

Analysis of training methodologies in the development of the physical capacities of young male soccer players: case studies in Portugal and the United Kingdom

Diogo Rodrigues Monteiro

Porto, 2026

U.PORTO

FACULDADE DE DESPORTO
UNIVERSIDADE DO PORTO

Analysis of training methodologies in the development of the physical capacities of young male soccer players: case studies in Portugal and the United Kingdom.

Dissertation presented to obtain the 2nd cycle in Sport Training, specialization in High Performance Training, from the Faculty of Sport of the University of Porto, under the terms of Decree-Law no. 74/2006, of March 24, in the wording given by Decree -Law No. 65/2018 of August.

Supervisor: José Afonso, Ph.D.

Co-supervisor: Ana Ramos, Ph.D.

Diogo Rodrigues Monteiro

Porto, 2026

Ficha de Catalogação

Monteiro, D. R. (2026). *Analysis of training methodologies in the development of the physical capacities of young male soccer players: in Portugal and the United Kingdom*. Master's Dissertation for obtaining the Second Cycle in Sports Training, specialization in High Performance Training, presented to the Faculty of Sport of the University of Porto.

Keywords: YOUTH FOOTBALL; PHYSICAL CAPACITIES; STRENGTH AND CONDITIONING; MICROCYCLE PROGRAMMING; QUALITATIVE CASE STUDY.

ACKNOWLEDGEMENTS

The conclusion of this thesis represents the culmination of a long, demanding, and profoundly enriching journey that would not have been possible without the support, availability, and contribution of various people and institutions. First and foremost, I express my sincere gratitude to my advisor, Professor José Afonso, for his guidance, scientific rigor, availability, and critical spirit demonstrated throughout this entire process. His suggestions, questions, and high standards were essential for the development of this work and for my academic and professional growth. I also thank my co-advisor, Professor Ana Ramos, for her availability, guidance, and contributions during the different phases of the thesis. Her attention to detail and observations were important in improving the quality and coherence of this work. I am grateful to SC Braga and Bradford City AFC for their openness and the opportunity to develop this research within their training environments. Access to their academies allowed me to understand different realities, observe various organizational approaches, and deepen my understanding of the development of physical capabilities in U-19 players. To the coaches and professionals who participated in the study, I extend my heartfelt thanks for their availability, trust, and generous sharing of their experiences, knowledge, and professional practices. The richness of their testimonies formed the foundation of this research and made it possible to understand, in greater depth, the decisions and challenges present in daily work at football academies. To all the teachers, colleagues, and professionals with whom I had the opportunity to learn and work throughout my academic and professional journey, I thank you for the lessons, sharing, and challenges that contributed to shaping the person and professional I am today. To my family, I deeply thank you for your unconditional support, patience, understanding, and encouragement throughout this entire journey. In moments of greatest difficulty, you were my main support and the motivation needed to continue. To my friends and all the people who, in some way, were present during this stage, I thank you for your friendship, support, and words of encouragement. Every gesture, conversation, and moment of relaxation was important along this path. Finally, I thank everyone who

contributed, directly or indirectly, to the realization of this thesis. This work represents not only an academic achievement but also the result of a learning, growth, and overcoming journey that I will carry with me into the future.

“Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating process, giving birth to evolution.” – Albert Einstein
(Cosmic Religion and Other Opinions and Aphorisms, 1931)

INDEX

ACKNOWLEDGEMENTS **V**
LIST OF FIGURES **IX**
LIST OF TABLES **XI**
ABSTRACT **XIII**
RESUMO **XV**
ABBREVIATIONS **XVII**
1. INTRODUCTION **1**
1.1 Study Aims 5
1.2 Dissertation structure 5
2. LITERATURE REVIEW **9**
2.1. Scope & Focus 9
2.2 Under-19 Match Demands – What should be expressed 10
2.3. Strength & Power – What theory prescribes and how practice adapts 12
2.4 Speed, Braking/Change of Direction & Reactive Agility – From mechanics to context 13
2.5 Seasonal Timing – Where the contents live across the season 14
2.6 Monitoring – The hinge between plan and execution 16
2.7 Synthesis — Where theory & practice meet and diverge 18
3. METHODOLOGY **23**
3.1 Study design 23
3.2 Context and participants 23
3.2.1 Clubs & teams 23
3.2.2 Strength & conditioning coaches 24
3.3 Data collection 26
3.4 Data analysis 26
3.5 Trustworthiness 27
4. RESULTS **31**
4.1. Macro framing: philosophy, intentions, and organisational structure 32
4.2. Weekly microcycle architecture: the weekly backbone for developing physical capacities 35
4.2.1. Planning horizon and weekly anchors 35
4.2.2. Content distribution by physical capacity 36
4.2.3. In-week adjustments: rules, conditional non-negotiables, and decision triggers 37
4.2.4. Compensatory work and exposure equalisation 37
4.3. Data/signals and micro-decisions: how the week is regulated 38
4.4. Individualisation infrastructure: assessment, profiling, and decision rules 40
4.4.1. Profiling systems and assessment moments 40
4.4.2. Flagging criteria and decision rules 41
4.4.3. Translating profiles into intervention: individual plans, progressions, and staged return 42
5. DISCUSSION **45**
5.1. Macro framing: philosophy, intentions and organisational structure 46
5.2. Weekly microcycle architecture for developing physical capacities 47

5.3. Data/signals and micro-decisions: from monitoring to actionable regulation 50
5.4. Individualisation infrastructure: assessment, profiling and decision rules 52
5.5. Provisional integrative model of physical programming in two U-19 academy cases 54
5.6. Limitations 57
5.7. Practical applications 57
5.8. Future research 58
6. FINAL CONSIDERATIONS 63
7. REFERENCES 67
8. Appendix 79
Informed Consent Term (portuguese version delivered to players) 79
Interview Guide 80

LIST OF FIGURES

Figure 1. Themes and subthemes that emerged from data..... 31
Figure 2. Provisional model of U-19 physical programming 55

LIST OF TABLES

Table 1 Seasonal timing according to theory. 15
Table 2 Testing battery and practical use 17

ABSTRACT

This study aimed to examine how two U-19 academy coaches, working in Portugal and the United Kingdom, planned, regulated and individualised the development and maintenance of players' physical capacities throughout the season, as well as the contextual factors influencing their decisions. An exploratory qualitative design comprising two case studies was conducted at SC Braga and Bradford City AFC. Two semi-structured interviews were completed with the coach responsible for physical preparation in each academy. Interviews were transcribed verbatim, translated into English when required and analysed thematically through within-case analysis and cross-case comparison. Credibility was supported through member checking, critical-friend dialogue and an audit trail of analytical decisions. Four interconnected dimensions were identified: macro framing, weekly microcycle architecture, data, signals and micro-decisions, and individualisation infrastructure. Both coaches prioritised robustness for acceleration and deceleration actions and regular maximal sprint-speed exposure, although the UK coach emphasised athletic development, whereas the Portuguese coach prioritised player availability and load tolerance. The match-day-relative microcycle functioned as the main organisational and regulatory unit. Monitoring informed adjustments to training dose and content, while individualisation was embedded within the collective programme through profiling, compensatory work, targeted interventions and progressive exposure. In both cases, physical programming emerged as a dynamic and situated process shaped by coaching intentions, contextual constraints, available information and professional judgement. The findings illustrate how coaches used the microcycle to preserve key physical priorities while adapting training to weekly demands and individual player needs.

Keywords: YOUTH FOOTBALL; PHYSICAL CAPACITIES; STRENGTH AND CONDITIONING; MICROCYCLE PROGRAMMING; QUALITATIVE CASE STUDY.

RESUMO

Este estudo analisou como dois treinadores de academias U-19, em Portugal e no Reino Unido, planearam, regularam e individualizaram o desenvolvimento das capacidades físicas dos jogadores ao longo da época. Foi adotado um desenho qualitativo exploratório, com dois estudos de caso realizados no SC Braga e no Bradford City AFC. Foram conduzidas duas entrevistas semiestruturadas com cada treinador responsável pela preparação física. As entrevistas foram transcritas, traduzidas quando necessário e submetidas a análise temática, combinando a análise individual dos casos com a comparação entre ambos. A credibilidade foi reforçada através da validação pelos participantes, do diálogo com critical friends e do registo das decisões analíticas. Foram identificadas quatro dimensões interligadas: enquadramento macro, arquitetura semanal do microciclo, dados, sinais e microdecisões, e individualização. Ambos os treinadores priorizaram a robustez para ações de aceleração e desaceleração e a exposição regular à velocidade máxima. O treinador britânico enfatizou o desenvolvimento atlético, enquanto o português priorizou a disponibilidade e a tolerância à carga. O microciclo constituiu a principal unidade de organização e regulação, enquanto a monitorização apoiou ajustes no treino e a individualização foi integrada no programa coletivo através de perfis, trabalho compensatório e intervenções específicas. Em ambos os casos, a programação física surgiu como um processo dinâmico, moldado pelas intenções dos treinadores, pelos constrangimentos contextuais, pela informação disponível e pelo julgamento profissional, permitindo preservar prioridades físicas e adaptar o treino às exigências semanais e individuais.

Palavras-chave: FUTEBOL JUVENIL; CAPACIDADES FÍSICAS; FORÇA E CONDICIONAMENTO; PROGRAMAÇÃO DE MICROCICLOS; ESTUDO DE CASO QUALITATIVO.

ABBREVIATIONS

Acc/Dec — Accelerations/decelerations

AFC — Association Football Club

CMJ — Countermovement jump

COD — Change of direction

CR-10 — Category-ratio 10 scale

CSCS — Certified Strength and Conditioning Specialist

EFL — English Football League

GNSS — Global Navigation Satellite System

GOD — Gabinete de Otimização Desportiva / Sports Optimization Office

HR — Heart rate

HSR — High-speed running

IFT — Intermittent Fitness Test

ILP/ILPs — Individual Learning Plan(s)

IPVC — Instituto Politécnico de Viana do Castelo

IR1 — Intermittent Recovery Level 1

IT — Information technology

KSCA — Karnataka State Cricket Association

LSI — Limb symmetry index

MAS — Maximal aerobic speed

MD — Match day

MD-x — Match day minus x (e.g., MD-4, MD-1)

MSS — Maximal sprint speed

ROM — Range of motion

RPE — Rating of perceived exertion

S&C — Strength and conditioning

s-RPE — Session rating of perceived exertion

SC — Sporting Clube

SSG — Small-sided games

U-16 — Under-16

U-19 — Under-19

UK — United Kingdom

VBT — Velocity-based training

VIFT — Final velocity reached during the 30-15 Intermittent Fitness Test

Yo-Yo — Yo-Yo Intermittent Recovery Test

CHAPTER 1 - INTRODUCTION

1. INTRODUCTION

Athleticism is critical for success across all sports (Sattler et al., 2015). It encompasses physical skills like strength, speed, agility, endurance, and ROM, which are all crucial for optimal performance (Sporis et al., 2010). Developing and maintaining athleticism is vital, as it affects the player's ability to execute technical movements effectively (Lloyd et al., 2015) and to fulfill the match's tactical requirements. This is partly achieved through Strength & Conditioning (S&C) programs, speed and agility training, and range of motion (ROM) training (Faigenbaum et al., 2016). Emphasis on different aspects of athleticism may vary by sport, highlighting the need to tailor training programs to meet each player's and discipline's specific needs (Lloyd et al., 2016).

S&C training programs tailored to soccer usually focus on building overall strength, power, and muscular endurance, which are essential for sustaining performance throughout a match (Silva et al., 2016). Training protocols including strength and plyometric exercises have shown improvements in strength and power in young soccer players (Oliver et al., 2024; Martín-Moya et al., 2023). Speed and agility training in soccer is crucial for improving acceleration, deceleration, and change of direction, which are key components of agility (Jeffreys, 2013). However, much of what is traditionally considered agility training often of pre-programmed change of direction (COD) drills, which represent only a subset of agility — agility also involves reactive components and decision-making in dynamic environments (Sheppard & Young, 2006; Nimphius et al., 2018; Trajković et al., 2020). ROM can be enhanced to a similar extent through strength training or stretching, with meta-analytical evidence indicating comparable improvements when training is performed through full joint ranges (Afonso et al., 2021; Alizadeh et al., 2023). Additionally, programming for recovery, such as incorporating appropriate rest periods and active recovery sessions, is essential for maintaining players' physical readiness and preventing performance decline during the competitive season (Leeder et al., 2012; Nédélec et al., 2013). These multifaceted approaches contribute to the holistic development of soccer players, enhancing their physical capacities and performance on the field.

At the core of a multifaceted approach lie the principles of S&C which serve as the foundation for enhancing physical capabilities, potentially reducing injury risks, and maximizing overall athletic potential (Bompa & Haff, 2009; Mujika & Padilla, 2003). Within it, planning, programming, and evaluating are three fundamental concepts. The first step is planning, tailored to individual player profiles, positional demands, and team objectives. Personalized planning for young soccer players should consider age, biological maturation, and injury history (Mujika & Padilla, 2003). Effective programming follows, organizing training systematically to attempt to optimize performance and prevent overtraining and undertraining (Issurin, 2010). Ongoing evaluation and control mechanisms are essential for monitoring progress and adjusting plans; however, claims about mitigating injury risk should be interpreted cautiously, as evidence often based on proxy/surrogate outcomes rather than actual injury data (Stone et al., 2004; Afonso et al., 2025).

A pivotal dichotomy within S&C methodologies is the balance between integrated and analytical training approaches. Integrated training aims to replicate real match scenarios by merging various fitness components, technical skills, and tactical awareness within dynamic environments (Carling, Le Gall, & Dupont, 2012; Bangsbo, 2014). Conversely, analytical training drills down into specific skill sets, fostering mastery through focused exercises (Reilly & Gilbourne, 2003; Bloomfield et al., 2007). In practice, these approaches often intersect, creating a continuum that combines the holistic development of integrated training with the precision of analytical methods. For example, in elite soccer training, there's a blend of integrated and analytical methods. This means that while players engage in team-oriented exercises replicating real match scenarios, they also undergo individual sessions focusing on specific skills. Thus, it is a balance between simulating match situations and refining technical abilities with precision.

This dynamic interplay extends beyond training methodologies and encompasses the individual-collective continuum. While collective training fosters team cohesion, strategic understanding, and effective communication on the field (Carron et al., 2002; Hill-Haas et al., 2011), individualized approaches

acknowledge each player's unique needs and strengths. Navigating this continuum requires a nuanced understanding of how collective training enhances team dynamics while also recognizing the importance of individual development within the team framework (González-Víllora et al., 2015). For example, a team engaging in group drills to synchronize their passing and movement patterns, enhancing their collective match play. Meanwhile, individual players might work on their dribbling technique or defensive positioning during extra sessions. This combination of team-oriented training and individual skill development is vital for optimizing both team cohesion and player performance on the field, essential for success in soccer matches.

Given the positional heterogeneity and the constrained weekly schedule typical of academy soccer, S&C staff often individualise within a collective framework—adjusting exercise selection, volume/intensity, and supplementary drills to address player-specific needs while preserving team priorities (Haff & Triplett, 2016; Clemente et al., 2021; Clemente et al., 2022; Mujika, 2017). In practice, this can take the form of targeted strength/power or speed/CoD micro-doses allocated to players flagged by profiling or match exposure, while the squad completes a shared core programme (González-Víllora et al., 2015).

The development of young players is a multifaceted process that extends beyond physical capabilities. Young athletes undergo various stages of growth, each characterized by distinct physiological, psychological, and social changes that influence their training needs and developmental pathways (Lloyd et al., 2014; Malina et al., 2004). Developmental frameworks emphasise that training should be age-appropriate and aligned with biological maturation, balancing long-term development with immediate performance demands (Bailey et al., 2010; Côté et al., 2007). In the present thesis, these developmental considerations are treated as contextual constraints that shape how physical capacities are programmed within U-19 squads. By understanding and implementing stage-specific training approaches, coaches can better prepare young athletes for the demands of professional soccer while fostering their overall development (Ford et al., 2011).

Reconciling theoretical prescriptions with what coaches can implement is central in academy soccer. In U-19 contexts, pragmatic constraints — school schedules, access to facilities and suitable surfaces, staff/time budgets, the presence or absence of live Global Positioning System/force-platforms, and fixture congestion — frequently open a gap between the “ideal” described in the literature and the “possible” at microcycle level. Observational and conceptual analyses therefore recommend examining how principles are operationalised on the ground and which decision rules are applied (Kiely, 2018).

Typical adaptations reported in academies include: (i) a short planning horizon centred on the microcycle with relatively stable anchors (e.g., Match Day-4 field-based strength/acc–dec; MD-2 speed/Maximal velocity exposures; MD-1 reactivity) (Buchheit et al., 2024; Oliva-Lozano et al., 2022); (ii) prioritisation of minimum-effective dosing to preserve neuromuscular quality — e.g., 1–2 weekly strength/plyometric exposures with low velocity loss (~10–20%) and weekly exposures to maximal sprint velocity — to address the differential transfer of gym vs sprint work (Oliver et al., 2024; Behm et al., 2025); (iii) data-light monitoring when live GNSS is unavailable, using day-type profiles and historical $m \cdot min^{-1}$/position values to estimate load and to adjust set/area/duration at session design (Ravé et al., 2020; Marynowicz et al., 2020); and (iv) individualisation embedded within the team day — e.g., brief Individual Learning Plans windows on MD-4 or minute-based top-ups for players with limited match exposure — preserving collective structures while addressing specific needs. These pragmatic mechanisms are the lens through which the present cases are described.

Within the competitive calendar, transitional phases (pre-season and scheduling windows) are used to (re)establish physical capacities and address identified weaknesses before stabilising weekly routines during in-season periods (Gabbett, 2016). The study treats these windows descriptively, focusing on how coaches report sequencing and dosing work across the season. These choices are elaborated in the Results section, where coaches detail microcycle anchors (MD-4/MD-2/MD-1), dosing rules, and embedded individualisation.

Accordingly, this thesis analyses two real-world cases to document what is implemented, where it departs from theory, and the reasons coaches report for their interventions. By comparing two academy contexts in different countries, the study characterises how coaches report organising the development of physical capacities in U-19 squads and the rationales they offer for their decisions. The contribution is descriptive and interpretative: it contrasts reported methods and decision rules with the theoretical base synthesised in the review, noting points of alignment and divergence that can inform future applied research. It does not test effectiveness or propose universal “best practices”.

1.1 Study Aims

This study aimed to investigate the training methodologies employed by the technical staff of two young soccer teams, one in Portugal and another in the United Kingdom, with a focus on developing and maintaining players' physical capacities throughout the season to prevent performance decline.

The specific objectives of this study were: document and analyse the opinions and practices of the coaches from the teams under investigation; investigate the training approaches adopted by these coaches, including the strategies employed to maintain and enhance physical capacities during the season; examine the contextual factors influencing coaches' decisions regarding player physical training, including aspects such as club culture; provide insights into the physical development of young soccer players and the strategies used by coaches to optimize team performance.

1.2 Dissertation structure

The thesis was structured into several sections. It began with the introduction, which established the general context of the study and highlighted its importance and relevance in the field. This section addressed three main components: the rationale, the general aim of the study — clearly defining the

central purpose of the research — and the structure of the dissertation, providing an overview of how the work was organised and briefly describing the content of the subsequent sections.

Next, the literature review critically analysed existing scholarship, addressing relevant concepts, theories, and previous studies related to the topic. This section situated the study within the academic context and identified gaps in the literature that the present work sought to address.

The methodology section described the procedures used to conduct the study. Rather than listing subsections, it presented a coherent narrative that explained the study design and the context in which it occurred, outlined who participated (including the clubs, teams, and strength & conditioning coaches), detailed how data were gathered, and explained how they were analysed. It also reported the strategies adopted to enhance trustworthiness and ensure the credibility and plausibility of the interpretations.

The results section presented the main findings, foregrounding participants' perceptions and experiences. It reported the data without advancing interpretative claims, using illustrative quotations and, where helpful, concise tables to summarise themes and subthemes.

In the discussion section, the findings were examined considering the existing literature. This section explored the meaning and implications of the results — both theoretical and practical — and acknowledged the study's limitations, outlining constraints encountered and indicating directions for future work.

The conclusion closed the thesis by synthesising the principal points, reaffirming the relevance of the study, and highlighting its contributions to the field.

Finally, the references were presented, listing all sources consulted and cited throughout the work in accordance with current academic standard.

CHAPTER 2 – LITERATURE REVIEW

2. LITERATURE REVIEW

2.1. Scope & Focus

This review addresses the development of physical capacities deemed relevant in U-19 soccer that can be directly implemented and controlled by the technical staff, therefore excluding recovery/sleep topics, which may fall under the responsibility of different professionals. We start by exploring the demands of the game (what needs to be expressed), then move to the means of training that underpin those demands (strength/power; speed; braking/COD vs. reactive agility), (iii) seasonal timing (when contents are placed in pre-season vs. in-season microcycles), and (iv) monitoring as the hinge that connects prescriptions to day-to-day programming. For each theme, we first summarise what theory prescribes—priorities, methods and rationale—then synthesise how practice has implemented those prescriptions in applied studies, foregrounding barriers that explain divergences. (Oliver et al., 2024; Ramírez-Campillo et al., 2023; Lee et al., 2024; Ravé et al., 2020; Oliva-Lozano et al., 2022; Marynowicz et al., 2020).

A central premise guiding this review is that a gap frequently emerges between the “ideal” (theoretical prescriptions) and the “possible” (what coaches can implement) in academy contexts. Pragmatic constraints — calendar volatility (congestion, postponements), limited contact time (school timetables), technology and facility access (e.g., lack of live-GNSS, force plates; pitch dimensions/surface), and staff/time budgets—shape short-horizon, microcycle-centred decision-making. Consequently, coaches often rely on day-type templates, embedded individualisation (e.g., brief ILP windows/top-ups), and data-light monitoring (day-type profiles; metres·min^{-1} by position) to approximate theoretical targets while preserving match readiness. This operational lens—how principles are translated under constraints—anchors the comparisons made throughout the chapter (Kiely, 2018; Reilly & Gilbourne, 2003).

Within that lens, the literature converges on several pragmatic guidelines that help to organise and interpret the data: microcycle anchors (e.g., MD-4 field-based strength/acc–dec; MD-3 volume/HSR; MD-2 MSS/MSS exposures; MD-1 reactivity), minimum-effective dosing for strength/plyometrics (≈ 1–2 exposures/week with low velocity loss ~10–20%), and regular maximal sprint speed (MSS) exposures (≥1–2/week) to complement gym-based work. When technology is limited, consistent thresholds and simple readiness trends (e.g., CMJ) support decision-making. In parallel, we acknowledge measurement gaps beyond locomotor metrics — e.g., perception–decision–action demands and qualitative braking technique — which complicate "ideal" targeting and are revisited in §1.2. (Lee et al., 2024; Harper et al., 2022; Ravé et al., 2020; Oliva-Lozano et al., 2022; Buchheit et al., 2024; Oliver et al., 2024; Behm et al., 2025; Marynowicz et al., 2020).

2.2 Under-19 Match Demands – What should be expressed

U-19 match play approaches adult profiles in running volume and intensity and is characterised by intermittent work with repeated accelerations, decelerations, and short sprints. The cumulative neuromuscular (eccentric) solicitation is high, making braking robustness and the ability to repeat short-burst efforts central to performance across 90 minutes (Harper et al., 2022; Oliva-Lozano et al., 2022).

From a practical standpoint, U-19 match demands require players to tolerate (i) mixed metabolic and mechanical loads (total distance/HSR alongside dense acceleration–deceleration sequences), (ii) repeated exposures to near-maximal sprinting that support match-relevant speed actions, and (iii) frequent braking and re-acceleration events that increase eccentric load. This profile helps justify weekly designs that rehearse both HSR/maximal sprint speed (MSS) exposure and high acceleration/deceleration densities without abrupt spikes (Harper et al., 2022; Oliva-Lozano et al., 2022; Ravé et al., 2020).

Analyses of worst-case scenarios (1–5-min peaks) show density patterns like adult soccer, reinforcing the importance of preparing players not only for

match averages but also for peak passages of play (Harper et al., 2022; Oliva-Lozano et al., 2022).

In applied research, external load via GNSS/inertial sensors typically includes total distance, HSR (absolute or individualised thresholds), sprint distance/efforts (often MSS-based), and acc/dec (counts and metres). Internal load commonly combines heart rate and session-RPE to contextualise exposure. Intra-squad consistency of thresholds is essential for week-to-week comparability; cross-study comparison is complicated by device/protocol differences, hence the emphasis on within-team trends and day-type profiles. Peak-window reporting (e.g., rolling 1–5-min) complements totals by indexing intensity (Ravé et al., 2020; Marynowicz et al., 2020; Oliva-Lozano et al., 2022).

Several decisive demands are not fully captured by locomotor metrics: (i) the perception–decision–action elements of reactive agility; (ii) the quality of deceleration and change-of-direction mechanics (foot strike, angles, penultimate step, stiffness), beyond mere counts; (iii) contact/duel load and contest intensity; and (iv) the micro-transition profile (very brief, chaotic sequences) that stresses coordination and robustness. These gaps explain why coaches often triangulate information using SSG manipulation, technical coaching cues, video tagging, and simple readiness trends to infer whether the match-relevant capacities are being expressed, particularly when live-GNSS or force-diagnostics are unavailable (Lee et al., 2024; Harper et al., 2022; Reilly & Gilbourne, 2003).

If the game taxes braking capacity and short-burst speed, the training spine must develop both force production/absorption and locomotor qualities. We therefore transition from what must be expressed (this section) to what builds it — first, strength & power (Section 2.3), then speed and COD vs reactive agility (Section 2.4).

2.3. Strength & Power – What theory prescribes and how practice adapts

Theoretical and meta-analytic work supports multi-joint resistance training and plyometrics, alone or combined, to improve maximal strength, vertical/horizontal jump, acceleration and COD in youth soccer players; effects on maximal sprint speed are typically smaller, hence speed work remains a separate necessity (Oliver et al., 2024; Ramírez-Campillo et al., 2023). When well dosed, plyometrics are safe and effective for speed-strength and jump indices; recommended progressions prioritise volume → intensity and explicit landing technique. In youth, a pragmatic minimum effective dose clusters around ≥4 weeks (≥8 sessions) and ≈90–100 foot-contacts/week (Ramírez-Campillo et al., 2023).

Velocity-based training (VBT) is supported as a self-regulation tool: maintaining low velocity loss (~10–20%) within sets preserves repetition quality and yields outcomes comparable to fixed-percentage prescriptions; when devices are unavailable, maximal intent and low-loss heuristics are accepted surrogates (Behm et al., 2025; Sekulović et al., 2024). In-season, 1–2 weekly strength/plyometric exposures with moderate volumes and low velocity loss help maintain neuromuscular qualities without compromising match readiness (Behm et al., 2025; Oliver et al., 2024). Full-range strength work can also improve joint mobility to an extent comparable to stretching, enabling an integrated approach without lengthy separate mobility blocks (Afonso et al., 2021; Alizadeh et al., 2023).

Applied studies describe in-season patterns of 1–2 gym exposures/week anchored away from match day (e.g., higher-magnitude work at MD-4; brief neural micro-doses later). Contents are typically multi-joint patterns(squat/hinge/push/pull/lunge), ballistics (jumps/throws) and plyometric blocks progressed from volume to intensity. Where VBT is scarce, staffs use effort intent, simple readiness checks (e.g., CMJ trend) and conservative set–rep schemes to modulate dose (Oliver et al., 2024; Behm et al., 2025; Ramírez-Campillo et al., 2023). Barriers that explain divergence from ideal prescriptions include device access (VBT, force platforms), calendar congestion, staff/time constraints, and facility/surface availability — all of which

promote pragmatic substitutions while preserving theoretical logic (Kiely, 2018; Reilly & Gilbourne, 2003).

Strength & power provide the capacity for force production and absorption; translating that capacity to the pitch requires targeted work on speed and direction-change, with a precise distinction between pre-programmed COD and reactive agility. In applied academy settings, prescriptions are moderated by device access (VBT/force-diagnostics), calendar volatility and limited contact time. Consequently, staffs commonly: (i) anchor the highest-magnitude lower-body strength at MD-4; (ii) keep later-week gym work to brief neural "micro-doses"; (iii) privilege simple progression rules (volume → intensity; low velocity loss) over tightly individualised velocity zones; and (iv) use CMJ trends and technical landing cues to safeguard quality when technology is sparse. These patterns align with the microcycle narratives we analyse in the Results and help explain why 'combined' methods are preferred when time and space are constrained (Kiely, 2018; Reilly & Gilbourne, 2003; Oliver et al., 2024; Behm et al., 2025).

2.4 Speed, Braking/Change of Direction & Reactive Agility – From mechanics to context

Theory distinguishes COD — pre-programmed turning, braking or accelerating — from reactive agility, integrating perception–decision–action under uncertainty (Lee et al., 2024). Because deceleration produces high eccentric forces, technical coaching (angles, penultimate step, stiffness) and eccentric robustness are emphasised for both performance and risk management. (Harper et al., 2022). Manipulating space, player density, and rules in small-sided games (SSG) targets specific locomotor stimuli: larger relative areas and fewer constraints → more HSR/maximal sprint speed (MSS), whereas short, congested formats → higher acc/dec densities (Gómez-Álvarez et al., 2024). In standard one-match weeks, literature supports maximal sprint speed (MSS) exposures on MD-2 and brief reactive elements on MD-1, with COD

progressions (e.g., 30°→45°→90°→180°) earlier in the week (Oliva-Lozano et al., 2022; Buchheit et al., 2024; Harper et al., 2022).

Applied reports converge on ≥1 (preferably 2) maximal sprint speed (MSS) exposures/week, commonly at MD-2, via sprints and/or larger-space SSG; reactive tasks are kept brief close to match day, while small-space drills are used earlier to concentrate acc/dec without excessive volume (Oliva-Lozano et al., 2022; Gómez-Álvarez et al., 2024; Buchheit et al., 2024). Barriers to ideal implementation include timing-gate/GNSS access, pitch size/surface, weather, and limited contact time (e.g., school schedules), prompting reliance on SSG manipulation and competitive constraints as proxies for pure linear speed sessions (Reilly & Gilbourne, 2003; Kiely, 2018).

Having clarified what to train and how, the next step is when to place these contents across the year — pre-season versus in-season — and how weeks are typically structured. Max-velocity sessions depend on space, surface and timing-gate/GNSS availability; in many academies, large-area SSG or constrained games are used as proxies to create HSR/MSS exposure when linear sprint infrastructure or time is limited. Weather and pitch sharing further push MSS to MD-2, with COD/acc/dec concentrated earlier via small-space tasks. Close to match day, reactive elements are deliberately brief to respect freshness. These adjustments maintain the theoretical intent while respecting weekly realities, a pattern mirrored in the case data (Oliva-Lozano et al., 2022; Gómez-Álvarez et al., 2024; Kiely, 2018).

2.5 Seasonal Timing – Where the contents live across the season

Theory prescribes restoring and elevating physical capacities, integrating technical-tactical content, and progressively increasing session frequency, volume, and intensity according to squad profile; multicentre evidence links more pre-season sessions to lower in-season injury burden at elite level (Hannon et al., 2021; Lechner et al., 2023; Ekstrand et al., 2020). Youth studies show greater load variability in pre-season than in-season, warranting systematic monitoring to avoid abrupt spikes (Hannon et al., 2021). In U-19, 6–

8-week multicomponent programmes (strength/plyometrics + intermittent running/SSG) improve fitness markers compatible with entering the competitive phase (Lechner et al., 2023; Gómez-Álvarez et al., 2024).

In-season, the aim is to maintain/adjust capacities with sufficient load while tapering to the match; distribute speed/COD across the week and add position/game-plan-specific contents (Oliva-Lozano et al., 2022; Buchheit et al., 2024; Oliver et al., 2024; Lee et al., 2024).

Table 1 summarises the main theoretical distinctions between pre-season and in-season timing for U-19 programming.

Table 1 Seasonal timing according to theory.

Dimension	Pre-season	In-season
Primary objectives	Restore/elevate capacities; integrate technical-tactical; progressive volume/intensity (Hannon et al., 2021; Ekstrand et al., 2020).	Maintain/adjust with sufficient load and taper (Oliva-Lozano et al., 2022; Buchheit et al., 2024).
Priority physical contents	Strength/plyometrics; intermittent running/SSG; structured intro of COD, acceleration, braking (Lechner et al., 2023; Ramírez-Campillo et al., 2023; Gómez-Álvarez et al., 2024).	Maintenance doses of strength/plyometrics; distribute speed/COD per microcycle; position-specific (Oliver et al., 2024; Lee et al., 2024).
Typical weekly distribution	More sessions and volume early; later shift to specific intensity and microcycle simulation (Hannon et al., 2021; Lechner et al., 2023).	Peaks MD-4/MD-3; reductions MD-2/MD-1; MD-4 strength (acc/dec), MD-3 volume/HSR, MD-2 sprint, MD-1 reactivity (Oliva-Lozano et al., 2022; Buchheit et al., 2024).
Load monitoring	Implement/validate GNSS/inertial + s-RPE/HR; avoid acute spikes (Ravé et al., 2020; Hannon et al., 2021).	Integrate External load + Internal load to modulate volume/intensity and taper; account for microcycle duration (Marynowicz et al., 2020; Vardakis et al., 2024; Oliva-Lozano et al., 2022).
Risk/control	Progressions and control of acceleration/deceleration exposure (Ekstrand et al., 2020; Harper et al., 2022).	Manage congestion; prudent MD-2 sprint exposure; taper (Buchheit et al., 2024; Oliva-Lozano et al., 2022).

Applied studies mirror this allocation: pre-season blocks often combine 2–3 gym exposures/week with progressive SSG/running to reach game-specific intensities by weeks 5–6; in-season, weekly organisation frequently anchors MD-4 strength (acc/dec emphasis) → MD-3 volume/HSR → MD-2 MSS → MD-1 reactive, adjusted to microcycle length and fixture congestion (Oliva-Lozano et al., 2022; Hannon et al., 2021; Buchheit et al., 2024; Oliver et al., 2024). Barriers — fixture cancellations, two-game weeks, travel, and education schedules — reduce controllability of periodised plans, shifting emphasis from rigid periodisation to short-horizon programming guided by day-type templates (Kiely, 2018; Reilly & Gilbourne, 2003). Because calendar realities force frequent adjustments, monitoring becomes the practical hinge between plan and execution. Pre-season length, friendly availability and dual academic commitments vary widely; some squads cannot achieve “ideal” block lengths or session counts, and preparation must focus on reaching safe weekly intensities rather than exhaustive capacity building. In-season, postponements and two-match weeks routinely break long-range periodisation; coaches pivot to short-horizon programming using stable day-type anchors (MD-4/MD-3 peaks → MD-2 MSS → MD-1 reactivity), adjusting volumes according to microcycle length and recent exposures. The Results section provides concrete examples of this pivot (Kiely, 2018; Oliva-Lozano et al., 2022).

2.6 Monitoring – The hinge between plan and execution

External load via GNSS validly captures locomotor exposure and the mechanical cost of acc/dec, while internal load via s-RPE (often CR-10 × duration) and HR shows moderate-to-strong associations with external lod in youth, supporting cost-effective daily decision-making—even with variable microcycle duration (Ravé et al., 2020; Marynowicz et al., 2020; Vardakis et al., 2024). In elite youth, weekly load relates to match running metrics, supporting the peaks-to-taper distribution for match running. (Kanaras et al., 2024). Reviews also note gaps between coach-planned load and athlete-perceived load,

reinforcing daily s-RPE feedback as a corrective. (Inoue et al., 2022). Where technology is limited, studies show meaningful correlations between s-RPE parameters and GNSS variables (duration, distance, HSR, acc/dec), enabling external load + Internal load integration with constrained resources (Marynowicz et al., 2020; de Dios-Álvarez et al., 2023).

Assessments should be valid, reliable, and sensitive to seasonal change, with simple protocols and realistic resources. A practical window strategy is a pre-season broad baseline (jumps/hops; CMJ app/platform; 10–20 m sprints; COD 505; intermittent/aerobic), followed by in-season re-assessments centred on a reduced, sensitive core (e.g., CMJ, 10–20 m, 505) (Franceschi et al., 2023; Hannon et al., 2021; Asimakidis et al., 2025; Badby, 2025).

Table 2 summarises a testing battery commonly reported in academy practice and recent evidence, alongside its primary metrics.

Table 2 Testing battery and practical use

Domain	Preferred test	Primary metric(s)	Evidence (2020–2025) and typical academy use
Neuromuscular	CMJ (force platform / app)	Jump height; flight time; peak/mean propulsive output	Moderate-to-excellent reliability in U-19; apps (e.g., MyJump 2) valid/reliable vs force platforms; frequent use for rapid monitoring and in-season re-tests (Franceschi et al., 2023; Gençoğlu et al., 2023; Stafylidis et al., 2025; Asimakidis et al., 2024).
Unilateral function	Hop tests (single, triple, cross-over; LSI)	Distances; LSI (%)	Reliability/validity in youth supports use for return-to-sport and functional screening, variable routine use (Greenberg et al., 2020; Smiley et al., 2024; Asimakidis et al., 2024).
Speed (acceleration)	10–20 m sprints	0–10/0–20 m times	Strong evidence; very frequent use; standardised timing essential; integrate with MSS when resources permit (Lee et al., 2024; Altmann et al., 2026; Asimakidis et al., 2024).
Maximal sprint speed (MSS)	30–40 m with gates/GNSS	MSS ($km \cdot h^{-1}$)	Criterion validity at group level vs radar; frequent use with gates/GNSS; standardise device/protocol due to individual variability (Altmann et al., 2026; Asimakidis et al., 2024).

Change of direction (COD)	505 (traditional / modified)	Total time; asymmetry	Good evidence in youth; widely used; prefer dual-beam/corrections; standardise angles/instructions (Krolo et al., 2020; Skala et al., 2025; Asimakidis et al., 2024).
Intermittent / aerobic endurance	Yo-Yo IR1 or 30–15 IFT	Final distance / VIFT / estimated MAS	Robust evidence and common academy use; recommended as standard for seasonal re-tests (Grgic, 2019; Grgic, 2021; Kusuma et al., 2025; Smith et al., 2025; Asimakidis et al., 2024).

Across applied reports, a commonly adopted core is CMJ + 10–20 m sprints (± MSS) + 505 + Yo-Yo IR1/30–15 IFT, with outcomes interpreted alongside external load + internal load to differentiate adaptation vs transient fatigue and guide weekly adjustments (Asimakidis et al., 2024; Grgic, 2019; Grgic, 2021; Altmann et al., 2026; Krolo et al., 2020; Ravé et al., 2020; Marynowicz et al., 2020; Kanaras et al., 2024).

Live-GNSS is not universally used in U-19; many programmes rely on post-session GNSS summaries plus daily s-RPE and simple wellness check-ins to triangulate load. Re-testing windows are scarce during congested periods, favouring a reduced, reliable core (CMJ; 10–20 m; 505) and within-team thresholds over cross-team benchmarking. In resource-constrained settings, metres·min^{-1} by exercise and position, updated iteratively, act as a “quasi-live” estimator to steer set/space/duration decisions on the day. These practices will frame the interpretation of the present case (Marynowicz et al., 2020; Ravé et al., 2020; Asimakidis et al., 2024; Lee et al., 2024).

2.7 Synthesis — Where theory & practice meet and diverge

There is robust consensus that strength/plyometrics/combined methods improve strength, jumps, acc- youth; applied studies implement these via multi-joint patterns, ballistic work, and plyometric blocks earlier in the week in-season (Oliver et al., 2024; Ramírez-Campillo et al., 2023). The COD vs reactive agility distinction is reflected operationally: analytical COD progressions mid-week and brief reactive elements near match day (Lee et al., 2024; Harper et al., 2022; Buchheit et al., 2024). A recurring weekly template is MD-4/MD-3

peaks → MD-2 maximal sprint speed (MSS) → MD-1 reactive (Oliva-Lozano et al., 2022; Buchheit et al., 2024; Douchet et al., 2024).

Divergences most often follow resource constraints (VBT/force-plate access), limited time with players (school schedules), calendar volatility (congestion, postponements), surface/weather, and staff capacity. These conditions favour short-horizon programming, day-type templates, and constraint-led task design, preserving the logic of the literature adapting execution (Kiely, 2018; Reilly & Gilbourne, 2003).

In academy environments, staff often protect a small set of non-negotiables that survive calendar volatility and resource limits. First, they often stabilise day-type anchors (MD-4/MD-3 peaks → MD-2 MSS → MD-1 reactivity) and then scale dose rather than sequence when weeks shorten or congest. Second, they often seek to secure weekly non-negotiables — ≥1–2 MSS exposures and 1–2 neuromuscular (strength/plyometric) exposures—because these carry the clearest transfer to match-relevant locomotor qualities and can be delivered with minimal equipment when required. Third, individualisation is often embedded as micro-windows (ILPs/top-ups) within team sessions, prioritising players with the largest gaps. Fourth, decision-making often relies on data-light guardrails — within-team thresholds, metres·min^{-1} by exercise/position, session-RPE, simple readiness trends (e.g., CMJ) — to steer set/space/duration in real time or near-real time when live technology is unavailable. Finally, constraints may be leveraged pedagogically via SSG manipulation and competitive tasks to elicit HSR or Acc/Dec densities when linear sprint infrastructure, space or time is limited. These steps preserve the theoretical intent while reducing dependence on technology or long contact blocks (Kiely, 2018; Reilly & Gilbourne, 2003; Oliva-Lozano et al., 2022; Gómez-Álvarez et al., 2024; Oliver et al., 2024; Behm et al., 2025; Marynowicz et al., 2020; Ravé et al., 2020).

Through this lens, divergence from ideal prescriptions reflects rational adaptation rather than non-compliance: where technology is rich, more granular targets (e.g., velocity bands, neuromarker checkpoints) can be pursued; where it is sparse, coaches prioritise sequence fidelity (keeping anchors) and quality heuristics (low velocity loss; technical execution) over precision dosing. In both

scenarios, the quality of weekly micro-decisions — how anchors, non-negotiables and guardrails are combined — determines how closely practice approximates theory (Buchheit et al., 2024; Lee et al., 2024; Harper et al., 2022; Asimakidis et al., 2024; Altmann et al., 2026).

Taken together, the literature suggests that the quality of weekly decisions under constraints — rather than strict adherence to idealised planning — governs how theory is realised. This perspective explicitly links the review to the microcycle-centred, constraint-aware results analysed in this thesis.

CHAPTER 3 - METHODOLOGY

3. METHODOLOGY

3.1 Study design

This study adopted an exploratory qualitative design to describe how U-19 coaches organised the development of physical capacities in real-world contexts. In line with recommendations for exploratory work in sport and exercise science, the study prioritised generating practice-relevant understanding of what is done, how, and why, rather than testing causal effects or predefined hypotheses (Ditroilo et al., 2025).

A qualitative interpretive approach was used to understand coaches' experiences and decision-making from their perspective, recognising that programming choices are shaped by contextual constraints and organisational cultures (Nelson et al., 2025; Lincoln & Guba, 1985).

3.2 Context and participants

3.2.1 Clubs & teams

The selection of Bradford City AFC and SC Braga was based on convenience sampling, insofar as access to these environments and their lead U-19 physical-preparation coaches was feasible within the project timeframe. Convenience was complemented by purposive criteria: both clubs have established youth-development pathways and organisational infrastructures that support systematic physical preparation, making them information-rich cases for examining planning, programming and evaluation practices in U-19 football (Sarstedt et al., 2018; Ramos et al., 2021).

Bradford City AFC, a club with a long-standing history in English football, has prioritised youth development through its academy, which has been categorised as an EFL Category Three academy since 2014. The academy was designed to support the development of players from age six to eighteen, with the aim of promoting them into professional football. Over the years, Bradford's

academy has helped develop talents like Fabian Delph and Dean Furman, who progressed to have successful professional careers. Bradford City continues to invest in its academy, which plays a key role in the club's broader strategy to develop homegrown players.

Similarly, SC Braga is widely recognised in Portugal for its robust investment in youth development, having obtained a five-star classification in the Portuguese Football Federation's Academy Certification since 2019. The club's modern training facilities, inaugurated in 2017, include seven football pitches and specialised spaces for physical conditioning, designed to support the development of youth players. SC Braga has a proven track record of producing elite talent, with players like Trincão and Pedro Neto advancing through its ranks to join top clubs in Europe. Between 2017 and 2023, SC Braga promoted 36 players to its first team, emphasising the club's ongoing success in developing young talent.

Both clubs were therefore appropriate case settings to study how coaches plan, programme and evaluate the development of physical capacities in U-19 squads.

3.2.2 Strength & conditioning coaches

The Bradford City AFC Strength and Conditioning (S&C) coach brings a unique blend of sports science and engineering expertise to his role. Raised in Mysore, India, he developed a passion for sports early on, participating in disciplines such as cricket and bodybuilding. His career initially began in the IT industry after completing a degree in Computer Science and Engineering in 2008. However, his deep interest in bodybuilding led him to transition into sports science, obtaining his Certified Strength & Conditioning Specialist (CSCS) certification in 2015. His practical experience started with the Karnataka State Cricket Association (KSCA), where he developed training programs for fast bowlers, focusing on workload management and recovery. He further honed his skills at the National Cricket Academy, working with national teams and tournaments like the Duleep Trophy. By 2018, he was leading the training for

KSCA’s Elite Men’s team, introducing innovative methods such as the "High Force - High Velocity with French Contrast Sequencing Method." This approach elevated athletic performance through precise measurements and tailored training. In 2023, he joined Bradford City AFC as the coordinator of the Sports Optimization Department and S&C coach for the U-19 team. His analytical background in engineering complements his sports science expertise, allowing him to design data-driven training programs that maximize player development. His continuous pursuit of specialized training, including courses at the Barça Innovation Hub and National Cricket Academy, ensures he stays at the forefront of sports science innovations. This interdisciplinary approach, combining practical coaching experience with a passion for science-based training, makes him an invaluable asset in nurturing young athletes at Bradford.

The SC Braga S&C coach, a native of Braga, Portugal, has built his career on a strong foundation in sports and exercise physiology. Engaged in sports from the age of five, he participated in a variety of activities including soccer, swimming, cycling, and athletics. His early exposure to multiple sports helped him understand the tailored demands of different athletic disciplines, driving his pursuit of a sports-focused education. After completing his secondary education, he enrolled in the Sports and Leisure program at the Polytechnic Institute of Viana do Castelo (IPVC) in 2016. Initially exploring career options as a soccer coach and personal trainer, his interests evolved towards the physical preparation of high-performance athletes. During his master's studies in Sports Training, he gained practical experience as an exercise physiologist with SC Braga's U-16 team, followed by a role with Grupo Desportivo de Chaves, where he helped the club earn promotion to Portugal’s first division. In 2023, the SC Braga coach returned to his hometown club to work in the Sports Optimization Office (GOD), applying his expertise in strength and conditioning to develop the club's youth athletes. His commitment to professional development is evident through the numerous courses he has completed, including specialized training at the Dragon Clinic and Barça Innovation Hub. These courses, combined with his practical experience at Chaves and Braga, enable him to implement cutting-edge sports training strategies that optimize athletic performance. His holistic approach,

grounded in both academic and practical knowledge, makes him a key figure in SC Braga's efforts to nurture the next generation of soccer talent.

3.3 Data collection

Data were gathered through semi-structured interviews with the lead U-19 physical-preparation coach in each club.

Two interviews were conducted per coach to elicit philosophies, decision rules, and operational criteria for individualisation (United Kingdom Coach: 6 May and 13 June 2024; Portuguese Coach: 3 and 4 June 2024). A pilot interview with an external youth S&C coach (not included in the sample) was conducted to refine clarity, sequencing, and probes, with minor wording adjustments implemented afterwards (Cushion et al., 2012). The final guide targeted three domains aligned with the study objectives: (i) weekly microcycle organisation for strength/power and speed/COD in pre-season and in-season; (ii) assessment/profiling practices and data-supported individualisation; and (iii) coordination and contextual constraints (e.g., first-team interactions, fixture schedule).

Interviews were held in quiet meeting rooms, audio-recorded with consent, and professionally transcribed verbatim. Interviews conducted in Portuguese were translated into English with back-checking against the originals to ensure meaning fidelity (Bryman, 2001). The interview guide is provided in Appendix A.

3.4 Data analysis

Analysis followed thematic analysis (Braun & Clarke, 2006). The six stages were completed: familiarisation with transcripts; generation of initial codes; construction of candidate themes; review of themes for internal coherence and external distinctiveness; definition and naming; and analytic reporting.

Coding units were meaning-based (phrases to paragraphs). A living codebook tracked code labels, definitions, and inclusion/exclusion rules; revisions were logged to preserve an audit trail of analytic decisions. Coding

combined deductive frames derived from the study objectives and literature review (e.g., weekly anchors/dosing; assessment–profiling–individualisation; coordination constraints) with inductive codes capturing emergent decision rules (e.g., ±15% day-type rule; ILPs on MD-4; live vs non-live GNSS; minute-based compensatory criteria).

Given the multiple-case design, analysis proceeded in two layers: (i) within-case thematic development for each coach, followed by (ii) cross-case comparison to identify convergences and divergences in how physical capacities were programmed and justified. The unit of analysis was the coaching approach in each setting, consistent with exploratory qualitative guidance in sport and exercise science (Ditroilo et al., 2025).

3.5 Trustworthiness

Trustworthiness was addressed following established qualitative criteria (Lincoln & Guba, 1985). Credibility was strengthened through member checking of factual summaries (anchors, rules, definitions) with each coach and through critical-friend review, whereby researchers experienced in youth S&C challenged code meanings, theme boundaries, and consideration of negative evidence (McMillan & Schumacher, 2014; Baskerville & Goldblatt, 2009). The translation process (Portuguese → English) included back-checking to support interpretive accuracy. Dependability was supported by an audit trail (interview guide versions, codebook iterations, and excerpt tables). Confirmability was supported through analytic memos documenting assumptions, rationale for code merges/splits, and reflections related to the researcher's S&C background (Maxwell, 2012). Transferability was addressed through clear description of context, participants, and inclusion criteria.

CHAPTER 4 - RESULTS

4. RESULTS

The themes and subthemes that emerged from the data are summarised in Figure 1.

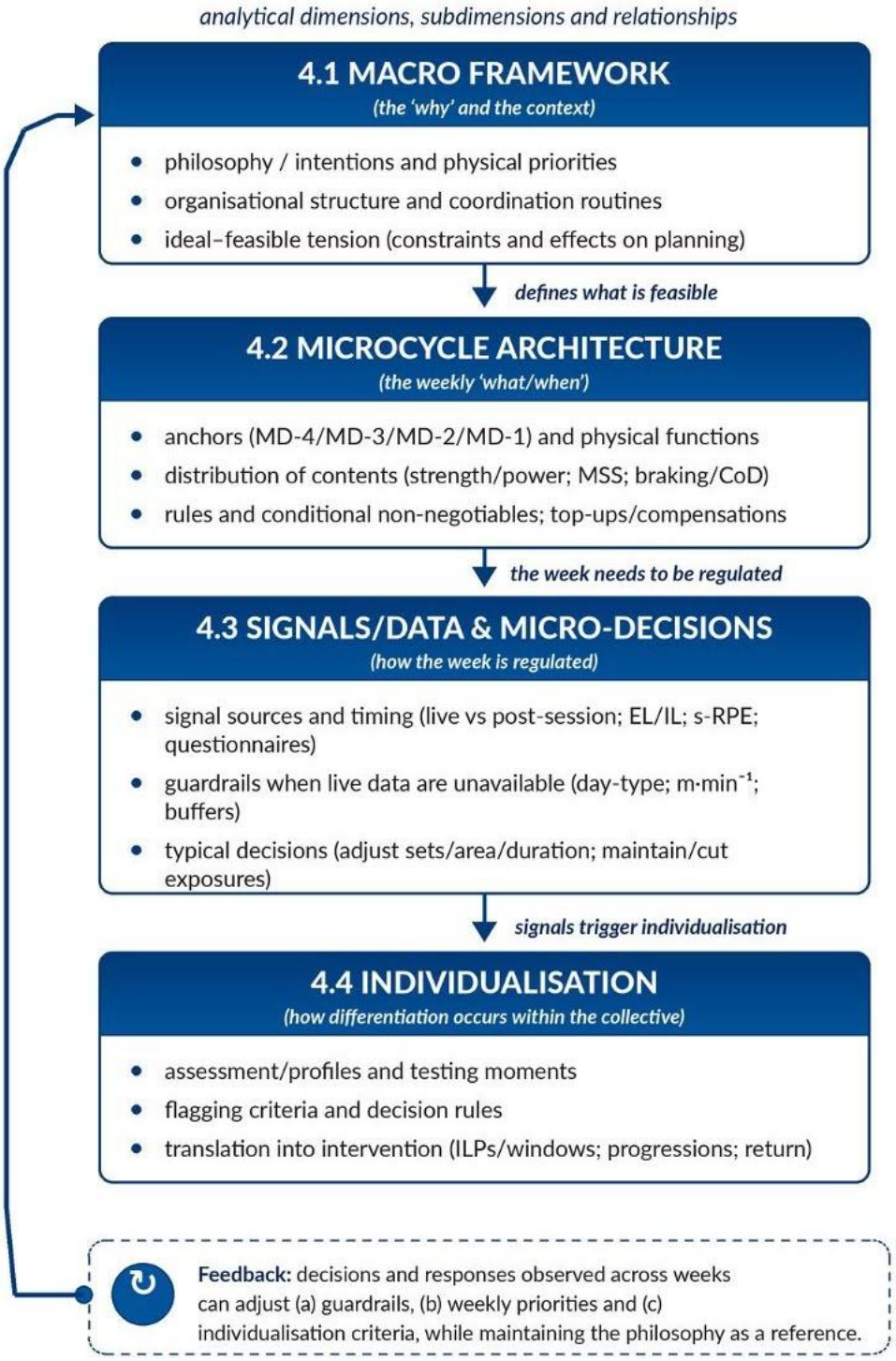


Figure 1. Themes and subthemes that emerged from data

4.1. Macro framing: philosophy, intentions, and organisational structure

This theme describes the macro framing each coach reported for developing physical capacities in U-19 squads, before detailing weekly programming in subsequent themes. The focus is on: (i) philosophy, intentions and physical priorities; (ii) the organisational structure and coordination routines that shaped decision-making; and (iii) the ideal-possible tension created by constraints and their effects on planning. This tension was not understood as a fixed macro-level issue only; rather, it provided the contextual backdrop for the microcycle-level adjustments and individualisation decisions presented later in the chapter.

4.1.1. Philosophy, intentions, and physical priorities

In the UK coach's case, physical preparation was framed as building "athleticism" to support football execution, with repeated emphasis on acceleration, sprinting and deceleration mechanics:

> *"My coaching philosophy is to build athleticism in the players, and for them to use that athleticism to develop football-specific skills… we instil acceleration mechanics, sprinting mechanics, and deceleration mechanics whenever we can. — Coach UK (Interview_Bradford_2)"*

In the Portuguese coach's case, the guiding principle placed stronger emphasis on player availability and tolerance of the training-competition process, whilst still aiming to improve key physical capacities such as speed, jumping ability and repeated-sprint ability:

> *"The essential point—the goal of my work on physical capacities—is to give the athlete the tools to be available for the maximum number of training sessions and matches, so he can show his quality in the game. — Coach PT (Interview_Braga_2)"*

Both coaches also treated exposure to maximal sprint speed (MSS; referred to as vMax in the interviews) as a priority that should recur weekly, although the reported targets differed between contexts:

“Match Day –2 is our speed day: we target max velocity at least once a week for hamstring robustness. — Coach UK (Interview_Bradford_2)”

“On the pitch, hitting vMax at least 2×/week has strong evidence for maintaining/gaining speed and some hamstring protection. — Coach PT (Interview_Braga_2)”

Taken together, the two cases framed physical development around robust mechanics for high-intensity acceleration-deceleration actions and regular maximal-speed exposure, whilst differing in the primary rationale used to justify these priorities: athleticism-to-skill in the UK case and availability-to-perform in the Portuguese case.

4.1.2. Organisational structure and coordination routines

In the UK coach’s case, the organisational layer was described as a structured routine interface between academy and first-team staff. This daily touchpoint was used to align information on injuries, loading, surfaces, player requests and anticipated changes in availability:

“Every morning the Academy staff—S&C and medical—meet the first-team staff. We discuss injuries, loading, surfaces… and any player requests… It’s a daily touchpoint. — Coach UK (Interview_Bradford_3)”

That interface also shaped conservative decision buffers, because player call-ups could occur with little notice and because exposure may increase when players attempt to impress in a first-team environment:

“The first team might call them up at any time, and players exert more to impress. So, we keep a buffer—don’t try to “optimise” them the day after a short appearance. — Coach UK (Interview_Bradford_3)”

In the Portuguese coach’s case, coordination was framed as a multidisciplinary division of labour intended to preserve feasibility, maintaining a shared general programme whilst allocating other staff to players’ individual needs:

“We have a multidisciplinary team, and we split the work, so the physiologist is not overloaded. He guarantees the general component. Other staff focus on individual needs. — Coach PT (Interview_Braga_2)”

The Portuguese coach also described a clear separation of decision-making roles: match minutes were determined by the head coach, whilst performance staff provided information that could trigger adjustments for specific players:

> *"The distribution of minutes is 100% the head coach's decision… I give feedback from the departments. If a player needs more rest or is coming back from injury, I flag it. — Coach PT (Interview_Braga_2)"*

In both cases, coordination routines shaped what was feasible to deliver, how quickly information could be acted upon and how conservative buffers were applied when uncertainty was high.

4.1.3. Ideal–possible tension: constraints and effects on planning

Both coaches described an "ideal" organisation of physical work, but also emphasised that the competitive calendar and academy context frequently constrained what could be implemented. In the UK coach's case, this tension was expressed through the contrast between the relative clarity of pre-season planning and the volatility of in-season periods:

> *"Only pre-season periodisation works cleanly… In-season, weather changes, cancellations, and congested weeks disrupt plans… so we manage by microcycle—start the week higher, taper into the game. — Coach UK (Interview_Bradford_3)"*

The same ideal-possible tension was also visible in relation to spacing between demanding stimuli. Even when the desired organisation was clear, the coach described the need to manage dose carefully when optimal spacing could not be guaranteed:

> *"Ideally you'd give 48 hours after power, but in academy football we rarely have that luxury, so I manage the volume carefully. — Coach UK (Interview_Bradford_2)"*

In the Portuguese case, the coach similarly rejected a closed interpretation of periodisation and described programming as dynamic because constraints can reshape the plan across the microcycle:

"Talking about "closed" periodisation makes less sense… There are constant changes in microcycles and even on the day… Therefore, the programming is dynamic. — Coach PT (Interview_Braga_2)"

This was accompanied by a conservative stance towards maintaining adaptations during the season, especially when the feasible dose was lower than the ideal dose:

"We learned that many times it is better a little less than a little more… During the season the main objective is to maintain those adaptations. — Coach PT (Interview_Braga_2)"

Overall, both cases depicted the same organising tension: coaches reported stable intentions, such as robustness for acceleration-deceleration actions and regular maximal-speed exposure, but implementation was continually reshaped by constraints that limited ideal sequencing, spacing and workload control. This helps explain why the weekly microcycle became the operational unit through which physical development was delivered.

4.2. Weekly microcycle architecture: the weekly backbone for developing physical capacities

This theme describes how each coach reported organising the match-day-relative microcycle as the weekly backbone for developing and maintaining physical capacities. In this thesis, the term "anchor" refers to a recurring day-type or training slot within the microcycle that carries a relatively stable physical function, such as lower-body strength, high-speed exposure, maximal sprint speed, power or reactivity. Anchors do not imply rigid repetition; rather, they provide stable reference points that can be adjusted according to player status, match exposure and contextual constraints.

4.2.1. Planning horizon and weekly anchors

In both cases, the microcycle was described as a stable week-type built around day-types anchored to match day. In the UK case, the coach described fixed anchor points, particularly a dedicated lower-body strength day and a consistent power day:

“Typically: MD –4: lower-body strength… MD –2: power… Opponent doesn’t change that anchor point. — Coach UK (Interview_Bradford_2)”

In Portugal, the coach provided a clear Saturday-to-Saturday template and described how it was adapted by match exposure, whilst retaining the same anchor logic:

“Saturday-to-Saturday microcycle: Sunday off; Monday recovery; Tuesday lower-body strength; Wednesday upper-body strength (2 push + 2 pull); Thursday (MD-2) a mix of lower-body power and push/pull power; Friday (MD-1) recovery-oriented… provided it does not compromise the match. — Coach PT (Interview_Braga_2)”

Together, these accounts indicate that weekly anchors were used primarily to protect sequencing, whilst adaptation occurred through dose and delivery.

4.2.2. Content distribution by physical capacity

Within the weekly structure, both coaches described a deliberate distribution of content by physical capacity. In the UK case, the coach described using gym content to support braking robustness through eccentric force-absorption work, linking this explicitly to deceleration capability:

“In the gym we train eccentric force-absorption—basically deceleration… We do drop jumps, split jerks, and similar work. — Coach UK (Interview_Bradford_2)”

In Portugal, the coach outlined a pitch-based sequence in which early-week work concentrated high-tension acceleration-deceleration demands, followed by a more extensive day and then explicit maximal-speed exposure close to match day:

“Tuesday… a session with a lot of tension—many accelerations and decelerations… Day –3 is more extensive, with a bigger pitch… Day –2 we work maximal velocity… I finish with 2 × 30 m runs at maximal velocity. — Coach PT (Interview_Braga_2)”

Across cases, content distribution reflected an intent to cover force production and force absorption (strength/power and braking robustness)

together with regular maximal-speed exposure, whilst the delivery route was shaped by contextual constraints such as pitch demands, time and resources.

4.2.3. In-week adjustments: rules, conditional non-negotiables, and decision triggers

A key cross-case issue concerned how coaches regulated dose when planned targets and real-world conditions diverged. Rather than treating all priorities as absolute “non-negotiables”, the interview evidence suggests that some exposures were protected priorities or conditional non-negotiables: they were intended to be preserved, but their dose, timing or delivery could be modified when player status or contextual constraints required it. In the UK case, the coach reported using live GPS with player-specific thresholds to support rapid decisions on whether to extend or cut exposure:

> *“In STATSports I set day-specific thresholds per player—>+15% is amber, >+25% is red—so I can show risk in real time. — Coach UK (Interview_Bradford_2)”*

In Portugal, the coach described a quasi-live approach built on historical profiles by exercise and position, using average $m \cdot min^{-1}$ and expected positional volumes to estimate session load and adjust sets, space and duration:

> *“My solution is to categorise exercises… create averages (metres per minute, volume by position) and, with that, estimate the session and adjust (sets, area, duration). — Coach PT (Interview_Braga_1)”*

In both cases, the objective was to preserve key exposures whilst regulating weekly load; however, the temporal resolution of regulation differed, with live thresholding in the UK case and estimation/post-session confirmation in the Portuguese case.

4.2.4. Compensatory work and exposure equalisation

Both coaches reported compensatory strategies intended to reduce weekly exposure gaps between players with high match minutes and players with limited minutes. In the UK case, the coach described a compensatory session for

players below a minute's threshold, using explicit locomotor targets and adding top-ups if targets were not met:

> *"For the MD+1 compensatory for <45', the target might be ~6.5 km… sprinting and HSR targets… plus acceleration/deceleration targets… If any target isn't hit, I top up. — Coach UK (Interview_Bradford_3)"*

In Portugal, compensatory work was also described as minute-based, with dose adjusted according to match exposure and the week organised to converge players' exposure levels over subsequent days:

> *"Depending on the minutes played, I adjust the week… that reflects in the compensatory interval work (e.g., 1 set vs 2 sets)… On Monday there is compensatory to minimise differences… From Tuesday onwards we try for everyone to converge to the same level. — Coach PT (Interview_Braga_2)"*

Overall, both cases used compensatory work to support exposure equalisation, whilst operationalising it through different measurement and control systems. This reinforces the need to examine how the week was regulated through signals and micro-decisions.

4.3. Data/signals and micro-decisions: how the week is regulated

This theme describes how coaches reported using signals—objective metrics, subjective information and practitioner observation—to regulate the delivery of the microcycle when planned intentions met daily constraints. The focus is descriptive: what was monitored, when information became available and how signals translated into concrete micro-decisions. Critical evaluation of whether these sources were sufficient or whether additional sources should be considered is reserved for the Discussion.

4.3.1. Signal sources and timing

Both coaches described combining objective and subjective inputs but differed in the timing of information. In the UK case, the coach reported that live monitoring supported in-session judgement, whilst emphasising that decisions were not driven by numbers alone:

"We don't train off numbers alone; we also read body language and how players feel. — Coach UK (Interview_Bradford_2)"

In Portugal, the coach described a daily workflow in which internal load was captured through post-session RPE and a morning questionnaire, with objective external load available via GPS reporting, but without live feedback in the U-19 context:

"Here I adjust based on subjective information… RPE post-training; the morning questionnaire: sleep time/quality, general fatigue, localised pain, stress… We also have an objective metric: external load via GPS. — Coach PT (Interview_Braga_2)"

Across both cases, the stated intent was to regulate exposure around weekly priorities; however, the timing and resolution of information differed, with in-session triangulation in the UK case and post-session confirmation supported by daily check-ins in the Portuguese case.

4.3.2. Guardrails when live control is limited

Where immediate control was limited, both coaches described using practical guardrails to keep sessions aligned with the intended day-type and recent baselines. In the UK case, the coach described a comparable objective—avoiding excessive drift—using a rolling monthly reference:

"I take a four-week (monthly) average and use that as the reference, making sure we don't exceed it. — Coach UK (Interview_Bradford_3)"

In the Portuguese case, the coach reported combining standardisation with quantitative bandwidth rules:

"We control by acute:chronic ratio (7 to 21/28 days) and try to keep each day-type within ±15% of that same day's recent average. — Coach PT (Interview_Braga_2)"

These guardrails functioned as pragmatic boundaries intended to preserve weekly intent whilst allowing day-to-day adaptation under uncertainty.

4.3.3. Typical micro-decisions regulated by signals

Coaches described translating signals into concrete adjustments to task design and dose. In the UK case, micro-decisions were framed as extending or cutting exposure when sessions drifted above or below the intended target:

> *"If we're under target, I suggest extending; if we're over, we cut. — Coach UK (Interview_Bradford_2)"*

In Portugal, the coach described using the daily questionnaire and RPE signal to trigger discussions about reducing planned content, including removing gym work, when fatigue markers exceeded the expected range for that day-type:

> *"If I see that the sum on –4 and –3 is significantly above normal, I raise the question of adjusting: "Today does it make sense to keep it? Reduce? Remove the gym?" — Coach PT (Interview_Braga_2)"*

Overall, both cases depict a similar micro-decision logic—adjusting dose and task constraints to protect key weekly exposures—implemented through different monitoring resolutions and regulatory strategies. When these signals identified gaps, risk or specific individual needs, they also supported individualisation within the collective programme.

4.4. Individualisation infrastructure: assessment, profiling, and decision rules

This theme describes how coaches reported building and using an individualisation infrastructure within collective U-19 programmes. The focus is on: (i) how players were assessed and profiled, (ii) how concerns were prioritised through flagging criteria and decision rules, and (iii) how identified needs were translated into targeted interventions that fitted within the weekly structure.

4.4.1. Profiling systems and assessment moments

Both coaches described periodic testing as the primary mechanism for establishing reference points and identifying individual needs, but their systems

differed in instrumentation and emphasis. In the UK case, the coach described a multi-profile approach built around force-diagnostic tools:

> *"In the gym we create four profiles: power, force, functional movement screening, and strength… We build the power and force profiles with the NordBord and force plates. — Coach UK (Interview_Bradford_3)"*

In Portugal, the coach described a structured battery implemented at three points across the season, combining gym-based and field-based assessments:

> *"We do three moments per year… FMS… jumps… adductor/abductor dynamometry… isokinetic at 120°·s⁻¹… and on the pitch: 30 m sprints… a 505 variant… and Yo-Yo for cardiorespiratory capacity and MAS. — Coach PT (Interview_Braga_2)"*

In both cases, profiling was framed as a practical way to establish baselines and to inform individualised decisions within the constraints of a collective programme.

4.4.2. Flagging criteria and decision rules

Coaches reported using simple thresholds to support prioritisation, particularly where asymmetry or marked deficits were present. In the UK case, the coach described a threshold logic, but made explicit that flags were interpreted against symptoms and functional performance rather than treated as automatic decision rules:

> *"We look at the Limb Symmetry Index (LSI). Anything beyond 15% asymmetry we take seriously… If a player reports no issues and performs well… I don't overreact. — Coach UK (Interview_Bradford_3)"*

In Portugal, the coach described a pragmatic asymmetry criterion used to flag athletes for targeted work, alongside multiple indicators through which this may emerge:

> *"Athletes are flagged when they have asymmetries >15%… in the OSSI (or triple hop, bilateral strength ratio, adductor/abductor, etc.). Those athletes are signalled for individual work. — Coach PT (Interview_Braga_2)"*

Taken together, both coaches described using a similar quantitative trigger (approximately 15% asymmetry) to detect potential issues, whilst emphasising that subsequent prioritisation depended on interpretation, including symptoms, function and match impact.

4.4.3. Translating profiles into intervention: individual plans, progressions, and staged return

Both coaches described translating profiling and ongoing signals into interventions that remained embedded within the weekly microcycle. In the UK case, individualisation was formalised through a scheduled individual plan window designed to address specific deficits within a short block:

> *"On Match Day +3 or Match Day –4 we have a "window of opportunity" for Physical ILPs… Whatever a player lacks… he works on it for about 20 minutes. — Coach UK (Interview_Bradford_2)"*

In Portugal, individualisation was described as selective and triggered when a variable was judged to be limiting match performance, rather than applied routinely to all players:

> *"We identify who really needs individualisation when we realise that some variable is harming his game. — Coach PT (Interview_Braga_2)"*

Where return to competition was discussed explicitly, the UK coach described a staged minutes progression supported by achieving objective markers prior to reintegration:

> *"Before competition minutes, the player must hit numbers… Next step is a 15-minute appearance, then 30 → 60 → 90 as his acute and chronic loads justify it. — Coach UK (Interview_Bradford_3)"*

Overall, the two cases depict an embedded individualisation logic: profiling establishes reference points; flagging supports prioritisation; and targeted interventions are delivered through short windows, progressive exposure and workload-informed staging within the constraints of the weekly programme.

CHAPTER 5 - DISCUSSION

5. DISCUSSION

Based on the two qualitative case studies, this dissertation sought to understand how two specific U-19 academy coaches, working in distinct organisational contexts in Portugal and the United Kingdom, planned, regulated and individualised the development of players' physical capacities throughout the season. In line with the analytical structure presented in the results section, the discussion is organised around four interconnected dimensions: (i) macro framing: philosophy, intentions and organisational structure; (ii) weekly microcycle architecture for developing physical capacities; (iii) data/signals and micro-decisions; and (iv) individualisation infrastructure. Overall, the findings suggested that physical development in these two illustrative cases was not organised as the linear application of a predetermined periodisation model, but as a situated and adaptive process in which training intentions were continuously negotiated against contextual constraints, information availability, match-day demands and individual player needs. Within this broader pattern, four main findings structured the discussion: (i) both coaches valued robustness for high-intensity acceleration/deceleration actions and regular exposure to maximal sprint speed, but these priorities were framed through different rationales; (ii) the match-day-relative microcycle operated as the weekly 'backbone' through which broad physical priorities were converted into recurring anchors, content distribution and compensatory work; (iii) monitoring signals were used as practical resources for regulating micro-decisions, but their usefulness depended on timing, interpretation and actionability, not only on the type of data collected; and (iv) individualisation was embedded within the collective programme through assessment, profiling, flagging criteria, short intervention windows and progressive exposure. The contribution of this dissertation lies on showing how, in these two cases, the development of physical capacities was constructed through the interaction between work philosophy, feasibility, available information and professional judgement, rather than through physiological principles or formal training models alone.

5.1. Macro framing: philosophy, intentions and organisational structure

The first analytical dimension showed that both coaches attached importance to preparing U-19 players for the high-intensity actions that characterise contemporary football, particularly accelerations, decelerations, sprinting, maximal sprint-speed exposure and repeated neuromuscular demands. This emphasis was consistent with research showing that youth and academy football involves intermittent high-intensity activity, where sprinting, high-speed running, accelerations, decelerations and changes of direction are relevant components of match demands and physical preparation (Harper et al., 2022; Lee et al., 2024; Oliva-Lozano et al., 2022). The coaches' concern with regular maximal sprint-speed exposure also aligned with applied recommendations arguing that sprint exposure should be maintained within the training week, both as a speed-development stimulus and as a potential stimulus for sprint-related tissue tolerance (Buchheit et al., 2024).

However, the present findings added nuance to this literature by showing that similar physical priorities were supported by different rationales. In the UK case, physical preparation was framed mainly through the development of athleticism, understood as a base that helped players express football-specific skills more effectively. In contrast, the Portuguese coach framed physical work more strongly through availability, load tolerance and the player's capacity to remain able to train and compete consistently. This distinction resonated with wider critiques of overly generic training prescriptions, because the same physical content can have different practical meanings depending on the coach's philosophy, role and organisational context (Kiely, 2018). Thus, the finding did not contradict the literature on what capacities matter in youth football, butextended it by showing how coaches justified and prioritised those capacities in practice.

This difference between an athletic-development rationale and an availability-to-perform rationale should not be read as an opposition between development and maintenance. Both coaches described concerns with longer-term player progression and short-term readiness, but the balance between these concerns differed. The UK coach appeared to foreground the expansion of the

player's athletic resources, whereas the Portuguese coach foregrounded the preservation of availability and the capacity to tolerate the training-competition process. Such a distinction is important because literature on youth physical development frequently identifies relevant capacities, such as strength, power, speed or change of direction, but less often explains how coaches negotiate these priorities when time, competition schedules and organisational demands constrain delivery (Oliver et al., 2024; Ramírez-Campillo et al., 2023). The current findings therefore contributed by highlighting physical preparation as a situated decision-making process, not simply as the implementation of a capacity-development checklist.

Although both coaches reported stable intentions, their implementation was frequently conditioned by short-term constraints, including calendar volatility, match minutes, player availability, facilities, technology, staffing and the timing of information. This supported the argument that football training organisation cannot be understood only through idealised periodisation models, because practice is shaped by uncertainty, adaptation and contextual feasibility (Kiely, 2018; Oliva-Lozano et al., 2022). The present study added to this discussion by showing how this tension operated across multiple scales, since it shaped macro-level planning, weekly sequencing, in-session regulation and individualised interventions. Thus, coaching philosophy provided direction, but the delivered programme emerged through continuous negotiation between intention and feasibility.

5.2. Weekly microcycle architecture for developing physical capacities

The second theme showed that the match-day-relative microcycle acted as the main operational unit through which both coaches organised the players' physical development. This finding was consistent with applied football literature showing that training contents and load patterns are commonly distributed according to match-day proximity, with different physical emphases placed across the week (Douchet et al., 2024; Oliva-Lozano et al., 2022). In the present study, the microcycle allowed coaches to transform broad priorities, such as

strength, power, maximal sprint speed, acceleration/deceleration and compensatory work, into recurring weekly anchors. This reinforced the idea that, especially in-season, the microcycle is not merely a calendar structure but the main practical space in which development, maintenance and readiness are negotiated (Buchheit et al., 2024; Kiely, 2018). The notion of anchors helped interpret how the coaches kept working within a context characterised by instability.

In this dissertation, anchors refer to relatively stable day-types or training slots within the microcycle associated with specific physical functions. The UK coach described lower-body strength and power/speed exposures as recurring reference points, whereas the Portuguese coach described a saturday-to-saturday structure distributing lower-body strength, upper-body strength, power and maximal-speed exposure across the week. These accounts aligned with microcycle literature showing that proximity to match day typically influences neuromuscular, locomotor and tactical loading (Oliva-Lozano et al., 2022; Vardakis et al., 2024). Yet the present findings added that such anchors worked less as rigid prescriptions and more as decision aids, because they helped coaches decide what should be protected and what could be adapted when constraints intervened.

This interpretation also reframed the idea of non-negotiables in football preparation. Coaches and practitioners often describe certain stimuli, such as sprint exposure, strength work or neuromuscular activation, as non-negotiable because of their perceived importance for performance or robustness (Buchheit et al., 2024; Harper et al., 2022). However, the present findings suggested that, in these two cases, such elements were more accurately understood as protected priorities or conditional non-negotiables. They were repeatedly pursued, but their dose, timing, format or delivery could be modified according to player status, match exposure and weekly constraints. This distinction is important because it avoids portraying applied practice as more rigid than it actually was, while still recognising that coaches attempted to protect a small number of core physical exposures.

The content distribution reported by the coaches also broadly aligned with literature on strength, power, speed and braking development in youth football. Strength and plyometric-based approaches are frequently recommended to support force production, jumping, sprinting and change-of-direction performance, while acceleration/deceleration and maximal-speed exposures are increasingly recognised as distinct but interrelated training priorities (Lee et al., 2024; Oliver et al., 2024; Ramírez-Campillo et al., 2023). The UK coach's gym-based emphasis on eccentric force absorption for braking and the Portuguese coach's pitch-based sequence of tension, extensiveness and maximal velocity therefore reflected different delivery routes towards overlapping physiological targets. This added an applied layer to the literature by showing how similar capacities may be operationalised through different weekly structures depending on context, resources and coaching preference.

Compensatory work further illustrated the dynamic nature of the microcycle. Both coaches described using top-ups or compensatory sessions to reduce exposure differences between players with high match minutes and those with limited competitive involvement. This logic was consistent with research showing that match participation creates heterogeneous weekly loads within squads, meaning that players cannot be assumed to receive equivalent stimuli simply because they belong to the same team (Kanaras et al., 2024; Marynowicz et al., 2020). The UK coach used explicit locomotor targets for low-minute players, whereas the Portuguese coach adjusted interval work and sought convergence across subsequent days. Although operationalised differently, both approaches revealed that the microcycle was shaped retrospectively as well as prospectively: coaches planned for the next match but also responded to what players had accumulated in the previous one.

This finding contributed to understanding how development and readiness were managed simultaneously in these academy settings. Compensatory work was not merely an additional conditioning block, but a regulatory mechanism through which coaches attempted to maintain squad readiness and reduce exposure deficits. Existing literature often discusses load distribution and monitoring at team level, but the present findings highlighted the importance of

intra-squad differences created by match exposure and selection (Kanaras et al., 2024; Ravé et al., 2020). The weekly backbone of physical development therefore appeared to depend not only on pre-planned sequencing, but also on the capacity to recalibrate the week in response to actual player exposure.

5.3. Data/signals and micro-decisions: from monitoring to actionable regulation

The third theme showed that the training week was not only planned, but also regulated through signals collected before, during and after training. Both coaches used sources of external and internal load information (e.g., GNSS-derived metrics, session-RPE and questionnaires), alongside coach observation and, at specific moments, physical testing. This supported monitoring literature arguing that no single metric can fully capture player status and that useful training regulation requires integration between external load, internal load and contextual information (Inoue et al., 2022; Marynowicz et al., 2020; Ravé et al., 2020). The present study extended this discussion by showing that the practical value of monitoring depended not only on what was measured, but also on when information became available and whether it could be translated into a coaching staff decision.

In the UK case, live GNSS supported in-session coach decisions, such as extending or cutting exposure when players were below or above intended thresholds. In the Portuguese case, the absence of live GNSS in the U-19 context required a more estimated approach, based on day-type profiles, metres per minute, positional references, post-session reports and daily check-ins. This difference should not be interpreted as a simple hierarchy in which live data are automatically superior. Rather, it suggested that different monitoring systems afforded different types of decision: live data could support immediate regulation, whereas post-session data supported reflection, calibration and subsequent planning (Inoue et al., 2022; Ravé et al., 2020).

This finding is relevant because monitoring is often discussed primarily in terms of metric selection, while the present findings suggested that timing and

actionability are equally important. A metric may be valid and relevant, but if it arrives too late to inform the session, its practical meaning changes. Conversely, live information may support rapid adjustment, but only when accompanied by clear criteria and coach interpretation. Thereby, monitoring should not be reduced to data collection but understood as a decision-support process in which information must be interpreted and acted upon within real coaching environments (Marynowicz et al., 2020; Vardakis et al., 2024). In these two cases, the key issue was not simply whether data existed, but whether they could influence micro-decisions, such as adjusting sets, area, duration, exposure volume, top-ups or gym content.

This theme also allowed a critical reflection on whether the reported signal sources were sufficient. GNSS, session-RPE, questionnaires, physical tests and coach observation were relevant because they offered information on external workload, perceived exertion, subjective status and physical capacities (Inoue et al., 2022; Ravé et al., 2020). However, they may not capture the full complexity of readiness in youth players. Additional sources, such as more frequent neuromuscular monitoring, pain or discomfort location, injury history, maturation status, sleep behaviour, psycho-emotional stress, school demands and technical-tactical observation, could potentially enrich interpretation. This is particularly relevant in academy settings, where biological maturation, educational demands and psychosocial stressors may influence training tolerance and adaptation beyond what standard load metrics can show (Asimakidis et al., 2024; Lee et al., 2024).

Nevertheless, this possibility must be considered cautiously. More data do not automatically produce better decisions. Additional monitoring sources may increase operational burden, interpretative noise and staff workload if they are not linked to clear decision rules. Therefore, the central question is not whether academies should collect more information, but whether the information collected is relevant, timely, interpretable and actionable within the constraints of the context. This was one of the conceptual contributions of the present study since it showed that monitoring systems were not neutral technical tools but were

embedded in organisational realities and became meaningful only when they shaped concrete decisions.

5.4. Individualisation infrastructure: assessment, profiling and decision rules

The fourth analytical dimension showed that both coaches attempted to individualise physical development but did so within the constraints of a collective team programme. Individualisation was not described as a fully separate process in which each player followed an independent plan. Rather, it emerged as a layer embedded within the microcycle, activated through assessment, profiling, flagging criteria, short intervention windows, compensatory work and progressive exposure. This finding aligns with literature that values individual profiling in youth football, particularly to identify strengths, limitations and asymmetries in qualities such as strength, power, speed, change of direction and aerobic capacity (Asimakidis et al., 2024; Franceschi et al., 2023; Lee et al., 2024).

The two cases differed in the assessment infrastructure used to support this process. The UK coach described a more instrumented approach, including force-related profiles and tools such as NordBord and force plates, whereas the Portuguese coach described a broader seasonal battery combining gym-based and field-based tests. These differences likely reflect both methodological choices and contextual conditions, such as access to technology, staff capacity and organisational priorities. The finding underscores that assessment systems are not only selected because they are scientifically relevant, but also because they are feasible, repeatable and interpretable within a specific academy environment (Franceschi et al., 2023; Vardakis et al., 2024). A key contribution of this finding is that profiling appeared to be only the first step in individualisation. The presence of data did not automatically produce meaningful individual work. Coaches had to interpret which markers mattered, decide which deficits deserved priority and determine how these could be addressed within the weekly structure. This was evident in the use of flagging criteria. Both coaches referred to asymmetry thresholds around 15%, but these were not treated as automatic rules. Particularly in the UK case, asymmetry was interpreted alongside

symptoms, function and performance. This supports the view that quantitative thresholds can help detect potential concerns, but that they remain insufficient without contextual judgement (Asimakidis et al., 2024; Lee et al., 2024).

Numerical thresholds may support prioritisation, but they can also create false certainty if detached from the player's broader context. A given asymmetry or deficit may have different meanings depending on injury history, training age, position, maturation status, symptoms and current match demands (Asimakidis et al., 2024; Greenberg et al., 2020; Smiley et al., 2024). Therefore, individualisation requires determining whether that cut-off is functionally meaningful and how it should be addressed without disrupting the collective programme (Franceschi et al., 2023; Ravé et al., 2020). In this sense, the present study reinforces the need to connect assessment with decision-making rather than treating testing as an isolated process.

The way both coaches translated information into practice suggests that individualisation in academy football may be most feasible when delivered through micro-interventions rather than entirely separate programmes. In the UK case, individual development plan windows provided short, targeted opportunities to address specific deficits. In the Portuguese case, individualisation was described as more selective and triggered when a variable was judged to limit match performance. Although different in structure, both approaches point to the same practical logic: individualisation must fit into the rhythm of the team week if it is to be sustainable. This complements the literature by showing not only that individualisation is desirable, but also how it may be operationalised within time-limited collective environments (Vardakis et al., 2024).

Taken together, these findings suggested that individualisation in U-19 academy contexts depends on an infrastructure linking assessment, interpretation, prioritisation and intervention. Collecting more individual data is insufficient if the information is not converted into decisions about exercise selection, dose, timing, progression or return-to-competition exposure. The present study therefore contributes by showing how individualisation operated as an embedded layer of the collective programme in two real academy contexts,

where individual needs had to be addressed within shared schedules, limited time and variable resources.

5.5. Provisional integrative model of physical programming in two U-19 academy cases

Building on the four analytical dimensions discussed above, this dissertation proposes a provisional integrative model for understanding how physical programming was constructed in these two U-19 academy cases. The model should not be read as a general guide for football academies, nor as a normative sequence of best practice. Rather, it is an interpretative and illustrative proposal derived from two specific coaches working in two specific contexts. Its value lies in making visible the relational logic through which physical decisions were constructed, and in offering a conceptual language for future case-based research on physical development in academy football.

The model suggests a dynamic sequence with feedback loops. Macro framing, including philosophy, intentions and organisational structure, provides direction by defining which capacities are considered important and why. Contextual constraints then delimit what is feasible in each week, including fixtures, match minutes, player availability, access to technology, human resources, facilities and information quality. Weekly microcycle architecture translates broad priorities into anchors, content distribution and compensatory strategies. Data/signals and guardrails regulate the execution of the week by indicating whether the delivered programme is moving towards or away from what was intended. Micro-decisions then adjust dose, format, duration, space, number of sets or supplementary exposures. Finally, individualisation infrastructure differentiates the collective programme according to profiles, flags, specific needs and observed responses.

Figure 2 presents this provisional integrative model and the relationships between its components.

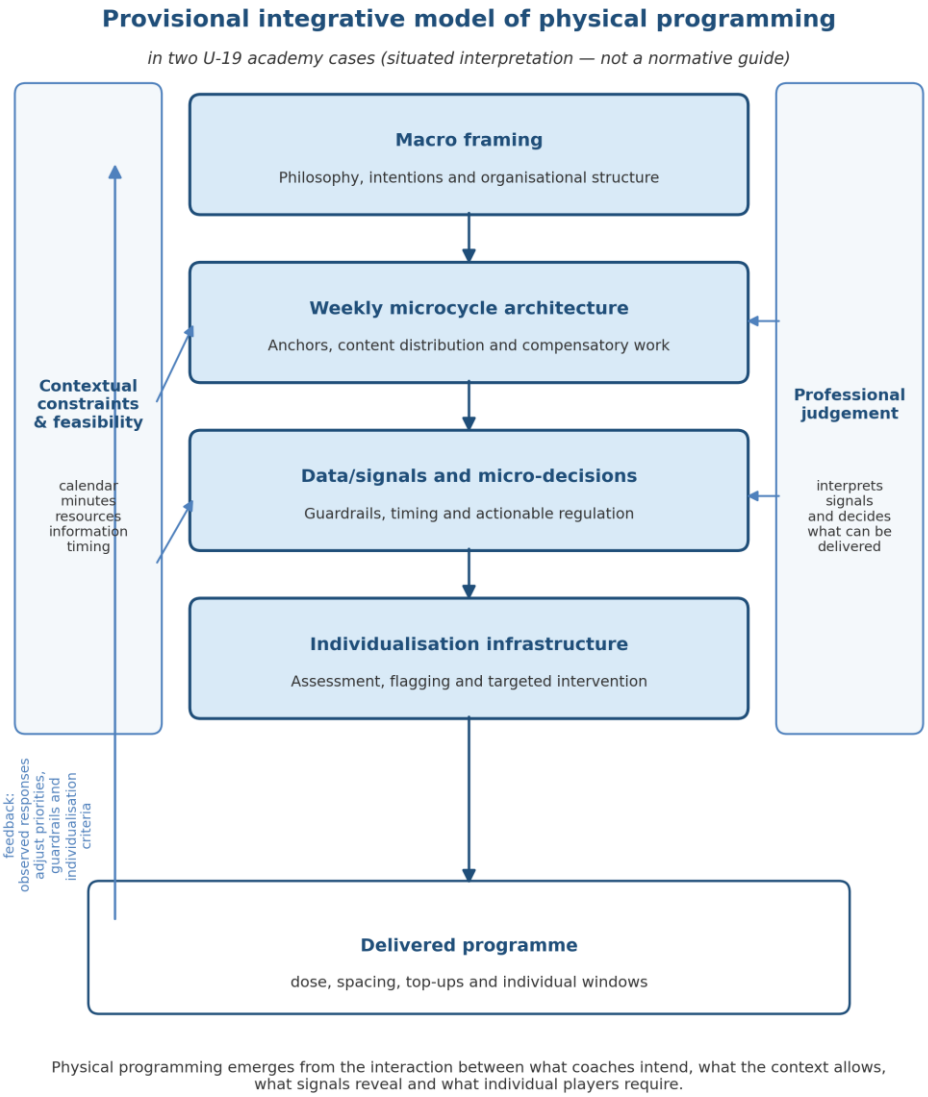


Figure 2. Provisional model of U-19 physical programming

This sequence should not be read as linear. Rather than moving in a fixed direction from philosophy to delivery, physical programming was continually reshaped by the responses observed across weeks. For instance, a player who did not reach a target exposure could receive compensatory work, whereas an athlete who showed an asymmetry or a drop in a physical marker could be flagged for targeted intervention. Similarly, incomplete information could lead the coach to apply more conservative buffers, and a late call-up to the First Team

could alter the balance between development, maintenance and competitive readiness. In this sense, physical programming emerged as a system of continuous regulation in which initial intentions were constantly adjusted by the realities of practice.

The theoretical value of the model is that it shifts attention from a content-only view of physical development to a decision-centred view. Previous literature has described the importance of developing strength, speed, power, change of direction, endurance and repeated high-intensity actions in young footballers (Harper et al., 2022; Lee et al., 2024; Oliver et al., 2024; Ramírez-Campillo et al., 2023). The present findings suggested that, in academy settings, an additional question is required: how are these capacities prioritised, distributed, regulated and individualised within real working systems? The model therefore integrates four levels that are often discussed separately: macro philosophy and organisation, weekly microcycle architecture, monitoring-based regulation and individualisation infrastructure.

At the same time, the model highlights the adaptive nature of the coach's work. Physical programming did not emerge as the mechanical application of literature or protocols, but as a professional practice requiring interpretation. The coach had to decide when to preserve a priority, when to adapt an exposure, when to reduce dose, when to complement an individual player's work and when to accept that a given objective was not feasible in that week. This reading is consistent with context-sensitive approaches to planning and coaching practice, which emphasise that professional judgement and environmental constraints mediate the translation of scientific principles into action (Kiely, 2018).

The model also makes explicit the central tension identified in this dissertation: physical development in U-19 academy football sits between what coaches intend to develop and what the context allows them to deliver. Philosophy offers direction but does not guarantee implementation. The microcycle offers organisation but does not eliminate uncertainty. Monitoring offers information but does not make decisions by itself. Individualisation offers differentiation but must fit within the collective. It is within this interaction that the main conceptual contribution of the study is located.

5.6. Limitations

This study has limitations that should be acknowledged. First, the data were mainly derived from interviews and may therefore have been influenced by participants' memory, social desirability or the way each coach interpreted the questions. In addition, when a topic was not mentioned, this may mean that it was not a priority for the coach, but it may also reflect a limitation of the interview guide or a direction induced by the question itself. This limitation is especially relevant when discussing gaps, because the absence of explicit reference should not automatically be interpreted as absence of practice (Braun & Clarke, 2019; Sparkes & Smith, 2014).

Second, the analysis involved translation, qualitative interpretation and excerpt selection, which inevitably implies a degree of subjectivity. Although strategies were used to strengthen credibility, including triangulation and critical friends dialogue during analysis, the findings should be read as an interpretative account grounded in the data, not as a neutral or exhaustive description of the reality of the clubs (Braun & Clarke, 2019; Sparkes & Smith, 2014).

Third, the study focused primarily on the coaches' perspectives when examining programming rationales and decision-making logic. This was appropriate for the purpose of the study, but it means that other perspectives, such as those of players, head coaches, medical staff, analysts and other stakeholders, were not equally represented. This limits the extent to which the analysis can capture how physical programming was experienced, negotiated or perceived by the wider multidisciplinary environment.

5.7. Practical applications

Because the study involved two illustrative cases, the following points should be read with caution. First, practitioners may benefit from defining a small number of weekly anchors linked to priority physical capacities, such as strength, power, maximal sprint-speed exposure or compensatory work. However, these anchors should be treated as adaptable priorities rather than rigid rules, because

the present findings showed that contextual constraints often required modification of dose, timing or delivery.

Second, simple guardrail systems may be useful when live monitoring tools are unavailable. Day-type references, recent averages, metres-per-minute estimates, player-specific thresholds and subjective feedback can support practical decisions, provided they are interpreted contextually and linked to concrete actions. The findings suggested that low-resource systems can still support meaningful regulation when they are coherent, consistently applied and connected to decision rules.

Third, individualisation may be more sustainable when embedded within the collective programme through short intervention windows, top-ups, individual development tasks and staged progressions. Attempting to create fully separate programmes for every player may be unrealistic in many academy contexts. A more feasible approach may be to use assessment and monitoring information to identify priority needs and then integrate targeted micro-interventions into the weekly rhythm of the team.

Fourth, practitioners should be cautious when using thresholds such as asymmetry cut-offs. These can support flagging and prioritisation but should not replace contextual judgement. The present findings suggested that thresholds were most useful when interpreted alongside symptoms, function, performance, playing position, injury history and current training demands. This reinforces the practical need for staff to discuss data collaboratively rather than applying numerical rules mechanically.

Finally, clubs may benefit from improving communication routines between academy, First Team and medical/performance departments. In both cases, organisational coordination shaped what could be planned, monitored and delivered. Daily or regular information-sharing routines may help staff anticipate player injuries, late call-ups, changes in availability and shifts in match exposure, thereby reducing discrepancies between intended and actual training exposure.

5.8. Future research

Future research should continue to examine physical development in academy football through further qualitative case studies across deliberately contrasting contexts. Rather than pursuing scale in the form of very large samples, future work could build a cumulative body of case-based evidence by studying different clubs, countries, competitive levels and organisational structures. This would help identify which patterns appear common across settings and which are context-specific (Patton, 2015; Stake, 2006).

A second avenue would be to combine interviews with objective training documentation, weekly plans, GNSS data, internal-load records, testing data and direct observation of sessions. Such designs would allow researchers to compare what coaches report intending to do with what is planned and what is delivered, thereby deepening understanding of the gap between intention, plan and practice (Braun & Clarke, 2019; Sparkes & Smith, 2014).

A third avenue concerns the temporal availability of monitoring information. Further research could examine whether live systems improve the quality of in-session micro-decisions or whether, in certain contexts, simple but well-interpreted post-session systems can support equally appropriate regulation. This would help clarify the practical value of live data in relation to cost, staffing and interpretative capacity (Inoue et al., 2022; Ravé et al., 2020).

Future studies could also explore which combinations of signal sources are most useful for guiding individualisation in youth football. Beyond external and internal load, this might include maturation, injury history, neuromuscular readiness, psychosocial indicators, school demands, competitive context and technical-tactical observation. Such work would be particularly valuable if it examined how coaches trigger specific decisions.

Finally, future research could investigate more deeply how coaches and multidisciplinary staff negotiate priorities between long-term player development and immediate competitive demands, particularly how different clubs balance development, availability, readiness and performance across the season. This could be strengthened by including players, head coaches, medical staff, analysts and planning documents, allowing researchers to triangulate what is

planned, what is reported, what is delivered and how these processes are experienced by different stakeholders.

CHAPTER 6 – FINAL CONSIDERATIONS

6. FINAL CONSIDERATIONS

This discussion interpreted the findings through an integrated lens, showing that, in the two cases analysed, the development of physical capacities in U-19 academy football was shaped by the interaction between coaching philosophy, contextual constraints, weekly organisation, available signals and individualisation mechanisms. Rather than reflecting the linear application of a predefined plan, physical programming emerged as a dynamic and situated process in which coaches sought to preserve key physical priorities while continuously adapting the week to the demands, constraints and information available within their specific contexts.

The main contribution of this dissertation lies in demonstrating that the microcycle operated as an organisational and regulatory unit, and that individualisation emerged within — rather than outside — the collective structure. Although the findings do not allow broad generalisations, they offer an illustrative conceptual proposal for understanding how two U-19 academy coaches navigated the space between what was ideally planned and what was possible to implement. This reinforces the importance of studying physical preparation in youth football not only through the capacities that should be trained, but also through the contextual conditions, signals and professional judgements that shape how those capacities are actually delivered.

CHAPTER 7 - REFERENCES

7. REFERENCES

Afonso, J., Pizarro, A., Pizzari, T., Reurink, G., Clemente, F. M., Silva, A. F., Akyildiz, Z., Chen, R., Thapa, R. K., Silva, J. R., Sarmento, H., Ramirez-Campillo, R., Andrade, R., & Rocha-Rodrigues, S. (2025). Injury risk and prevention research in sports: Are titles delivering on their promises or are they just a sales pitch to capitalize on a hot topic? Journal of Sport and Health Science, 15, 101048.

Afonso, J., Ramirez-Campillo, R., Moscão, J., Rocha, T., Zacca, R., Martins, A., Milheiro, A. A., Ferreira, J., Sarmento, H., & Clemente, F. M. (2021). Strength training versus stretching for improving range of motion: A systematic review and meta-analysis. Healthcare, 9(4), 427.

Alizadeh, S., Daneshjoo, A., Zahiri, A., Hadjizadeh Anvar, S., Goudini, R., Hicks, J. P., Konrad, A., & Behm, D. G. (2023). Resistance training induces improvements in range of motion: A systematic review and meta-analysis. Sports Medicine, 53(3), 707–722.

Altmann, S., Ruf, L., Backfisch, M., Thron, M., Woll, A., Walter, L., Kaul, D., Bergdolt, L., & Härtel, S. (2026). Assessing maximal sprinting speed in soccer: Criterion validity of commonly used devices. Science and Medicine in Football, 10(1), 126–131.

Asimakidis, N. D., Beato, M., Bishop, C. J., & Turner, A. N. (2025). Evaluating the reliability and seasonal sensitivity of a fitness-testing battery in elite youth soccer. International Journal of Sports Physiology and Performance, 20(8), 1091–1102.

Asimakidis, N. D., Bishop, C. J., Beato, M., Mukandi, I. N., Kelly, A. L., Weldon, A., & Turner, A. N. (2024). A survey into the current fitness testing practices of elite male soccer practitioners: From assessment to communicating results. Frontiers in Physiology, 15, 1376047.

Badby, A. J., Comfort, P., Ripley, N. J., Cuthbert, M., Robles-Palazón, F. J., Mundy, P. D., & McMahon, J. J. (2025). Which metrics can I monitor? Test-retest reliability of countermovement jump and countermovement rebound

jump force-time metrics in youth soccer players in-season. International Journal of Strength and Conditioning, 5(1), Article 418.

Bailey, R., Collins, D., Ford, P., MacNamara, Á., Toms, M., & Pearce, G. (2010). Participant development in sport: An academic review. Sports Coach UK.

Bangsbo, J. (2014). Physiological demands of football. Sports Science Exchange, 27(125), 1–6.

Baskerville, D., & Goldblatt, H. (2009). Learning to be a critical friend: From professional indifference through challenge to unguarded conversations. Cambridge Journal of Education, 39(2), 205–221.

Behm, D. G., Konrad, A., Nakamura, M., Alizadeh, S., Culleton, R., Hadjizadeh Anvar, S., Pearson, L. T., Ramirez-Campillo, R., & Sale, D. G. (2025). A narrative review of velocity-based training best practice: The importance of contraction intent versus movement speed. Applied Physiology, Nutrition, and Metabolism, 50, 1–9.

Bloomfield, J., Polman, R., & O'Donoghue, P. (2007). Physical demands of different positions in FA Premier League soccer. Journal of Sports Science and Medicine, 6(1), 63–70.

Bompa, T. O., & Haff, G. G. (2009). Periodization: Theory and methodology of training (5th ed.). Human Kinetics.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. Qualitative Research in Sport, Exercise and Health, 11(4), 589–597.

Bryman, A. (2001). Social research methods. Oxford University Press.

Buchheit, M., Douchet, T., Settembre, M., McHugh, D., Hader, K., & Verheijen, R. (2024). The 11 evidence-informed and inferred principles of microcycle periodization in elite football. Sport Performance & Science Reports, 218, 1–23.

Carling, C., Le Gall, F., & Dupont, G. (2012). Are physical performance and injury risk in a professional soccer team in match-play affected over a prolonged period of fixture congestion? International Journal of Sports Medicine, 33(1), 36–42.

Carron, A. V., Colman, M. M., Wheeler, J., & Stevens, D. (2002). Cohesion and performance in sport: A meta-analysis. Journal of Sport & Exercise Psychology, 24(2), 168–188.

Clemente, F. M., Praça, G. M., Bredt, S. G. T., de Andrade, A. G. P., Aquino, R., & Mazzilli, L. O. (2021). Effects of small-sided game interventions on the technical execution and tactical behaviours of young and youth team-sport players: A systematic review and meta-analysis. Frontiers in Psychology, 12, 667041.

Clemente, F. M., Silva, A. F., Rampinini, E., & Mendes, B. (2022). The effects of pitch size and format variability on training and match-play demands in soccer: A systematic review and meta-analysis of small-sided games. International Journal of Environmental Research and Public Health, 19(20), 13343.

Cushion, C. J., Harvey, S., Muir, B., & Nelson, L. (2012). Developing the Coach Analysis and Intervention System (CAIS): Establishing validity and reliability of a computerised systematic observation instrument. Journal of Sports Sciences, 30(2), 201–216.

Côté, J., Baker, J., & Abernethy, B. (2007). Practice and play in the development of sport expertise. In G. Tenenbaum & R. C. Eklund (Eds.), Handbook of sport psychology (3rd ed., pp. 184–202). Wiley.

de Dios-Álvarez, V., Suárez-Iglesias, D., Bouzas-Rico, S., Alkain, P., González-Conde, A., & Ayán-Pérez, C. (2023). Relationships between RPE-derived internal training load parameters and GPS-based external training load variables in elite young soccer players. Research in Sports Medicine, 31(6), 1240–1255.

Ditroilo, M., Mesquida, C., Abt, G., & Lakens, D. (2025). Exploratory research in sport and exercise science: Perceptions, challenges, and recommendations. Journal of Sports Sciences, 43(12), 1108–1120.

Douchet, T., Paizis, C., Carling, C., & Babault, N. (2024). Influence of a modified versus a typical microcycle periodization on the weekly external loads and match-day readiness in elite academy soccer players. Journal of Human Kinetics, 93, 133–144.

Einstein, A. (1931). Cosmic religion: With other opinions and aphorisms. Covici-Friede.

Ekstrand, J., Spreco, A., Bengtsson, H., Bahr, R., & Karlsson, J. (2020). Are elite soccer teams' preseason training sessions associated with fewer in-season injuries? A 15-year analysis from the UEFA Elite Club Injury Study. The American Journal of Sports Medicine, 48(3), 723–729.

Faigenbaum, A. D., Lloyd, R. S., MacDonald, J., & Myer, G. D. (2016). Citius, altius, fortius: Beneficial effects of resistance training for young athletes. British Journal of Sports Medicine, 50(1), 3–7.

Ford, P., De Ste Croix, M., Lloyd, R., Meyers, R., Moosavi, M., Oliver, J., Till, K., & Williams, C. (2011). The long-term athlete development model: Physiological evidence and application. Journal of Sports Sciences, 29(4), 389–402.

Franceschi, A., Nguyen, A.-D., Gomollón, N., Godwin, M. S., Núñez, F. J., & McMahon, J. J. (2023). Test-retest reliability of force-time characteristics during countermovement and rebound jumps in youth soccer players. Journal of Strength and Conditioning Research, 37(12), 2498–2508.

Gabbett, T. J. (2016). The training-injury prevention paradox: Should athletes be training smarter and harder? British Journal of Sports Medicine, 50(5), 273–280.

Gençoğlu, C., Karavelioğlu, M. B., Oranchuk, D. J., & Akyüz, O. (2023). Validity and reliability of the My Jump app to assess vertical jump performance: A meta-analytic review. Scientific Reports, 13, 21043.

González-Víllora, S., Serra-Olivares, J., Pastor-Vicedo, J. C., & Teoldo da Costa, I. (2015). Review of the tactical evaluation tools for youth players, assessing the tactics in team sports: Football. SpringerPlus, 4, 663.

Greenberg, E. M., Greenberg, E. T., Albaugh, J., Storey, E., & Ganley, T. J. (2020). Uninjured youth athlete performance on single-leg hop testing: How many can achieve recommended return-to-sport criterion? Orthopaedic Journal of Sports Medicine, 8(11), 2325967120961062.

Grgic, J. (2021). Reliability of the 30-15 Intermittent Fitness Test: A systematic review and meta-analysis. Journal of Sports Sciences, 39(9), 1011–1020.

Grgic, J., Oppici, L., Mikulic, P., Bangsbo, J., Krustrup, P., & Pedisic, Z. (2019). Test-retest reliability of the Yo-Yo test: A systematic review. Sports Medicine, 49(10), 1547–1557.

Gómez-Álvarez, N., Ramirez-Campillo, R., Yanci, J., & Izquierdo, M. (2024). Effects of small-sided soccer games on physical fitness: A systematic review and meta-analysis. Journal of Clinical Medicine, 13(17), 5221.

Haff, G. G., & Triplett, N. T. (Eds.). (2016). Essentials of strength training and conditioning (4th ed.). Human Kinetics.

Hannon, M. P., Coleman, N. M., Parker, L. J. F., McKeown, J., Unnithan, V. B., Close, G. L., Drust, B., & Morton, J. P. (2021). Seasonal training and match load and micro-cycle periodization in male Premier League academy soccer players. Journal of Sports Sciences, 39(16), 1838–1849.

Harper, D. J., McBurnie, A., Dos' Santos, T., Bishop, C., & Cronin, J. B. (2022). Biomechanical and neuromuscular performance determinants of horizontal deceleration: A review with implications for training and injury mitigation. Sports Medicine, 52(11), 2457–2484.

Hill-Haas, S. V., Dawson, B., Impellizzeri, F. M., & Coutts, A. J. (2011). Physiological, technical, and tactical responses to small-sided games in soccer: A systematic review. Sports Medicine, 41(3), 199–220.

Inoue, A., de Almeida, M. O., Penna, E. M., Palucci Vieira, L. H., & João, P. V. (2022). Internal training load perceived by athletes and planned by coaches: A systematic review and meta-analysis. Sports Medicine - Open, 8, 150.

Issurin, V. (2010). New horizons for the methodology and physiology of training periodization. Sports Medicine, 40(3), 189–206.

Jeffreys, I. (2013). Developing speed. Human Kinetics.

Kanaras, V., Michailidis, Y., Mandroukas, A., Stafylidis, A., Vardakis, L., Kyranoudis, A. E., Christoulas, K., Gissis, I., & Metaxas, T. I. (2024). Weekly external load correlation in season microcycles with game running performance and training quantification in elite young soccer players. Sensors, 24(14), 4523.

Kiely, J. (2018). Periodization theory: Confronting an inconvenient truth. Sports Medicine, 48(4), 753–764.

Krolo, A., Gilic, B., Foretic, N., Pojskic, H., Hammami, R., Spasic, M., Uljevic, O., & Sekulic, D. (2020). Agility testing in youth soccer players: Evaluating reliability, validity, and correlates of newly developed testing protocols. International Journal of Environmental Research and Public Health, 17(1), 294.

Kusuma, K. C. A., Artanayasa, I. W., & Lesmana, K. Y. P. (2025). Yo-Yo intermittent recovery test level 1 for young soccer player: Test-retest reliability. Jurnal Keolahragaan, 13(1), 10–17.

Lechner, S., Ammar, A., Boukhris, O., Trabelsi, K., Glenn, J. M., Schwarz, J., Hammouda, O., Zmijewski, P., Chtourou, H., Driss, T., & Hoekelmann, A. (2023). Monitoring training load in youth soccer players: Effects of a six-week preparatory training program and the associations between external and internal loads. Biology of Sport, 40(1), 63–75.

Lee, Y.-S., Lee, D., & Ahn, N. Y. (2024). SAQ training on sprint, change-of-direction speed, and agility in U-20 female football players. PLOS ONE, 19(3), e0299204.

Leeder, J., Gissane, C., van Someren, K., Gregson, W., & Howatson, G. (2012). Cold water immersion and recovery from strenuous exercise: A systematic review and meta-analysis. British Journal of Sports Medicine, 46(4), 233–240.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Sage.

Lloyd, R. S., Cronin, J., Faigenbaum, A. D., Haff, G. G., Howard, R., Kraemer, W. J., Micheli, L. J., Myer, G. D., & Oliver, J. L. (2016). National Strength and Conditioning Association position statement on long-term athletic development. Journal of Strength and Conditioning Research, 30(6), 1491–1509.

Lloyd, R. S., Faigenbaum, A. D., Myer, G. D., Stone, M. H., Oliver, J. L., Jeffreys, I., Moody, J. A., Brewer, C., Pierce, K. C., McCambridge, T. M., Howard, R., Herrington, L., Hainline, B., Micheli, L. J., Jaques, R., Kraemer, W. J., McBride, M. G., Best, T. M., Chu, D. A., & Alvar, B. A. (2014). Position

statement on youth resistance training: The 2014 International Consensus. British Journal of Sports Medicine, 48(7), 498–505.

Lloyd, R. S., Faigenbaum, A. D., Stone, M. H., Oliver, J. L., Jeffreys, I., Moody, J. A., Brewer, C., Pierce, K. C., O'Bryant, H. S., Micheli, L. J., Knight, C. A., & Kraemer, W. J. (2015). Long-term athletic development-Part 1: A pathway for all youth. Journal of Strength and Conditioning Research, 29(5), 1439–1464.

Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). Growth, maturation, and physical activity (2nd ed.). Human Kinetics.

Martín-Moya, R., Silva, A. F., Clemente, F. M., & González-Fernández, F. T. (2023). Effects of combined plyometric, strength and running technique training on change-of-direction and countermovement jump: A two-armed parallel study on young soccer players. Gait & Posture, 105, 27–34.

Marynowicz, J., Kikut, K., Lango, M., Horna, D., & Andrzejewski, M. (2020). Relationship between session rating of perceived exertion and external training load measures in youth soccer. Journal of Strength and Conditioning Research, 34(10), 2800–2804.

Maxwell, J. A. (2012). Qualitative research design: An interactive approach (3rd ed.). Sage.

McMillan, J. H., & Schumacher, S. (2014). Research in education: Evidence-based inquiry (7th ed.). Pearson.

Mujika, I. (2017). Quantification of training and competition loads in endurance sports: Methods and applications. International Journal of Sports Physiology and Performance, 12(Suppl. 2), S2-9–S2-17.

Mujika, I., & Padilla, S. (2003). Scientific bases for precompetition tapering strategies. Medicine & Science in Sports & Exercise, 35(7), 1182–1187.

Nelson, L., Groom, R., & Potrac, P. (Eds.). (2025). Research methods in sports coaching (2nd ed.). Routledge.

Nimphius, S., Callaghan, S. J., Spiteri, T., & Lockie, R. G. (2018). Change-of-direction and agility tests: Challenging our current measures of performance. Strength & Conditioning Journal, 40(1), 26–38.

Nédélec, M., McCall, A., Carling, C., Le Gall, F., Berthoin, S., & Dupont, G. (2013). Recovery in soccer: Part II-Recovery strategies. Sports Medicine, 43(1), 25–41.

Oliva-Lozano, J. M., Gómez-Carmona, C. D., Fortes, V., & Pino-Ortega, J. (2022). Effect of training day, match, and length of the microcycle on workload periodization in professional soccer players: A full-season study. Biology of Sport, 39(2), 397–406.

Oliver, J. L., Ford, P., De Ste Croix, M., Lloyd, R. S., & Myer, G. D. (2024). The effects of strength, plyometric and combined training on strength, power and speed characteristics in high-level, highly trained male youth soccer players: A systematic review and meta-analysis. Sports Medicine, 54(3), 623–643.

Patton, M. Q. (2015). Qualitative research & evaluation methods (4th ed.). Sage.

Ramirez-Campillo, R., Sortwell, A., Moran, J., Afonso, J., Clemente, F. M., Lloyd, R. S., Oliver, J. L., Pedley, J., & Granacher, U. (2023). Plyometric-jump training effects on physical fitness and sport-specific performance according to maturity: A systematic review with meta-analysis. Sports Medicine - Open, 9(1), 23.

Ramos, A., Coutinho, P., Davids, K., & Mesquita, I. (2021). Developing players' tactical knowledge using combined constraints-led and step-game approaches: A longitudinal action-research study. Research Quarterly for Exercise and Sport, 92(4), 584–598.

Ravé, G., Granacher, U., Boullosa, D., Hackney, A. C., & Zouhal, H. (2020). How to use Global Positioning Systems data to monitor training load in the real world of elite soccer. Frontiers in Physiology, 11, 944.

Reilly, T., & Gilbourne, D. (2003). Science and soccer: A review of applied research in the soccer codes. Journal of Sports Sciences, 21(9), 693–705.

Sarstedt, M., Bengart, P., Shaltoni, A. M., & Lehmann, S. (2018). The use of sampling methods in advertising research: A gap between theory and practice. International Journal of Advertising, 37(4), 650–663.

Sattler, T., Sekulić, D., Spasić, M., Perić, M., Krolo, A., Uljević, O., & Kondrič, M. (2015). Analysis of the association between motor and anthropometric

variables with change of direction speed and reactive agility performance. Journal of Human Kinetics, 47, 137–145.

Sekulović, V., Jezdimirović-Stojanović, T., Andrić, N., Elizondo-Donado, A., Martin, D., Mikić, M., & Stojanović, M. D. M. (2024). Effects of in-season velocity-based vs. traditional resistance training in elite youth male soccer players. Applied Sciences, 14(20), 9192.

Sheppard, J. M., & Young, W. B. (2006). Agility literature review: Classifications, training and testing. Journal of Sports Sciences, 24(9), 919–932.

Silva, J. R., Brito, J., Akenhead, R., & Nassis, G. P. (2016). The transition period in soccer: A window of opportunity. Sports Medicine, 46(3), 305–313.

Skala, F., Horníková, H., Vrablanský, M., & Zemková, E. (2025). Concurrent validity of single- and dual-beam timing systems for linear and change of direction speed testing in youth soccer players. Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology.

Smiley, T., Dallman, J., Long, R., Kapple, M., Aldag, L., Mok, A., Bernard, C., Martin, K., Vopat, L., & Vopat, B. (2024). Lower extremity return to sport testing: A systematic review. The Knee, 50, 115–146.

Smith, K., Wright, M. D., Chesterton, P., & Taylor, J. M. (2025). Estimating maximal aerobic speed in academy soccer players: A comparison between time-trial methods and the 30-15 Intermittent Fitness Test. European Journal of Sport Science, 25(6), e12315.

Sparkes, A. C., & Smith, B. (2014). Qualitative research methods in sport, exercise and health: From process to product. Routledge.

Sporiš, G., Jukić, I., Milanović, L., & Vučetić, V. (2010). Reliability and factorial validity of agility tests for soccer players. Journal of Strength and Conditioning Research, 24(3), 679–686.

Stafylidis, A., Michailidis, Y., Mandroukas, A., Metaxas, I., Chatzinikolaou, K., Stafylidis, C., Papadopoulou, S. D., & Metaxas, T. I. (2025). Validity and reliability of the MyJump 2 application for measuring vertical jump in youth soccer players across age groups. Applied Sciences, 15(11), 6253.

Stake, R. E. (2006). Multiple case study analysis. Guilford Press.

Stone, M. H., O'Bryant, H. S., & Garhammer, J. (2004). Programming to enhance strength and power. Strength & Conditioning Journal, 26(4), 22–30.

Trajković, N., Sporiš, G., Krističević, T., Madić, D. M., & Bogataj, Š. (2020). The importance of reactive agility tests in differentiating adolescent soccer players. International Journal of Environmental Research and Public Health, 17(11), 3839.

Vardakis, L., Koutsokosta, M., Michailidis, Y., Zelenitsas, C., Topalidis, P., & Metaxas, T. I. (2024). Correlation between perceived exertion, wellness scores, and training load in professional football across microcycle durations. Applied Sciences, 14(15), 6767.

CHAPTER 8 - APPENDIX

8. Appendix

Informed Consent Term (portuguese version delivered to players)

U.PORTO
FACULDADE DE DESPORTO
UNIVERSIDADE DO PORTO

Termo de Consentimento

Caro Treinador,

A presente investigação visa a elaboração da dissertação para a conclusão do 2º Ciclo em Treino Desportivo – Ramo de Alto Rendimento, da Faculdade de Desporto da Universidade do Porto.

As metodologias de treino para o desenvolvimento das capacidades físicas em jovens jogadores de futebol têm sido objeto de crescente interesse devido à sua influência crucial no desempenho desportivo e na formação atlética dos jogadores em fase de crescimento. A busca por estratégias eficazes para aprimorar aspetos como força, resistência, velocidade, agilidade, entre outros tornou-se uma prioridade nos círculos desportivos.

No contexto do futebol juvenil, diversos desafios se apresentam, incluindo a necessidade de adaptação dos processos de treino às características específicas dessa faixa etária, bem como à promoção de um ambiente que favoreça o desenvolvimento físico e mental dos jogadores em formação. Este estudo propõe-se a investigar e analisar diferentes metodologias de treino destinadas a otimizar as capacidades físicas de jovens jogadores de futebol, visando fornecer insights valiosos para clubes e treinadores no aprimoramento do processo de formação desportiva.

O estudo foi desenhado para observar e analisar as metodologias de treino usadas no desenvolvimento das capacidades físicas dos jovens jogadores. Para obtermos as informações necessárias relativas às metodologias usadas, serão observados treinos e realizadas entrevistas aos treinadores responsáveis. A metodologia proposta consiste num estudo de caso desenhado com o intuito de perceber o porquê da escolha/utilização das mesmas. A mesma não contempla quaisquer riscos para os participantes.

Para a análise das variáveis pretendidas recorrer-se-á a apontamentos escritos durante os treinos e gravação das entrevistas aos treinadores, procedimento que será para uso restrito da equipa de investigação estando a confidencialidade garantida em todos os dados recolhidos. Além da utilização de pseudónimos, os dados originais serão guardados em discos encriptados

e acessíveis apenas pela equipa de investigação. Ademais, todas as transcrições de entrevistas serão fornecidas aos treinadores participantes, para validarem e/ou editarem as transcrições antes da sua utilização para efeitos de análise dos dados.

A participação no presente estudo será voluntária, pelo que o treinador tem o direito de não participar, assim como a possibilidade de desistir a qualquer momento.

.....

Dado o entendimento das implicações do estudo, permitindo assim a utilização das informações para fins científicos e pedagógicos e concordância com uma participação voluntária:

Eu (treinador) _____, concordo em participar no estudo acima descrito, e autorizo a utilização das informações e a gravação das entrevistas com uso restrito confinado às instituições envolvidas.

_____, ___ de _____ de 202__

Assinatura do Treinador

_____

Interview Guide

Theme	Questions	Purpose
Training Methodology	• What are the main principles and philosophies behind your team's training methodology, that is, what are the main ideas that guide your team's training? Why these ideas? Can you give me examples? • How do you approach/work on the development of players' physical abilities during training sessions? Can you give me examples? • Is there a specific emphasis on certain aspects of training, such as endurance, strength, speed or agility? Is this emphasis the same throughout the microcycles? Why? If it does, does it vary depending on what and why? Can you give me examples? • What are the common or distinct strategies used to develop training programs that target different motor skills? Why and how do you make this distinction? Can you give me examples? • How do you balance the specificity of training with the need to address a diverse range of motor skills? Can you give me examples? • How do you see the importance of complementary training in the physical preparation of the players? Why do they look at it that way? Is the way you see it the same throughout the season? Why? Can you give me examples? • How are these moments integrated into training programs and how do they contribute to the development and performance of players? Are they integrated in the same way throughout the era? Why? Can you give me examples?	Understand the fundamental principles and general approaches used by trainers in conducting training sessions. This helps to identify the emphases and priorities in developing the physical capabilities of the players.
Periodization and Scheduling of Training	• How is the periodization of training planned throughout the season? Why do you opt for this form of periodization? Does it meet the team's goals? The key moments of the season? • Are there variations in the approach to training during the different phases of the season (pre-season, in-season and post-season? Why? Can you give me examples? • How are rest and recovery periods scheduled throughout the season? Why? Can you give me examples? • Considering the context of motor skills training, how do you approach the management of these players in terms of the distribution of playing minutes, specific training regimes and strategies to maintain a balance between preserving fitness and performance on the field? Is the approach the same throughout the season? Why? Can you give me examples? • What is the perception of the integration of substitute players in training programs, when it comes to developing and maintaining different motor skills? Is this integration	Explore how coaches plan and adjust training throughout the season. This allows you to understand how the different phases of training are structured to optimize the performance and physical condition of the players.

	the same throughout the season? Why? Can you give me examples?	
Recovery Strategies	• How do you deal with optimizing the performance of players, considering both aspects related to training and recovery strategies? How is this management done throughout the season? Why is it done this way? Can you give me examples? • In the training approach, are specific methods implemented to prevent injuries and manage physical fatigue? Which and how are these considerations integrated into training programs? Why are these and so? Can you give me examples? • When it comes to managing fatigue throughout the season, how are the demands of training balanced with the need to allow for proper recovery? Why do they do it that way? Can you give me examples? • What are the strategies to maintain a healthy balance between effort and recovery? Are they the same throughout the season? Why do you use those? Can you give me examples?	Investigate the practices adopted to ensure the proper recovery of players, minimize injuries and manage fatigue. This information is crucial to understanding how clubs take care of the health and physical condition of players.
Personalized Approach	• Is there a personalized approach to training, considering the individual or positional needs of the players? Why do you consider this personalized embroidery important? Can you give me examples? • How are the specific physical characteristics and abilities of each player evaluated and incorporated into training planning? Is it the same for all players? Why? Can you give me examples?	Find out if there is an individualized consideration in training, considering the unique characteristics of each player. This helps to understand if the training is adapted to the specific needs of each player.
Evidence-Based Methods	• Is the training practices based on methods based on scientific evidence? Which ones? Why do you think it is important to use methods based on scientific evidence? Have they followed in a rigorous way? Why? Can you give me examples? • How are research and scientific findings integrated into the training methodology? Why do you integrate them? What are the latest scientific discoveries that have been integrated into your training? Why? Can you give me examples? • How often, and based on what factors, does the training plan change as it progresses. What impact could this have on the development of their motor skills? Why? Can you give me examples?	Assess whether training practices are based on scientific evidence. This is important to ensure that training decisions are informed by up-to-date research and knowledge.
Club Culture and Training Environment	• What is the club's culture? How does club culture influence training decisions? Why? Can you give me examples? • How is a positive and motivating environment created and maintained in training for players? What is a positive environment for you? Why is it important in training? Can you give me examples?	Explore how club culture influences training practices and how an environment conducive to player development is cultivated. This provides insights into the cultural

	• Are there specific traditions or cultural values that have an impact on training? What traditions or cultural values? Why do they impact training? Can you give me examples?	aspects that can shape training decisions.