Thomas et al., 2020). The result for this factor suggests that the set of questions may not be addressing the underlying issues as clearly as should be the case; since all participants responded to an English-language survey, language issues may have been a consideration here. It is also possible that the lack of reliable interconnectedness between these questions is indicative of a wide range of respondents: some volunteer or part-time Coaches who are not in regular contact with their athletes and cannot provide individualised training plans, and some full-time Coaches in better-provisioned federations with clearer pathways. The set of questions about LTAD, in other words, may appear to Coaches in such different circumstances to be targeting different underlying principles. For this reason, and because other researchers have indicated similar issues with LTAD factor questions, Coach responses to that set of questions have not been discarded, but are understood to require investigation in further studies.

Descriptive statistics: LTAD as positive and the need for Supports and AOE

Item-by-item descriptive statistics for the 28 questions of the TDEQ-5 shows that Athletes, Coaches, and Parents consider Sport Climbing TDEs to be doing a decent job of considering LTAD, a crucial element for developing athletes (Martindale, Collins and Daubney, 2005). This finding is in keeping with Martindale et al. 2023's results: there is, in fact, much overlap of specific questions in both the top 25% and the bottom 25% of Martindale et al.'s results (2023) of a multi-sports study based on the responses of 485 Parents, which found that in the top 25% 'positive' responses were 5 LTAD-factor questions, and the questions that fall in those categories here. This research on Sport Climbing TDEs specifically reports a minimum of 4 of the 7 questions in the top 25% as LTAD-factor questions from all cohorts, suggesting that most Athletes experience their Sport Climbing TDE as positive and looking beyond short-term achievement. Martindale et al. (2023) reported that of the lowest-scoring questions, 4 were HQP-factor focused, with 3 focused on Supports. The majority of questions falling in the bottom 25% of this study's findings are Support-factor questions across all three cohorts. This indicates that Sport Climbing TDEs are

notably weak in providing supports to youth climbers. This finding is more alarming when it is considered that some respondents are based in federations that *do* have access to multi-disciplinary support expertise, indicating that even among those with better supports, there is still a perceived lack of support across the board. It is also noteworthy that while Martindale et al. (2023) report no AOE-factor questions falling into the bottom quartile, for Athlete respondents here, two questions in that 'weak' section are AOE-focused and highlight issues with the triangulated relationship between the other two cohorts of Coaches and Parents. Athlete responses show a gap between Coach and Parent alignment of expectations, with Coaches not taking time (or not having time) to communicate expectations and aims to Parents, and with Athletes also receiving potentially different advice from Parents than from Coaches (or receiving advice from Parents in lieu of Coach advice). That Athletes also express uncertainty about what they need to do to progress in the sport – a HQP-focused question in the bottom quartile – indicates a lack of structures and clear pathways within federations and also within the international Sport Climbing environment.

Coaches' higher regard for the TDE than Athletes and Parents

The results show that, while there is strong overlap between the three cohorts' item-by-item analysis, mean responses for Coaches are considerably higher than those for Athletes, which are in turn higher than those of Parents. This is perhaps unsurprising, since Coaches have at least partial responsibility for the architecture of the TDE, and are thus more likely to speak highly of environments that they contribute to the design of. Athletes are also directly part of that environment. Parents, however, are at a slight distance – and are also shouldering the considerably financial burden for coaching and competition at international level; it is therefore unsurprising that the results show that they are slightly less positive even in their assessments of the TDE. These findings are consistent with other research into TDEs (i.e. Sargent Megicks et al., 2022). The discrepancies suggest the need for further in-depth analysis of each cohort's experience of the TDE.

Preconditions for success / indicators for failure

Athletes, Coaches and Parents generally report that their environments are friendly and that there is camaraderie amongst participants; all three cohorts' data also showed that LTAD is a significant and valued part of the TDE, as discussed above. However, the study also demonstrated that Supports were lacking for Athletes, that HQP was inconsistent, calling into question some of the findings from other individual items. For example, AOE 4 – 'I am involved in most decisions about my sport development' – purports to understand youth athletes' involvement in decision-making alongside Coaches, support staff, and Parents. However, because the results indicate that many athletes are acting without significant or regular interaction with Coaches, responses to this question – which falls in the top 25% of means for both Athletes and Parents – suggests that rather than representing positive AOE, this question might also indicate lack of Support, poor HQP, and *poor* AOE. Qualitative interviews and more in-depth research about Athletes' experiences are needed to clarify these and other issues, since lack of coaching time/ contact with the environment is a significant contributor to perceived failings of the TDE.

Many of the inefficacies of Sport Climbing TDEs falls within categories identified by a significant scoping review of multi-sport TDEs undertaken by Hauser et al. (2022). In an assessment of 'functional and dysfunctional environmental features' in TDEs, Hauser et al. conclude that 'athletes' holistic development is significantly influenced by features of the following categories: (1) *preconditions of the sport environment;* (2) the *organisational culture* of a TDE; (3) the *integration of efforts* between the sport and non-sport environment; and (4) a *holistic quality preparation* for life in and outside sport' (15). Hauser et al. identify four 'negatives' in the category of 'preconditions of the sport environment' that all chime with the findings of this study:

- Limited (skilled) coaching & support staff
- Lack of role models & links to elite level
- Limited finances & lack of facilities
- Limited support from sports federation
  (Figure 2, Preconditions of the Sport Environment; Hauser et al., p. 16)

Interestingly, Hauser et al.'s 2022 scoping review concludes that while the '*infrastructure* should be of good quality with all athletes having access to training facilities and equipment', 'finances and facilities' are not necessarily a 'key precondition' to functionality (p. 20), even though limited finances and facilities represent 'severe hindrances for athletic development' (p. 21). By contrast, their review finds that 'the availability of *skilled and capable coaches*' does seem to function as a key precondition (p. 20). Their finding is reflected in the repeated citation by Athletes and Parents in this study of the challenges of accessing coaching, as well as by information from Coaches themselves, who detail challenges ranging from the difficulties of making a living while coaching to the lack of support from national federations; this is seen in both open-ended responses and interview data.

Preconditions for success/ failure: Coach and Parent Challenges

While this research set out to attempt to determine elements of the successful TDE in Sport Climbing, results revealed interesting, tangential findings about the challenges facing Coaches and Parents not as those who benefit from the TDE but as key stakeholders. Results highlight issues facing Coaches, in that only 29.6% work in full-time appointments. The fact that 16.9% of Coaches working with national federations recognised by the IFSC are unpaid is startling and worrying, and provides a clear sense of why lack of structures and supports emerge as 'areas for improvement' or negatives for so many respondents in the open-ended questions as well as in interviews with Head Coaches. Unpaid Coaches as well as those who work part-time and are hired in only by the day or session are under so much financial and time pressure that they are unlikely to be able to fulfil their roles in the way that full-time Coaches can.

Parents' results suggest comparable pressures. That half of parents report costs of upwards of 200 euro/ dollars per month for costs associated with Youth Team participation indicates the level of commitment required; and this survey did not garner insights into the substantial associated costs of travel, accommodation, kit and sustenance while abroad – or the ranges above 200 euro/ dollars that parents are committed to paying. With 47% of Parents disagreeing that costs are sustainable and 12% neither agreeing nor disagreeing, it is evident that costs associated with national and international competition are significant, and that lack of affordability is a factor and even a barrier for a significant proportion of families. Financial constraints are often reported as a barrier to talent development (i.e. Morley et al., 2017; Henriksen, Stambulova and Roessler, 2010), so the findings here this unsurprising. Given that this study also finds inconsistent levels of support from national federations, which includes financial support for athletes, it is possible to conclude that at least some athletes are unable to access or are limited in accessing appropriately high-level training, coaching, facilities, or competition experience due to financial issues.

Positive environments

Athletes, Coaches and Parents, as well as the Head Coaches interviewed here, all report the most successful element of Sport Climbing TDEs to be the positive atmosphere. Based on written responses to open-ended questions and the phrases used by Head Coaches in interviews, that positive atmosphere is based on camaraderie, friendship, and a supportive feeling amongst Athletes and also between Athletes and Coaches. In an indication of the disparity between federations, some stakeholders describe facilities as a strength or positive of the TDE, though a much higher percentage describe facilities as the key issue in need of improvement – while the far highest area for improvement was Supports. That some respondents felt the need in the 'positives' question to

point out the impossibility of naming any – 'n/a. We lack facilities' or 'Hard to name any [positives] since the coach just quit' – is significant, demonstrating a disjunction between some Sport Climbing federations' TDEs and those without resources: and this study suggests that the two things are aligned. That is, success in the Sport Climbing TDE seems to be at least partially linked to material and financial supports, whether that be through direct financial support, the employment of full-time Coaches, or the ability to access appropriate facilities.

The need for structures and pathways

TDEQ-5 responses and interview participants emphasised the need for 'coherent structures', echoing much of the research into TDEs (Webb, Collins, and Cruickshank, 2016). Henrikson and Stambulova argue that 'some environments are superior to others in their capacity to guide talented junior athletes in their transition to elite senior athletes' (2017, p. 271). Henriksen and Stambulova describe 'environmental success factors' (p. 272) which are the building blocks for athletic performance based on their survey of a wide variety of successful environments (p. 274) and across a wide range of sports. This study's findings suggest that many Sport Climbing TDEs lack such building blocks at present, indicating a lack of adequate coaching, supports, and experience at Youth level, and implying an uncertain path from Youth to Senior level for those who are not fortunate enough to work within particular national federations.

However, it is notable that Collins and MacNamara (2017) find that overly smooth paths at youth level do not prepare athletes for senior performance; from their perspective, the challenges faced by many elite-level Youth Sport Climbers may, in fact, serve to assist their eventual performance, functioning as 'speed bumps' (p. 343) on the 'rocky road' to success (Collins, MacNamara, and McCarthy, 2016). However, there are tipping points, with some challenges ending up as what Collins et al. call 'road blocks' rather than road bumps. While self-motivation and the development of autonomy are crucial skills according to previous research (Martindale et al. 2007, p. 196) and according to interview data here, the fact of autonomy for many Youth Sport Climbers appears to be the result of the lack of coaching and supports available to them, suggesting far from optimum talent pathways. Where autonomy is the result of no coach at all, in the case of some federations, it is difficult to describe the TDE as successful.

Gaps and needs

There are stark inconsistencies amongst national federations and governing bodies. Some are concerned with accessing additional supports such as extended sports psychology sessions to aid athlete preparation to podium at international competitions, while others are concerned not with nutritional expertise but the quality of the nutrition available to athletes from poor communities. This study thus shows that for established and better off federations, needs are extremely different from the majority of national set-ups. These findings echo much research that attributes success or failure of TDEs to systematic support by federations and, at a higher level, investment by governments (i.e. Holt, 2002, Li et al., 2014).

As Skille, Stenling and Fahlèn (2017) note, 'international elite sport success has become *the* government sport policy priority' (p. 456) in recent decades, particularly following the dominance during the Cold War of eastern bloc countries, which lead, they argue, to a proliferation of investment by international governments and, consequently, 'the gradual professionalization and commercialization of sport' (p. 457). The consequences of this process for youth athletes is multifaceted and in most cases their opportunities are dependent on their geographical location and, in the case of the athletes surveyed here, their selection by federations that are longer-established, have a history of Sport Climbing, and have clear structures in place with good coaching supports. As Taylor, MacNamara and Taylor 2022 make clear, delivery of coherent talent development strategies must be based on the availability of different resources, with the result that strategies need to consider top-down and bottom-up approaches (p. 5), with parental involvement, for example,

needing to be stepped up in 'resource light' environments (ibid.); this is reflected in the interviews with Head Coaches in such resource-light environments, who outline the necessity for parental supports on a level different to that of other, far better-resourced environments, which, while stopping short at preventing parental involvement, are in some ways discouraging of it. In this sense, better-resourced and more externally successful Sport Climbing TDEs are able to focus on the creation of a specifically youth-athlete centred environment – which may contribute to that level of external success, something that future research might consider.

Related to the question of resources, De Bosscher, De Knop and Van Bottenburg 2010's major work on the SPLISS model (the 'Sports Policy factors Leading to International Sporting Success') is useful to consider in the Sport Climbing TDE context, since it looked to 'explore a method to measure quantitatively the determinants of competitiveness of nations at an elite sport policy level' (p. 569). Based on extensive studies with athletes, coaches, and performance directors (2007, 2008, 2010), De Bosscher et al. distilled their results into 9 key pillars that contributed to international sporting success:

1. Financial support
2. Organisation and structure of sport policies: an integrated approach to policy development
3. Foundation and participation
4. Talent identification and development system
5. Athletic and post-athletic career systems
6. Training facilities
7. Coaching provision and coach development
8. (Inter)national competition
9. Scientific research (text in Figure 2, p. 575)

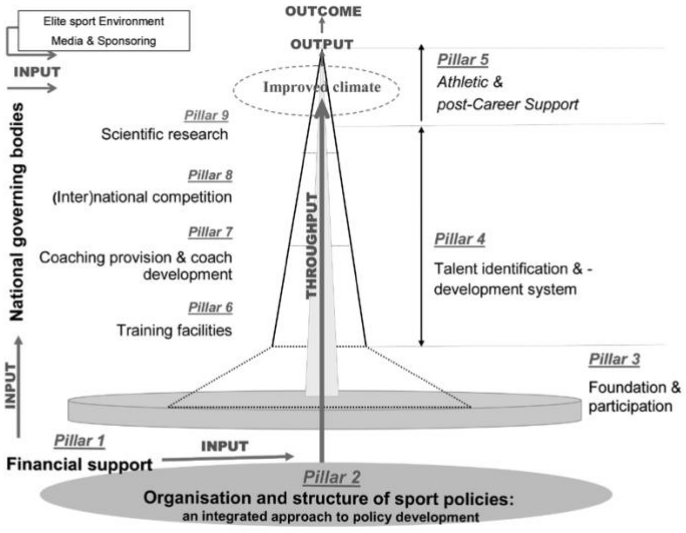


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Figure 2 — SPLISS model: A conceptual model of 9 pillars of Sports Policy factors Leading to International Sporting Success (De Bosscher et al., 2006).
*We acknowledge EASM for their permission to re-use this figure after publication in *ESMQ*, 2006.

This study indicates that while some national federations have financial and structural environments with sufficient expertise to either achieve or work towards international sporting success, others are missing key elements/ pillars – or, critically, they are missing the structures that support input, throughput and output/outcome as described by De Bosscher et al. above. If there is a weak or ill-defined talent pathway; no national training facility; little opportunity for coach development; an insufficiently challenging national competition schedule; and, at base, little funding, it is

unsurprising that many Athletes, Coaches and Parents report difficulties within Sport Climbing TDEs.

Implications for Practice and Summary of Key Findings

Since this is the first study to date in English about Sport Climbing TDEs, it is worth considering implications of this study for practice. Numbers of respondents per nation were deemed too low to present data comparisons on, though initial tests suggest that those nations ranked in the top ten by calculated IFSC results report higher means and, by implication, higher levels of satisfaction with their TDEs. Combined with responses to the open-ended questions, this indicates that the gap between top-ten nations (who receive additional quota spots at Continental Youth Cups and Championships, as well as at Senior competitions, consistently providing young athletes from those nations with additional exposure to competition) and those below is widening. While facilities, funding, and access to supports play roles in all sports, competitive Sport Climbing relies upon several specific material factors, including access to Bouldering, Lead and/or Speed climbing facilities; access to competition-grade holds; access to routesetters experienced enough to set those holds at appropriate levels; as well as access to appropriately experienced coaches. This study reports that some federations do not have access to these key elements: indeed, several federations report having only a 'home-made' bouldering facility in their country, for instance, and no Lead or Speed wall. The IFSC has, in recent years, developed an Olympic Solidarity funding programme; a 'World Climbing Academy' with occasional coaching opportunities (including for female coaches specifically); it also supports research projects like this one through dissemination; and this year initiated a development-funding opportunity aimed specifically at encouraging participation at the Youth World Championships, for which 37 national federations made applications. Much more needs to be done in this vein if the lower-ranking nations are ever to reach the level at which athletes can perform.

Routesetting came up as a recurring theme in open-ended questions and interviews, making it worth considering whether IFSC routesetter certification and routesetter training can be extended much more rapidly and in wider ways, for instance by each federation receiving access to one of their training programmes, or through the creation of mentorships. In addition, given the number of federations that report inconsistent or inadequate levels of coaching, the IFSC might consider more formal coach education programming, prioritising coaches of youth athletes in underfunded countries to achieve a more level playing field. While the IFSC now issues hold catalogues each year to alert federations about what holds will be used in upcoming worldwide events and the Olympics, the reality is that most federations do not have the funding, as evidenced by the data here, to purchase the approved holds – or the facilities in which to set them. The fact that IFSC routesetters for World Cups and even the Olympics are allowed to hold training clinics for federations prior to events is also a practice that might be reconsidered, unless funding and access to holds, setting styles and routesetters can be offered to federations worldwide or regionally through funded training camps or other initiatives. Otherwise, it seems likely that some youth athletes will continue to arrive at competitions without having had the experience of the IFSC-grade routesetting, holds and facilities that their competitors have on a regular basis.

This study suggests that, on the national level, federations can and should put structures and particularly pathways in place for the development of youth athletes. This involves clear selection criteria, clear training planning, and regular, consistent, high-level coaching. It is clear that parents are willing to and do pay for this coaching. Therefore, as this study shows in reports from all cohorts, the appointment of full-time coaches is in the interest of federations and the athletes themselves: though, as one Head Coach of a successful climbing nation put it, the 'purse of the parent' should not be a factor in determining involvement of an athlete in a talent pathway. The training environment is key for developing elite athletes, who, interview data shows, learn and develop more fully and are more prepared for performance when they train regularly with groups of

other youth athletes and are challenged by appropriate-level routesetting and movement exposure. While a one-size-fits-all approach cannot work for the creation of TDE pathways and policies, it might also be useful for younger federations in the early stage of planning such structures be matched with mentor federations for advice and/or training camps.

It is worth concluding with the observation that none of the coaches interviewed for this study felt that Sport Climbing's relatively new place in the Olympics significantly impacted their practice. Climbing's place in the Olympics creates excitement, particularly in federations where athletes have won Olympic medals or represented their countries. 'Many athletes want to be Olympians', C4 noted – but the crucial elements required to reach that status need to be put in place many years before.

There are many further areas for possible research in the arena of Sport Climbing TDEs. Individual federations, particularly externally successful ones, need to be studied in greater depth for examination of their structures, pathways, and procedures; other research is needed into the impact of facility access on Youth athletes' attained success. Finally, it would be worthwhile carrying out extended interviews with Coaches in different regions, since their insights into the histories of their TDEs could prove crucial to the development and set-up of new and emerging TDEs.

This study demonstrates that Sport Climbing TDEs are, for such a young competitive and Olympic sport, strongly committed to LTAD and the creation of supportive, friendly, and inclusive atmospheres. The work being done by Coaches, whether as full-time, remunerated officials or as passionately committed volunteers, is clearly having an impact. Parents also demonstrate high levels of commitment in terms of resource-commitment and supports. Athletes are also clearly committed to the development of their own practices, and demonstrate high levels of reflection in the open-ended responses. The onus is now on federations, national sports bodies, and the IFSC to work in concert to provide appropriate supports to advance the sport in a manner that ensures parity across the field of play and encourages the development and transition of Youth athletes into Senior competition.

Limitations

As noted, this study's numbers disallowed for conclusive insights into individual federations' set-ups. There was also a bias, as seen in the responses, from within Europe, perhaps because of the position of the researcher in Europe and the study's distribution from this geographical space. This means that perspectives are missing and that a geographical balance was not achieved. The study's ambitions to perform a large-scale mixed-methods project were challenged by the fact of the study taking place in the run-up to Youth and Senior competitions, which limited the time that coaches had available for interview. While the IFSC's official language of communication is English, language barriers may have been an issue for respondents. The project's mixed-methods approach meant that both sets of data might have been analysed in greater detail considered on their own. The researcher also realised in retrospect that further questions about the amount of time spent in the TDE would have provided more accurate insights into practices. Finally, the single biggest limitation of the study was the researcher's own lack of experience with statistical data, which posed challenges of interpretation.

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