UNIVERSIDAD POLITÉCNICA DE MADRID
Facultad de Ciencias de la Actividad Física y del Deporte

COACHING BEHAVIOUR AND YOUTH DEVELOPMENT IN CHINESE YOUTH FOOTBALL

DOCTORAL THESIS

Submitted for the degree of Doctor by:

Runze Feng
Master's Degree in Physical Education and Training
Beijing Sport University
Master's Degree in Sports Training and Nutrition
European University of Madrid

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Under the supervision of:
Dr. Miguel Ángel Gómez Ruano

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Title: Coaching Behaviour and Youth Development in Chinese Youth Football

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Declaration

I, Feng Runze, declare that the Doctor of Philosophy thesis entitled "Coaching Behaviour and Youth Development in Chinese Youth Football" is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This Ph.D. thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my work.

Signature: Date:

Sponsorship

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Dedication

To those who accompany, support, help and care about me

in this journey.

To my wife and my parents.

Dedicación

A quienes me acompañan, apoyan, ayudan y se preocupan por mí en este viaje.

A mi mujer y mis padres.

谨献给

那些一路陪伴我、支持我、帮助我、关心我的人。

我的妻子和我的父母。

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Abstract

Purpose: Coaching behaviour has been demonstrated to be closely associated with talent development and further linked to players' future success. The general objective of the Ph.D. thesis is to explore the better way to develop youth football players, specifically focusing on finding approaches better suited for Chinese contexts, considering factors of coaching and the youth development pathway. To implement our purpose, the thesis is structured around the following two main research aims: 1) compare the coaching behaviour and training activities between Sino-Spain youth football coaches to explore the impact of different pedagogies on coach's behaviour and players' perceptions ***(Aim 1)***; and 2) examine the associations of early specialization, sports volume, and maturity status with musculoskeletal injuries in elite youth football players, to propose relevant suggestions for long-term development of youth players ***(Aim 2)***.

Methods: The methodology was split into two main sections focused on each aim, respectively. Systematic observations and semi-structured interviews were developed for 6 youth coaches from Madrid (n = 3) and Beijing (n = 3). 16 players were randomly selected from each academy and were queried about their perception. Then the thematic analysis was done to qualitatively analysing the interview data using NVivo 14 ***(Aim 1)***. Secondly, players who participated in the National School Football Winter Camp were invited to fill out a questionnaire that included the data of maturity, level of early specialization (ES), sports volume, and injury history (n=178 children, n=88 boys and n=90 girls) ***(Aim 2)***.

Results: The results of the PhD thesis were described for each specific aim. ***Aim 1:*** The results of the case study showed significant differences in coaching behaviours and training activities between Sino-Spain coaches. Madrid coaches used more "playing form" (PF) and achieved greater times of activation (motor participation) during practices, compared to Beijing coaches. Concurrent instruction was the most used behaviour among coaches from both groups. Moreover, Madrid coaches applied more "positive feedback" whereas Beijing coaches used more "negative feedback". This phenomenon is related to different educational and pedagogical backgrounds. ***Aim 2:*** The survey results have shown that 80.3% of the athletes were classified as ES, while 19.7% of the athletes were classified as not ES. Almost all athletes (96%) participated in a sport for more than eight months in a year. Most athletes (75.8%) spent more than twice of the time on organized sports than

leisure activities. And 30.3% of athletes trained exceeding average weekly hours per week based on age in years. Binomial logistic regression models showed that there were significant differences in the odds ratios (OR) of reporting a history of injury among athletes with different levels of ES (p=0.024); there were significant differences in the odds of reporting a history of leg injury among players with different weekly sports volumes (p=0.038); The OR of players reporting foot injuries were significantly different between players with different maturity state (p=0.046); The OR of reporting acute injuries were significantly different between players with different levels of ES (p=0.054) and weekly activity (p=0.061). No significant differences were found between the remaining independent variables and the dependent variable.

Conclusions: The case study revealed significant differences in coaching behaviours and training activities between Madrid and Beijing coaches. Positive feedback is recommended to Beijing coaches and "silence" should also be properly used while "instruction" and "hustle" should be carefully used to help players learn to "think" (e.g., decision-making). This study offers a comparative analysis to develop proper strategies for a better player's development *(Aim 1)*. The survey study showed most school football elite players still follow the ES pathway. However, in the context of School Football Programme, early specialization still increases the risk of injury, especially acute injury. Pre-pubertal and early pubertal players have a higher incidence of foot injuries; players who train more hours per week than their age have more leg injuries and acute injuries. Therefore, priority protection and intervention should be carried out for groups with a high risk of injury *(Aim 2)*.

Key words: football, youth development, coaching behaviour, Chinese football, player learning, early specialization, sport pedagogy, school football.

Resumen

Objetivo: El comportamiento del entrenador ha demostrado estar estrechamente asociado con el desarrollo del talento y además vinculado al éxito futuro de los jugadores. El objetivo general de la tesis de doctorado es explorar la mejor manera de desarrollar a los jugadores juveniles de fútbol, centrándose específicamente en encontrar enfoques más adecuados para contextos chinos, considerando factores relacionados con el entrenamiento y el camino de desarrollo juvenil. Para llevar a cabo nuestro propósito, la tesis se estructura en torno a los siguientes dos objetivos de investigación principales: 1) comparar el comportamiento del entrenador y las actividades de entrenamiento entre entrenadores juveniles sino-españoles para explorar el impacto de diferentes pedagogías en el comportamiento del entrenador y las percepciones de los jugadores *(Objetivo 1)*; 2) examinar las asociaciones de la especialización temprana, el volumen deportivo y el estado de maduración con las lesiones musculoesqueléticas en jugadores juveniles de fútbol de élite, para proponer sugerencias relevantes para el desarrollo a largo plazo de los jugadores juveniles *(Objetivo 2)*.

Métodos: La metodología se dividió en dos secciones principales centradas en cada objetivo, respectivamente. Se desarrollaron observaciones sistemáticas y entrevistas semiestructuradas para 6 entrenadores juveniles de Madrid (n = 3) y Beijing (n = 3). Se seleccionaron aleatoriamente 16 jugadores de cada academia y se les preguntó acerca de su percepción. Luego se realizó un análisis temático para analizar los datos de las entrevistas utilizando NVivo 14 *(Objetivo 1)*. En segundo lugar, se invitó a los jugadores que participaron en el Campamento de Fútbol Escolar Nacional de Invierno a completar un cuestionario que incluía datos de madurez, nivel de especialización temprana (ET), volumen deportivo e historial de lesiones (n=178 niños, n=88 niños y n=90 niñas) *(Objetivo 2)*.

Resultados: Los resultados de la tesis doctoral se describieron para cada objetivo específico. *Objetivo 1:* Los resultados del estudio de caso mostraron diferencias significativas en los comportamientos de entrenamiento y las actividades de entrenamiento entre los entrenadores sino-españoles. Los entrenadores de Madrid utilizaron más la "forma de juego" (PF) y lograron mayores tiempos de activación (participación motora) durante las prácticas, en comparación con los entrenadores de Beijing. La instrucción simultánea fue el comportamiento más utilizado entre los entrenadores de ambos grupos. Además, los entrenadores de Madrid aplicaron más "retroalimentación positiva", mientras que los entrenadores de Beijing usaron

más “retroalimentación negativa”. Este fenómeno está relacionado con diferentes antecedentes educativos y pedagógicos. *Objetivo 2:* Los resultados de la encuesta han mostrado que el 80.3% de los atletas fueron clasificados como ET, mientras que el 19.7% de los atletas fueron clasificados como no ET. Casi todos los atletas (96%) participaron en un deporte durante más de ocho meses al año. La mayoría de los atletas (75.8%) pasaron más del doble del tiempo en deportes organizados que en actividades de ocio. Y el 30.3% de los atletas entrenaron más horas por semana de las recomendadas según su edad en años. Los modelos de regresión logística binomial mostraron que hubo diferencias significativas en las odds ratios (OR) de informar una historia de lesiones entre los atletas con diferentes niveles de ET (p=0.024); hubo diferencias significativas en las odds de informar una historia de lesión en la pierna entre los jugadores con diferentes volúmenes deportivos semanales (p=0.038); Las OR de informar lesiones en el pie fueron significativamente diferentes entre los jugadores con diferentes estados de madurez (p=0.046); Las OR de informar lesiones agudas fueron significativamente diferentes entre los jugadores con diferentes niveles de ET (p=0.054) y actividad semanal (p=0.061). No se encontraron diferencias significativas entre las variables independientes restantes y la variable dependiente.

Conclusiones: El estudio de caso reveló diferencias significativas en los comportamientos de entrenamiento y actividades entre los entrenadores de Madrid y Beijing. Se recomienda el uso de retroalimentación positiva para los entrenadores de Beijing y también se debe utilizar “silencio” adecuadamente mientras que “instrucción” y “prisa” deben ser utilizados cuidadosamente para ayudar a los jugadores a “pensar” (por ejemplo, la toma de decisiones). Este estudio ofrece un análisis comparativo para desarrollar estrategias adecuadas para un mejor desarrollo de los jugadores *(Objetivo 1)*. El estudio de encuesta mostró que la mayoría de los jugadores de élite de fútbol escolar todavía siguen la vía de ET. Sin embargo, en el contexto del Programa de Fútbol Escolar, la especialización temprana sigue aumentando el riesgo de lesiones, especialmente lesiones agudas. Los jugadores prepuberales y puberales tempranos tienen una mayor incidencia de lesiones en el pie; los jugadores que entrenan más horas por semana que su edad tienen más lesiones en la pierna y lesiones agudas. Por lo tanto, se deben llevar a cabo protección e intervención prioritarias para grupos con alto riesgo de lesión *(Objetivo 2)*.

Palabras clave: fútbol, desarrollo juvenil, comportamiento de entrenador, fútbol chino, aprendizaje de jugadores, especialización temprana, pedagogía deportiva, fútbol escolar.

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Abbreviations and Acronyms

AFC	Asian Football Confederation
ASUOI	Arizona State University Observation Instrument
CASI	Coach Analysis and Intervention System
CBAS	Coaching Behaviour Assessment System
CI	Confidence Intervals
GCA	Game-centred approaches
GS	Game Sense
OR	Odds ratios
P	p value
PAH	Predicted Adult Height
PF	Playing form
PP	Play Practice
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RPM	Rate Per Minute
SFP	School Football Programme
TF	Training form
TGfU	Teaching Games for Understanding
TGM	Tactical Games Model
UEFA	Union of European Football Associations
UPM	Universidad Politécnica de Madrid

PhD Thesis *D. Feng Runze*

CHAPTER 1

Introduction

1. Introduction

1.1. General Introduction

"*Don't worry about the wins or losses. Just help these guys be the best version of themselves on and off the pitch. This, in the end, is the most important thing.*"

——Pep Guardiola (The Apple TV+ comedy "Ted Lasso")

The above quote is from a football coach Pep Guardiola in the Apple TV+ series "Ted Lasso," which highlights an aspirational view of holistic coaching practice and athlete development. Indeed, youth coaches, in particular, should recognize that their responsibilities extend beyond teaching athletic skills to young players (Gilbert & Trudel, 2001, 2004b). Sports coaching has long been considered a social and pedagogical endeavour (Gallimore & Tharp, 2004; Jones, 2006; Jones, Armour, & Potrac, 2002; Jones, Armour, & Potrac, 2003; Nelson, Groom, & Potrac, 2016; Tharp & Gallimore, 1976). That is, coaches are at the heart of the coaching process (Cushion, 2010), and play a central role in helping athletes/players psycho-social development both on and off the field. Importantly, coaching behaviour directly impact athletes' experiences of sport (Gallimore & Tharp, 2004; Lewis, Groom, & Roberts, 2014; Smith & Smoll, 2014; Tharp & Gallimore, 1976), therefore, paying attention to how their coaching behaviours impact the players' is an important part of the holistic development of athletes. Ex-England international team manager Graham Taylor highlighted the importance of caring for players/athletes and 'understanding them as people" as an essential element of elite football coaching (Potrac & Purdy, 2004).

Youth football training is a crucial phase in developing players' capabilities, techniques, tactics, and sport-related knowledge. Advanced football countries have successful youth development programs such as the talent identification and development programme of the German Football Association (Deutscher Fußball-Bund, DFB) (Grossmann & Lames, 2015), the "Purples Talents Project" in Belgium

(Horne, 2022), and the "Elite Player Performance Plan" in England (The Premier League, 2011), which all prioritize the development of future football players. Coaching is a key factor in the success of these programs (Strudwick, 2016). Coaches aim to develop and maximise players' technical and tactical skills (Martindale, Collins, & Daubney, 2005), as well as their physical and psychological factors (e.g., environment, club-related, or family-related). Coaches play a crucial role in both athlete and team development (Côté et al., 2010; Cushion, 2010; Cushion, Armour, & Jones, 2006). And coach behaviour has a significant impact on player's behaviour, cognition, and emotional response, affecting whether and what they learn (Mageau & Vallerand, 2003; Smith & Smoll, 2002), as well as player's social, emotional, and physical development (Cushion, Ford, & Williams, 2012; Jones, Housner, & Kornspan, 1997). Confidence and self-efficacy are distinguishing factors for successful athletes (Gould, Weiss, & Weinberg, 1981; Ortega et al., 2009), and coach behaviours greatly influence the development of self-confidence in youth players (Forlenza et al., 2018), and affect athletes' and teams' efficacy (García-Angulo et al., 2020).

Coaching behaviours in sports are influenced by various factors. For example, in football, coaches' behaviours vary based on age group, with younger age groups receiving more instructions and older age groups receiving more divergent questions, feedback, and punishment (Partington, Cushion, & Harvey, 2014); differences in coaching behaviours have also been observed between male and female coaches (Millard, 1996), and coaches with different academic backgrounds (Agusti et al., 2020; Stonebridge & Cushion, 2018; Viciana & Mayorga-Vega, 2015). In addition, relevant factors of coaching behaviours were identified in other sports, such as basketball, where coaches give more instructions to athletes who were deemed high in improvement potential than those low expectancy athletes (Solomon et al., 1998; Solomon et al., 1996). Coaching behaviours in American football also vary throughout the season (Lacy & Darst, 1985). In volleyball, coaches' feedback differs based on the athletes' level and the coaches' experience (Markland & Martinek, 1988).

Recent studies have identified practice activities as an important factor affecting coaching behaviour (Ford, Yates, & Williams, 2010; Partington & Cushion, 2013). Previous research divided practice activities into three types (O'Connor, Larkin, & Williams, 2018; Stonebridge & Cushion, 2018): a) "Training form" (TF) refers to activities without a game-related focus (e.g. fitness training and technical practice), which is also named as "drill-based activity" or "non-active decision-making activity"; b) "Playing form" (PF) refers to activities with a game related focus (e.g. small-sided games), which is also named as "game-based activity" or "active decision-making activity"; and c) "Inactivity" refers to the time when the teams are not actively participating in either training or playing form activities (e.g. water breaks or when the coach was organizing the players), which is also named as "other" or "transition". While coaches used to employ more TF activities than PF activities in the past (Ford, Yates, & Williams, 2010; Partington & Cushion, 2013; Partington, Cushion, & Harvey, 2014), recent studies have shown a trend towards using more PF activities, with PF becoming the largest composition of training sessions (Ford & Whelan, 2016; O'Connor, Larkin, & Williams, 2017; O'Connor, Larkin, & Williams, 2018; Stonebridge & Cushion, 2018). This shift can be attributed to increased coach education programs, workshops, and national curriculum emphasizing the importance of PF in youth training, which is considered a good resource to develop youth players' decision-making ability and realise the transfer of training skills to the real game (Ford & Whelan, 2016; O'Connor, Larkin, & Williams, 2017), and can potentially affect coaches' behaviour to facilitate positive learning effects for players (Partington & Cushion, 2013).

Since the 1970s, there has been a steady rise in research focusing on coaching science. Gilbert and Trudel (2004a) analysed all English-language coaching research published in journals between 1970 and 2001, revealing that coaching behaviour has been a focal area within coaching science, with 50.7% of the studies concentrating on what coaches currently do. Coaching behaviour within sports environment can be viewed as the professional behaviours taken during the coaching process to achieve the coaching objectives for athletes or teams (Cushion, 2010). Broadly speaking, coaching behaviour aims to interact with athletes or

teams, assisting them in achieving enhanced performance. Coaching behaviour significantly influences athletes' development of skills and shapes their sporting attitudes and values (Côté et al., 2010; Cushion, Armour, & Jones, 2006). Coaches' expressions, actions, and instructional approaches can impact athletes' emotions, confidence, and motivation (Forlenza et al., 2018). Furthermore, coaching behaviour closely correlates with team cooperation and overall performance (García-Angulo et al., 2020). For example, how a coach behaves may affect internal team communication, collaboration, and the establishment of a positive climate.

China is also developing football through a series of policy reforms. In April 2016, the People's Republic of China (PRC) launched the "football development plan in the medium and long term (2016-2050)". In this plan, it is clearly pointed out that China must follow the law of football development, start from the teenagers, start from the grassroots, grasp from the foundation, advance in an orderly manner, and persevere. Two important tasks are clearly defined in this plan: firstly, strengthening youth football training and strengthening School Football construction. Secondly, expanding the team of football coaches, improving the football-teaching level of physical education teachers, developing professional football teachers, and cultivating school football coaches. Strengthening the construction of professional coaches and constantly improving the coach system. Therefore, youth football training and coach education have become two major issues that try to revitalize the Chinese football.

CHAPTER 2

State of the Art

2. State of the Art

2.1. Research Background in Coaching Behaviour

The field of coaching behaviour, as a primary area in coaching science, has evolved significantly. Systematic observation has remained a crucial method for recording and comprehending coaching behaviour, because it offers detailed information on behaviour indicators, aiding coaches and researchers in better understanding coaching practices and behavioural patterns (Cope, Partington, & Harvey, 2017; Kahan, 1999). Research tools for systematic observation have continuously evolved. Over the past two decades, an increasing number of coaching behaviour studies have integrated interview techniques with systematic observation, aiming to capture coaches' subjective perspectives on their coaching behaviour and motivations, contributing to a more comprehensive research approach (Cope, Partington, & Harvey, 2017). Since the emergence of coaching science, football has consistently remained one of the most widely studied sports (Gilbert & Trudel, 2004a). Perhaps due to its global appeal, football boasts vast participation and competitions across various countries and regions. In comparison to other sports, football has been studied significantly more in research on coaching behaviour (Cope, Partington, & Harvey, 2017; Cushion, Ford, & Williams, 2012). Cushion, Ford and Williams (2012) reviewed six studies on coach behaviours in football and integrated diverse perspectives of research, summarizing the implications for talent development in football, and identified a gap between coaches' theory and practice, which is also a longstanding issue identified and discussed within coaching science for quite some time now.

To determine the current state of coaching behaviour research within the context of youth football, particularly emphasizing the synthesis and analysis of diverse viewpoints or themes being explored in this field, a systematic review was done in this section. This section followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines to examine the

literature on coaching behaviour in youth football. A customized search was completed for studies assessing coach behaviour in youth football according to the PRISMA guidelines. Studies were included in the final review if they contained the following:

1) Including relevant data regarding coaching behaviour.

2) Participants included amateur and/or elite youth footballers' coaches.

3) The articles were published in English.

The search strategy for identifying articles was broken down into two phases: 1º) a search of the electronic databases (following the PRISMA guidelines); and 2º) a search using additional resources (following the PRISMA guidelines). Phase 1 consisted of a search of two electronic databases - Web of Science (WOS) and SCOPUS - in the period January 1900 – November 2023. Studies were identified using the following search terms: "coach behaviour", "soccer OR football", and "youth". These search terms were found to be commonly used within the literature and were selected to increase the breadth of the search. Phase 2 consisted of a secondary search of external sources such as the reference list of articles found in Phase 1, references in books, and additional website searches. On completion of the first phase, the study's author(s), title, and year of publication were recorded and articles were sorted to eliminate duplicates. From the list of unique entries, the publication's title was read to discern whether the article was written in English and was in the form of a complete, peer-reviewed journal study (i.e., "reviews", "commentaries" or "abstracts" were not included). From this refined list, a more intensive assessment took place, which required obtaining the abstracts and the full-text articles.

The procedure of data analysis comprised three steps. Initially, the final selected 29 papers underwent uploading into the qualitative analysis software NVivo 14 to aid in data organization and coding. Subsequently, pertinent data were extracted from each study, encompassing research objectives, sample details, methodologies, and key findings from the results, discussions, and conclusions sections. Thirdly,

the key findings of the included studies underwent thematic analysis using NVivo 14 to generate themes. Specifically, the analysis followed the six phases of thematic analysis (Braun & Clarke, 2006), involving data familiarization, generating initial codes, theme identification, review of initial themes, defining and naming themes, and producing the report. The author engaged in data immersion, conducted open and organic coding, and formulated initial themes, subsequently reviewed, and defined by the research team.

Figure 2.1 displays a PRISMA flow diagram delineating the excluded articles across various phases of the review process (Tong et al., 2012). Phase 1 identified 510 articles from the database searches using the keywords listed above, with an English-language restriction imposed. Removal of duplicates resulted in a total of 360 articles. After reviewing the titles and abstracts, 288 of these records were eliminated, leaving 72 studies identified for full-text assessment. After a thorough assessment, 50 articles were removed as they did not include relevant data for this study, they involved adult football coaches or coaches of other sports, or they were focused on the grey areas. This left a total of 22 articles that remained in the final study selection for phase 1. Throughout the procedure of phase 2, seven additional articles were discovered by scrutinizing the reference lists of the included articles. The first author manually included these in the review, totalling 29 articles included in the final review. Appendix A shows the extraction data of the final included papers. And figure 4.2 show the number of publications on coaching behaviour in youth soccer in different years.

Table 2.1 shows the methodology used in the selected papers. Table 2.2 shows the results of the thematic analysis in the key findings of the selected papers. Table 2.3 shows the information about the research context of selected papers. Table 2.4 shows the research origin country of the selected papers. Table 2.5 shows the research instrument used in the selected papers. Table 2.6 shows the players' athletic level of the selected papers. Table 2.7 shows the information about the citations of the selected papers.

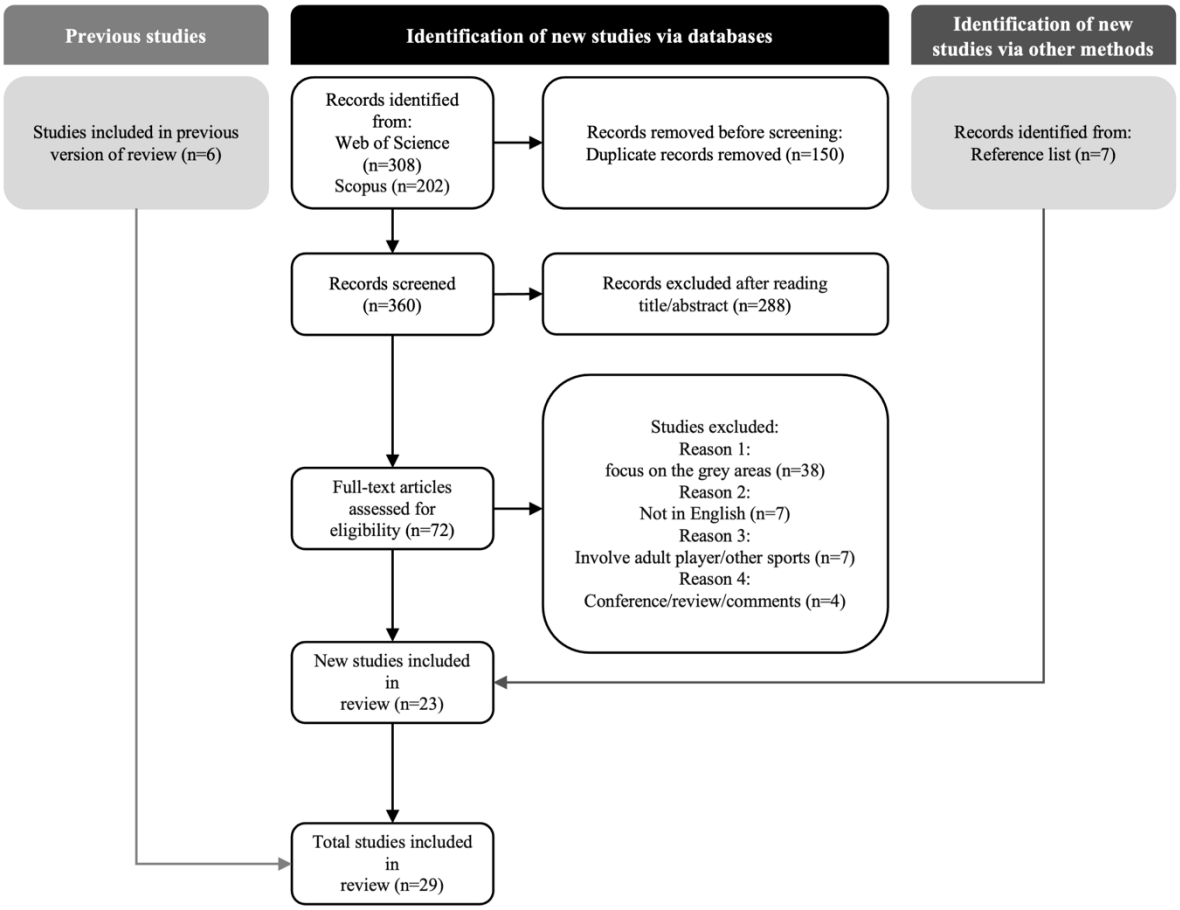


Figure 1 PRISMA flow chart showing the number of records collected and the number of eligible records after the screening process. PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table 1 Methodology analysis; ranked by No. of Publications; Quantitative QUANT; Qualitative QUAL; Mixed Method MM

Methodology	Num	Quant	Qual	MM
Systematic observation & interview	14			√
Systematic observation & questionnaires	2	√		
Systematic observation	8	√		
Observations in situ & questionnaire	1	√		
Semi-structured conversations, notes, coach dialogue	1		√	
Questionnaires	1	√		
Conversational analysis	1		√	
Systematic observation & interview & questionnaire	1			√

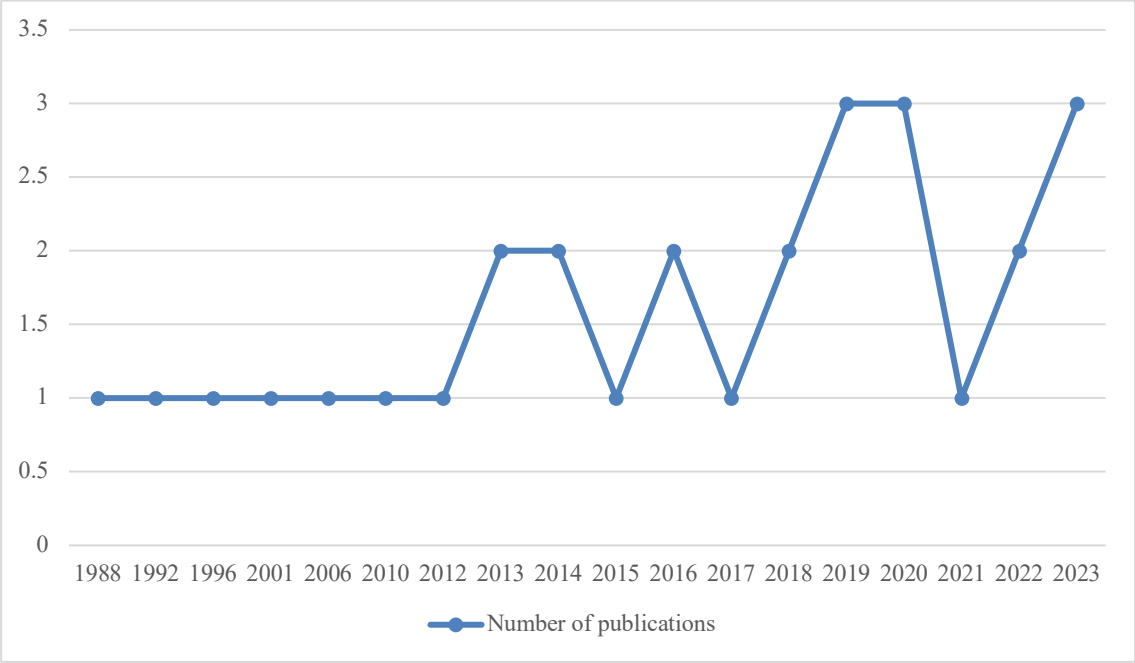


Figure 2 Number of publications on coaching behaviour in youth football

Table 2 Themes, subthemes, and the papers in which they were found

Theme	Subtheme	Paper
Coaching Behaviour - what coaches really done	Pattern of coaching behaviour and influencing factors	(Agusti et al., 2020), (Cope et al., 2016), (Cushion & Jones, 2001), (Ford et al., 2010), (Millard, Linda, 1996), (Miller, 1992), (O'Connor et al., 2018), (Partington & Cushion, 2012), (Partington & Cushion, 2013), (Partington et al., 2014), (Raya Castellano et al., 2020), (Santos et al., 2019), (Smith & Cushion, 2006), (Stodter & Cushion, 2019), (Stonebridge & Cushion, 2018), (Teques et al., 2019), (Wandzilak et al., 1988), (Worsfold, 2013).
	Practice activities	(Feng et al., 2023), (Ford et al., 2010), (O'Connor et al., 2018), (Partington & Cushion, 2013), (Wandzilak et al., 1988).
	Instruction & over coaching	(Cushion & Jones, 2001), (Feng et al., 2023), (Ford et al., 2010), (Lewis et al., 2014), (O'Connor et al., 2017), (Partington & Cushion, 2013), (Santos et al., 2019), (Smith & Cushion, 2006), (Vinson et al., 2016), (Wandzilak et al., 1988).
	Nature of training environment	(Cushion & Jones, 2001), (Feng et al., 2023), (Lewis et al., 2014), (Santos et al., 2019), (Teques et al., 2019), (Wandzilak et al., 1988).
Coaching behaviour and players' learning	Use of questions to promote learning	(O'Connor et al., 2017), (Raya Castellano et al., 2020), (Raya-Castellano et al., 2022), (Raya-Castellano et al., 2023), (Vinson et al., 2016).
	Use of silence to promote learning	(Smith & Cushion, 2006), (Stonebridge & Cushion, 2018).
	Barriers to developing decision-making ability	(O'Connor et al., 2017), (Partington & Cushion, 2013).
	Session format and learning environment	(Jones et al., 2023), (O'Connor et al., 2018), (Partington & Cushion, 2013),

		(Stonebridge & Cushion, 2018), (Vinson et al., 2016).
	Supporting player behaviour change	(Santos et al., 2019)
Coach Education and the epistemological gap between theory and practice	Coach education and coach's behaviour change	(Eather et al., 2020), (Hall et al., 2022), (Jones et al., 2023), (Raya-Castellano et al., 2021), (Raya-Castellano et al., 2022), (Stodter & Cushion, 2019), (Wandzilak et al., 1988).
	The epistemological gap between theory and practice	(Cushion and Jones 2001), (Ford et al., 2010), (Hall et al., 2022), (O'Connor et al., 2017), (Partington & Cushion, 2013), (Raya Castellano et al., 2020), (Wandzilak et al., 1988).
	Suggestions for coach education	(Agusti et al., 2020), (Hall et al., 2022), (Partington & Cushion, 2012), (Partington & Cushion, 2013), (Stodter & Cushion, 2019), (Raya-Castellano et al., 2021), (Wandzilak et al., 1988).

Table 3 Analysis of research context

Context	**Number of publications**
Training	14
Video-based feedback session	2
In-game	8
Training & Match	1
Half-time talks	1

Table 4 Analysis of research origin

Country	Number of publications
UK	15
Australia	4
Spain	4
Portugal	2
USA	3
China & Spain	1

Table 5 Analysis of research instrument

Instrument	Number of publications
CAIS	14
ASUOI	5
CAIS & ASUOI	3
CBAS	3
Coaching Behaviour Assessment Inventory (R. E. Smith et al, 1977)	1
SAIC & SOCAC & Questionnaire on Expectations of Instruction and Behaviour of Athletes in Competition	1
Conversational analysis transcription symbols (Groom et al. 2014)	1
A customized 'Coach Analysis Instrument' (Franks et al., 1988)	1

Table 6 Analysis of players' level

Players' level	Number of publications

Professional	11
Elite	5
Cross different levels	2
Amateur & Professional	1
Not Report	7
High School	1
Non-professional	1
Sub-professional	1

Table 7 Citations ranked by Journal: Publication type peer reviewed journal articles; date range: 1988-2023 (English Language)

Journal	**Number of publications**	**Total citations**
Journal of sports sciences	6	978
Physical Education and Sport Pedagogy	4	102
International Journal of Sports Science & Coaching	3	57
Journal of sport behaviour	3	537
International Journal of Performance Analysis in Sport	2	21
Frontiers in Psychology	2	35
Scandinavian journal of medicine & science in sports	1	337
Reflective practice	1	83
Sports Coaching Review	1	75
Physical Educator	1	66

Qualitative Research in Sport, Exercise and Health	1	56
Sport, Education and Society	1	12
International Journal of Sport and Exercise Psychology	1	6
Cuadernos de Psicología del Deporte	1	3
Performance Analysis of Sport IX (Book chapter)	1	0

This section thematically analysed the current research in this field, yielding three main themes will be described: 1) Coaching Behaviour - what coaches really done; 2) Coaching behaviour and players' learning; and 3) Coach Education and the epistemological gap between theory and practice.

2.1.1. Coaching behaviour – what the coaches really have done

The first theme of the systematic review will initially uncover what youth football coaches are precisely engaged in during both training sessions and matches. It aims to elucidate their overall behavioural patterns, how they structure practice activities, the relationship between their most frequently employed coaching behaviours and over-coaching, and the way in which their coaching behaviour influences and shapes the players' perceived climate.

Pattern of coaching behaviour

The coaching behaviour of coaches fundamentally involves interactions among coaches, athletes, and the context. It requires coaches to adapt to given environmental conditions and make decisions based on dynamic situational factors, characterized as a combination of both structured and improvised actions. Existing literature on coaching behaviour in football has explored coaches' behaviours during practice sessions, competitions, halftime breaks, and post-game video feedback sessions. These scenarios represent critical moments of interaction between coaches and athletes, allowing coaches to directly intervene with athletes. However, research primarily focuses on investigating coaching behaviours during

training practices, with limited exploration of behaviours during games. Specifically, Raya Castellano's study (Raya-Castellano et al., 2023; Raya-Castellano et al., 2021; Raya-Castellano et al., 2020) examines coaching behaviours during post-game video feedback sessions and halftime talks. Compared to these moments, training and games offer more frequent activities and extended interaction time between coaches and players. During these periods, athletes are actively engaged in practical activities rather than being indoors, where providing a calmer environment for thinking. Particularly during training, coaches have more opportunities for direct intervention and guidance with each player. Consequently, it's understandable that more literature concentrates on discussing coaching behaviours during training practices.

Various research findings indicate that coaching behaviour patterns exhibit significant stability, remaining resistant to the influence of factors such as players' age, skill levels, and coaches' gender, or coaching experience. Ford, Yates and Williams (2010) discovered that coaching behaviours remained relatively consistent regardless of players' age or technical proficiency. The willingness of coaches to adjust their coaching behaviours based on these factors was found to be limited. Similarly, Miller (1992) reported that coaching behaviours across different age groups of players did not exhibit significant differences. Coaches across various age groups tended to maintain consistent coaching behaviour patterns, suggesting a lack of adjustment based on players' developmental stages. Miller (1992) also observed no significant differences in coaching behaviours between coaches of different genders and coaching experiences. Stodter and Cushion (2019) proposed that the impact of learning on coaching behaviour is limited, possibly stemming from coaches' insufficient deep understanding of the theoretical foundations of certain coaching practices. This implies that coaches might not readily adapt their approaches, even when presented with new learning or insights, highlighting a certain resistance to change in coaching behaviour. Research findings indicate that the primary coaching behaviour pattern includes silent monitoring interspersed with instruction segments, coupled with organizational management and encouragement (Smith & Cushion, 2006).

While the overall pattern of coaching behaviour remains relatively stable, research identifies factors influencing specific coaching behaviour. First and foremost are the coaches' contextual factors. Between match and training settings, significant differences emerge in coaching behaviours. Matches elicit higher frequencies of encouraging remarks, while practices see elevated rates of instructional, organizational, and negative comments (Wandzilak, Ansorge, & Potter, 1988). This trend persists across diverse studies focusing on match contexts, where praise and encouragement rank among the top three behaviours (Millard, 1996; Partington & Cushion, 2012; Smith & Cushion, 2006; Wandzilak, Ansorge, & Potter, 1988), accompanied by a notable prevalence of silent observation (Partington & Cushion, 2012; Smith & Cushion, 2006), these behaviours are deemed more conducive to youth player development. Additionally, different practice activities influence specific coaching behaviour. In "training form" activities, coaches employ more prescriptive instructions, whereas "playing form" activities involve more feedback, questioning, praise, and on-task silence (Partington & Cushion, 2013). This suggests that games and game-based practices are more advantageous in promoting coaching behaviours conducive to players' learning (Ford, Yates, & Williams, 2010). Furthermore, a coach's academic background is also considered to impact their coaching behaviour significantly. Coaches with related university academic backgrounds exhibit a higher usage of divergent questioning and demonstrate a high level of self-awareness in interpretive interviews, providing theoretically sound justifications and more accurate predictions for their behaviours (Stonebridge & Cushion, 2018). Similar results are found (Agusti et al., 2020), indicating that coaches with a graduate degree employ more verbal behaviours that are conducive to player learning and development. Moreover, individual characteristics of coaches, such as emotional regulation abilities, correlate positively with ideal coaching behaviours and negatively with undesirable coaching behaviours. Coaches proficient in emotion regulation tend to exhibit more positive and fewer negative behaviours during games (Teques, Duarte, & Viana, 2019). Gender differences among coaches also result in subtle variations in coaching behaviours. For instance, compared to male coaches, female coaches

provide more general encouragement and engage less frequently in keeping control and general technical instruction (Millard, 1996).

In addition, player characteristics somewhat influence coaches' specific behaviours. Factors such as players' age and skill level seem somewhat arbitrary in influencing coaching behaviour. (Partington, Cushion, & Harvey, 2014) found that, compared to younger age groups, coaches of older age groups use more punitive behaviours and employ more divergent questioning and feedback. Similarly, Teques, Duarte and Viana (2019) suggests that coaches of younger age groups exhibit stronger self-regulation of emotions, leading to more positive behaviours during games. Worsfold (2013) also observed that coaches provide more personalized feedback to effective players. In summary, the coaching philosophy, or the deeply ingrained pedagogy, proves to be the most influential factor in shaping coaching behaviours (Cushion, 2010). Coaches' coaching philosophies mostly stem from their experiences as athletes being coached and as coaches accumulating coaching experiences. Due to a lack of deep learning around the theoretical foundations of certain practices, the impact of learning on observed coaching behaviour remains minimal (Stodter & Cushion, 2019).

Earlier systematic observation tools for observing soccer coaching behaviour predominantly included the Arizona State University Observation Instrument (ASUOI) and Coaching Behaviour Assessment System (CBAS); however, post-2010, the widely used observation tool became CAIS. Although studies employing systematic observation tools record coaching behaviours, discrepancies exist in coders' understanding of defined indicators. Taking into account ecological validity in different cultural contexts, several tools are modified or integrated versions, altering or omitting specific behaviour indicators. Nonetheless, in most related studies, the most common coaching behaviours during training include "silence", "instruction", "management/organization", "praise/encouragement", and "feedback". Over time, observations reveal an increase in coaches' questioning behaviours during training sessions. Definitions of "praise" vary between early and current studies, leading to a decline in coaches' praising behaviours during training while witnessing more positive feedback. There's a decreasing trend in

coaches' negative coaching behaviours such as scolding or punishment over time. However, the case study of this research identified that contemporary coaching behaviour of Chinese coaches aligns with the traditional coaching approach, featuring considerable punishment, scolding, and hustle behaviours, besides silent observation, organization, and instructional behaviours.

Through a systematic review, it becomes evident that coaching behaviours, while maintaining similar patterns, possess individualized traits. Whether within the same study sample or across different studies, primary behaviours remain alike, yet secondary behaviours differ. This divergence reflects the varied coaching styles and pedagogical philosophies among different coaches.

Practice activities

For a long period, studies on coaching behaviour studies discussed coaches' behaviour detached from practice activities. Until Ford, Yates and Williams (2010) introduced the categories of practice activities into "training form" and "playing form" subsequent research began considering coaching behaviour across various practice activities and emphasizing the critical role of coaches' intervention in structuring or distributing practice activities and its impact on players. Since 2010, there has been a noticeable shift in coaches' preference of practice activities from the initially observed majority of training form activities towards an increased utilization of playing form activities. This transition correlates closely with coach education programs. On the one hand, playing form activities have been increasingly viewed in numerous formal or informal coach learning programs as essential for developing players' decision-making abilities. On the other hand, the evolution and development of varied small-sided game formats have replaced previous emphasis solely on fitness or physical training and technical practice. Interestingly, the case study of this research identified that youth coaches in Chinese school football still maintain a training structure focused on training form activities (Feng et al., 2023). In this case, Chinese coaches overly prioritize fundamental skills as prerequisites for and foundations of competitive play, believing that proficiency in technique is vital for effective gameplay. This neglects

that gameplay itself serves as an effective means of skill practice. This inclination in coaching behaviour aligns with limited access to coach learning resources, resulting in an inability to update their coaching methodologies promptly. Due to the lack of new coaching philosophies to challenge their established coaching practice, and lack of learning resources for them to reflect themselves, consequently, they continue staying in their "comfort zone", employing traditional approaches, which were seen by themselves as safer, tried and tested, emphasizing honing players' fundamental skills.

Instruction & over coaching –how to strike a balance

Through the coaching behaviours data from systematic observation, we find that coaches utilize a substantial number of prescriptive instructions regardless of the type of practice activity (Ford, Yates, & Williams, 2010; Partington & Cushion, 2013). Concurrent instruction is consistently identified as the most frequently used single category of behaviour in many studies (Cushion & Jones, 2001; Feng et al., 2023). Some researchers point out instances of severe over-coaching, suggesting coaches intervene excessively, and provide excessive instructions or control during training or matches, leading to numerous pauses and restarts in practice activities (O'Connor, Larkin, & Williams, 2017). Coaches continuously direct players' actions and decisions on the field, offering feedback on their movements, with a lack of silent observation seen as over-coaching. Over-coaching may hinder players' creativity and problem-solving abilities, impacting their overall, long-term, sustainable development as athletes (O'Connor, Larkin, & Williams, 2017). In such situations, over-coaching typically involves persistent verbal instructions, interventions in player decisions, and excessive focus on technical or tactical aspects. Coaches exhibiting this style of behaviour may restrict players' autonomy, preventing them from making independent decisions and adapting to different game scenarios.

Over-coaching goes beyond providing instructions or constructive feedback. Excessive control and direction play a negative role in players' natural development, restricting the sporting experience and diminishing a sense of

freedom and enjoyment. For coaches, striking a balance between giving instructions and allowing players the freedom to learn, adapt, and develop skills during matches is crucial. However, existing research has not precisely defined how much instruction and feedback constitute over-coaching. Nonetheless, relevant studies offer suggestions regarding over-coaching. For example, Smith and Cushion (2006) propose that occasionally providing players with specific information and task-relevant cues appears to be most effective. Restricting guidance to brief, selective comments help avoid information overload for players.

The impact of coaching behaviour on the climate in training and matches

Coaching behaviour plays a crucial role in shaping the atmosphere of both training and matches, influencing the overall experience of players in these activities. Feedback stands out as a primary coaching behaviour, classified by researchers into positive and negative feedback (Feng et al., 2023), with both types influencing the overall environment of training or matches. Additionally, coaching behaviours such as scold, punishment, praising, encourage, and humour also impact the perceived climate by players in both competitive and practice environments.

Research reveals a notable contrast in coaching behaviours during training compared to matches (Feng et al., 2023; Smith & Cushion, 2006; Wandzilak, Ansorge, & Potter, 1988). During training, coaches often employ more negative behaviours, including negative feedback and scolds. Conversely, in matches, coaches tend to exhibit more positive behaviours, such as positive feedback and encouragement. This difference may be linked to distinct goals and situational pressures in the two environments. Training primarily aims to enhance players' technical skills, tactical understanding, and teamwork. Consequently, coaches may lean towards emphasizing technical details and error correction, involving more negative feedback, and scolding to facilitate player improvement. On the other hand, the primary goal of matches is often winning, necessitating coaches to focus more on inspiring player positivity, boosting confidence, and encouraging team spirit. In this context, positive feedback, praise, and encouragement serve as effective strategies to stimulate player performance.

Examining existing studies, it becomes evident that, despite variations in observed behaviours, most coaches incorporate a considerable amount of positive feedback, encouragement, and praise. Coaches express the expectation of providing players with emotionally positive guidance, leveraging auditory and visual cues to positively influence the team's psychological content (Santos, Gould, & Strachan, 2019). However, a recent case study underscore differences in coaching behaviours between China and Spain (Feng et al., 2023). Chinese coaches exhibit a higher level of negative factors during training, including negative feedback, scolding, and punishment, aligning with traditional Chinese cultural values that emphasize strict discipline to motivate players. In contrast, Spanish coaches demonstrate coaching behaviours more aligned with contemporary research, featuring a higher proportion of positive elements, such as positive feedback, encouragement, and praise. This disparity may be attributed to distinct coaching philosophies and educational approaches in the two countries. Traditional Chinese pedagogy values the concept of "strict teachers produce outstanding students", leading coaches to adopt rigorous disciplinary methods to inspire diligent training (Wilson, 1981). Interviews with Chinese coaches reveal their intent to use such methods to stimulate players' self-esteem, awaken their fighting spirit, and foster enthusiasm while simultaneously improving their psychological resilience and mental toughness. The aim is to encourage young players to take responsibility for their actions, make progress, and avoid repeating mistakes (Fung, 1999). However, these coaches may overlook the potential long-term psychological impact of the training atmosphere on young players. Current research underscores the intricate relationship between coaching behaviour and the perceived motivational climate of training and matches (Mollerlokken, Loras, & Pedersen, 2017; Smith et al., 2005; Stein, Bloom, & Sabiston, 2012; Weiss, Amorose, & Wilko, 2009). While coaches worldwide strive to instill discipline and motivate players positively, recognizing the potential long-term psychological effects of the training environment on young players is crucial. Establishing an empowering motivational climate through coaching behaviour is paramount for promoting the holistic development of players (Ntoumanis & Biddle, 1999; Tessier et al., 2013).

2.1.2. Coaching behaviour and players' learning

The second theme aims to unveil how youth football coaches' coaching behaviours impact players' learning. Specifically, we will delve into the obstacles that hinder the development of players' decision-making and problem-solving abilities, explore the utilization of "silence" and "questioning" to facilitate player learning, and discuss how to strategically structure practice activities to create the most conducive learning environment.

Barriers to developing decision-making ability

Exceptional decision-making skills are pivotal for becoming an elite football player(O'Connor, Larkin, & Williams, 2017; Roca & Ford, 2020). Players who consistently make optimal decisions are more likely to succeed in professional football. On the field, players must swiftly assess limited game information and decide on tactical actions such as passing, dribbling, or shooting. Outstanding decision-making involves making reasonable choices in rapidly changing situations, demonstrating not just technical prowess but also wisdom and insight. Rational and even creative decisions take precedence over proficient technical actions. Therefore, nurturing players' decision-making skills is of paramount importance.

However, as mentioned earlier, studies have found that youth football coaches often exhibit overcoaching, considered a significant obstacle to the development of "decision makers" and to the improvement of problem-solving abilities in adolescents (Cushion & Jones, 2006; Feng et al., 2023). Coaches attempt to aid players in constant learning by employing a continuous stream of instructional cues and technical feedback. However, an excess of teaching guidance and feedback may lead to information overload for players, robbing them of opportunities to experience, discover, and learn on their own during the sporting process (Raya-Castellano et al., 2022). Coaches tend to use a considerable amount of concurrent instructions both in matches and training, not only intervening in players' autonomous decision-making but also fostering dependence on coach directives, potentially inducing cognitive laziness and impairing their ability to adapt to

different scenarios and solve diverse problems (O'Connor, Larkin, & Williams, 2017).

Another situation hindering player learning is the excessive use of training form activities during practice (Feng et al., 2023; Partington & Cushion, 2013). This circumstance has seen improvement in football-developed countries. In recent years, the importance of the overall structure of football training sessions for the skill acquisition of youth players has been continually discussed and researched. With updates and widespread availability of coach education programs, recent investigations into practice activities have found a shift in elite youth football training sessions' time distribution in England, Germany, Portugal, Spain, and Australia (O'Connor, Larkin, & Williams, 2017; Roca & Ford, 2020). The emphasis has transitioned from predominantly "training form" to now predominantly "playing form", constituting around 60% of the entire training session, with individual technical exercises and fitness training comprising only about 20%. Current mainstream research advocates for increased involvement in decision-oriented practice activities, emphasizing small-sided game forms over monotonous technical exercises. In comparison to repetitive technical exercises, small-sided games with different rules better promote the use of visual observation and scanning in youth players during training and matches, enhancing their decision-making abilities (Davids et al., 2013; Pizarro et al., 2021).

Use of silence to promote learning

Existing research indicates that silence has consistently been one of the primary coaching behaviours employed by coaches. Graduate coaches consider silence as a means to facilitate player decision-making and observation (Agusti et al., 2020; Stonebridge & Cushion, 2018). Silence serves as a crucial strategy for effectively balancing coaches' tendencies towards over-coaching. Coaches' silent observation can promote player learning, aligning with theories of experiential and discovery learning. Through silent observation and thoughtful analysis of player performances, coaches not only choose appropriate moments for intervention but also afford players significant "free time", avoiding excessive verbal instructions

that might lead to information overload. The coach's "hands-off" at this juncture provides players with opportunities for self-exploration, practice, decision-making, and reflection, allowing them the necessary time and space to process and internalize their recent experiences (Renshaw, Oldham, & Bawden, 2012). Timely silence from the coach, refraining from immediate feedback, also aids players in analysing their performances during brief silent periods, encouraging proactive reflection on areas for improvement and potential solutions. Whether or not the solutions derived by players are effective, this process of active reflection is a crucial aspect of the learning process. It not only fosters problem-solving skills but also develops their ability to think independently. Coaches' strategic use of silence further contributes to eliciting players' active observation, enhancing their situational awareness, and helping them make informed decisions based on the dynamic changes in the game. During halftime talks and post-match video feedback sessions, coaches purposefully employ silence to facilitate group discussions (Raya-Castellano et al., 2023; Raya-Castellano et al., 2020). This strategic use of silence allows coaches not only to gather players' thoughts but also to promote the players' active participation and thoughtful consideration (Raya-Castellano et al., 2021).

Experiential and discovery learning are educational theories emphasizing learners' active participation, experiential practice, and self-directed exploration as effective learning methods (Castronova, 2002). Coaches' judicious use of silence just contributes to players' direct experiences in sports, enabling them to discover and acquire knowledge, skills, and values first-hand from their first-hand practical experiences. These theories underscore the importance of the learning process itself rather than just the outcome, emphasizing the role of the learner as an active participant in their education.

Use of questions to promote learning

The coaching process extends beyond direct guidance, involving the creation of effective learning environments, posing questions, and interacting with athletes to facilitate learning, transforming players into active participants or co-learners

(Cushion, 2013; Kidman, 2005). Coaching behaviour is pivotal in establishing a player-cantered environment, and "questioning" emerges as a crucial coaching behaviour for coaches to cultivate this environment, as questioning aids coaches in understanding the athlete's situation, and obtaining timely feedback on emotions, thoughts, and needs (Raya-Castellano et al., 2023). Through questioning, coaches assess specific aspects of the player, such as their understanding of techniques and tactics, enabling tailored adjustments to teaching methods and guidance aligned with their developmental needs. Coach questioning also facilitates communication between the coach and players and encourages discussions among players (McNeill et al., 2008), enhancing their active involvement in the learning process (Raya-Castellano et al., 2020). Strategic use of questions promotes players' critical thinking and self-reflection (Forrest, 2014), particularly through open-ended questions requiring intricate reasoning processes, stimulating higher-order thinking, and honing their ability to actively analyse and contemplate problem-solving methods. Crucially, questioning contributes to the development of players' decision-making skills (O'Connor, Larkin, & Williams, 2017). The coach's use of questioning, replacing direct instructions, aligns with the Game Sense pedagogy in sports coaching (Vinson et al., 2016), emphasizing the development of players' autonomy and decision-making abilities.

Research reveals that despite questioning being deemed a crucial teaching strategy, its prevalence in observed coaching behaviours is not overwhelmingly high (Agusti et al., 2020; Cushion & Jones, 2001; Feng et al., 2023); rather, questioning appears to be a secondary, supportive behaviour in the coaching process. In contrast to earlier studies, some recent studies indicate an increased prevalence of coaches using questioning, even ranking it as the fourth major coaching behaviour (Partington, Cushion, & Harvey, 2014; Partington et al., 2015; Stonebridge & Cushion, 2018). The significance of questioning extends beyond mere frequency; it necessitates an exploration of the specific interactions between coaches and players during questioning. Divergent question is considered key to fostering higher-order thinking but observed coach-posed questions predominantly align with convergent questioning, viewed as insufficient in cognitively engaging players (Cope et al., 2016). Due to limited training time, coaches often employ

convergent questioning to quickly elicit feedback from players or guide them towards providing anticipated answers through simple "yes" or "no" responses (Harvey & Light, 2015). Questioning is an interactive behaviour involving a range of complementary teaching actions, including body language, allowing time for answers, encouragement or discouragement of learner contributions, and discussions (Pedrosa - de - Jesus & da Silva Lopes, 2011). Evidently, coaches are not yet familiar with the strategic use of questioning to promote player learning. This lack of familiarity is tied to coaches' understandings of coaching and learning, as these beliefs influence their coaching practices, particularly in terms of questioning methods, content, timing, and reactions during interactions. Although research demonstrates that coaches are aware of the importance of questioning for the development of players, coaches still need to improve their ability to ask purposeful questions (Harvey, Cushion, & Massa-Gonzalez, 2010).

Session format and learning environment

The design of training sessions serves as the foundation for creating an optimal learning environment, in which coaches can influence players' learning experiences by adjusting practice sessions. Traditional training sessions often allocate a significant portion of time to "training form" activities, where coaches attempt to facilitate players' mastery of fundamental soccer techniques through isolated and repetitive technical drills in a non-pressured environment. However, the effectiveness of this training structure may compromise skill retention and match performance under the intense pressure of real-game scenarios (Masters, 1992; Raab, 2003; Smeeton et al., 2005). With the evolution of Game-centred approaches (GCA), novel pedagogical concepts have emerged, including Teaching Games for Understanding (TGfU) (Bunker & Thorpe, 1982), Play Practice (PP) (Launder & Piltz, 2013), the Tactical Games Model (TGM) (Mitchell, Oslin, & Griffin, 2020), and Game Sense (GS) (Light, 2004). These Game-centred approaches underscore the significance of practice activities in "playing form" for developing specific sports skills and enhancing tactical decision-making abilities (Harvey & Jarrett, 2014).

Research indicates that compared to "training form", coaches exhibit lower frequencies of instructional behaviour in "playing form" activities (Partington & Cushion, 2013). Therefore, training sessions primarily emphasizing "playing form" not only mitigate coaches' tendencies to over-coaching but also expose players to more decision-making scenarios relevant to real matches. Jones et al. (2023) propose the use of the MASTER framework to enable coaches to provide more game-based learning moments by incorporating additional "playing form" activities. This approach aids players in enjoying soccer while effectively enhancing their game awareness. GCA not only facilitates the effective translation of technical skills into real-game situations but also contributes to the development of players' tactical acumen and creativity.

Studies suggest that GCA can create a mastery-orientated motivational climate (Gray, Sproule, & Morgan, 2009) where athletes display more motivationally adaptive response patterns, contributing to increased task engagement, greater satisfaction, higher self-assessment of progress, and a propensity to maintain a positive attitude (Carpenter & Morgan, 1999). Moreover, research highlights the longitudinal positive benefits of GCA in developing tactical intelligence and creativity in adolescent athletes (Memmert, 2006, 2007; Memmert & Roth, 2007). Studies related to implicit learning and contextual interference also support the notion that GCA are more conducive to fostering decision-making, game intelligence, long-term learning, and technical retention (O'Connor, Larkin, & Williams, 2018).

Additionally, the transition phase between exercises represents a crucial moment during contact time with players, occupying approximately 20% of the entire training session, as evidenced in several studies (Feng et al., 2023; Stodter & Cushion, 2019). However, this period is often underutilized by many coaches. While some coaches perceive "transition" as time wastage, graduate coaches view it as an opportune moment for group discussions and social interactions (Stonebridge & Cushion, 2018). O'Connor, Larkin and Williams (2018) surveyed 66 training sessions conducted by 34 Australian youth football coaches, found that time of inactivity, such as freezing and listening or player huddles, accounted for

a substantial portion, approximately 31%. For instance, coaches directed players to stand still or gathered them for intervention speeches. Regardless of the duration of the training session, coaches spent an average of 3 minutes and 36 seconds introducing each exercise activity. On average, there were 6 - 8 incidences where the coaches interrupted the exercise to provide explicit guidance or feedback, thereby reducing the duration and continuity of players' experiential learning. This suggests a potential inclination towards over-coaching. Compared to interrupting exercise activities, effectively utilizing individual players' inactive time for personalized instructions or feedback is more efficient than stopping all players, ensuring opportunities for experiential learning, and maintaining the continuity and authenticity of a player-cantered overall learning environment.

2.1.3. Coach Education and the epistemological gap between theory and practice

Research on coaching behaviour ultimately aims to impact and assist coaches in continuous reflection and improvement of their coaching practices through regularly updated coach education resources. Coach education stands as a crucial role and key element for altering coaching behaviours, enhancing coach proficiency, and fostering the holistic development of athletes. Nevertheless, research indicates that coaches' coaching philosophies embody the accumulated social history, convention, and ideologies (Hall et al., 2022), consequently, their coaching behaviour patterns remain relatively stable and resistant to change, especially traditional and deeply ingrained coaching behaviours, which may prove resistant to alteration through short-term, formal coach education courses (Stodter & Cushion, 2019). The undeniable importance of coach education necessitates strategic and theory-based designs to enhance coaches' awareness, beliefs, and coaching behaviours. Recent research has discovered that the targeted and theory-driven coach education programme (MASTER) has effectively improved coaches' self-awareness and practices, successfully increasing the incorporation of "playing form" activities in training sessions, enhancing the quality of interventions, and receiving positive feedback from the participants (Eather et al., 2020; Jones et al., 2023). Raya-Castellano et al. (2021) found that as the coach development program

progressed, coaches either developed and consolidated their knowledge or increased their willingness to change. Reflection, supported by video feedback and reflective conversations, may have contributed to changes in coaches' questioning approaches (Raya-Castellano et al., 2022). Therefore, coach education has the potential to change coaching behaviour, contingent upon collaborative efforts between researchers and coach education developers. This collaboration is conducive to refining coach education programs, making them more targeted, theoretically supported, and capable of challenging coaches' existing coaching philosophies, prompting critical reflection, and fostering a deeper level of cognitive change in coaches, thereby instigating a willingness to actively change their behaviours.

Numerous studies have identified an epistemological gap among youth football coaches, as evidenced by a lack of alignment between their theoretical understanding and practical application (Cushion & Jones, 2001; Feng et al., 2023; O'Connor, Larkin, & Williams, 2017; Partington & Cushion, 2013; Wandzilak, Ansorge, & Potter, 1988). This manifests in coaches having a relatively low level of self-awareness, with discrepancies between their verbal recollections and actual observed behaviours. Coaches exhibit only partial effectiveness in estimating their own actions, and statements of intent often diverge from their knowledge and actions. Raya-Castellano et al. (2020) outlined three forms of cognitive dissonance or epistemological gap: 1) the use of teaching-related terms underpinned by flawed understanding; 2) the ability to identify beneficial coaching practices without a rational explanation; 3) coaches presenting strong rationales for specific behaviours but displaying contradictory behaviour frequencies. This cognitive dissonance significantly impedes the effective implementation of coaching philosophies and desired behaviours. The primary cause of this phenomenon may be the lack of continuous, systematic, and comprehensive coach education opportunities for coaches to deepen their theoretical understanding and stay updated. Short-term, formal coach education courses might not delve into the fundamental theories of coaching practices, leading coaches to rely on experiential learning without a solid theoretical foundation. Coaches often hold steadfast beliefs based on their experiences as players and coaches, and these ingrained

beliefs, influenced by football subcultures, impact their teaching and learning convictions. Coaches also tend to lack critical reflection on their coaching methods and philosophies.

Hall et al. (2022) suggest that clubs could foster critical reflection by providing forums for coaches to share their personal beliefs, biases, and assumptions, enabling coaches to critically reflect on the judgments and values forming the basis of their coaching practice beliefs. This epistemological gap warrants attention in coach education programs to bridge the conceptual understanding and practical application divide. Coach education programs need to pose questions that encourage coaches to engage in philosophical thinking, questioning their axiological and ethical values, as well as their ontological and epistemological beliefs, to identify where their philosophies manifest in their actual coaching practices and how they substantiate this knowledge (Allison, Abraham, & Cale, 2016). Coach education programs should also promptly integrate the latest and applicable research findings to narrow the gap between scientific insights and real coaching practices (Mallett et al., 2009). Customized design focused on specific issues, coupled with a holistic approach that combines new learning with existing knowledge, is essential. Emphasizing longitudinal and ongoing knowledge delivery and support, providing diverse learning mechanisms, and opportunities for comprehensive reflection are important. Specific training programs addressing coaches' communication and socio-emotional skills are crucial for maximizing their impact on player's learning. Coach education should pay more attention to the benefits of different practice types for player learning, offering coaches more information on teaching techniques to enhance coach-player interaction. This comprehensive approach equips coaches with the necessary tools to navigate all facets of their role (Maclean & Lorimer, 2016). The epistemological gap between theoretical understanding and practical application among youth football coaches presents a significant and intricate challenge, impacting coach effectiveness and player development. While numerous studies have identified epistemological discrepancies among football coaches, further research in this field is needed to enhance our understanding.

The current research reveals that the overall coaching behaviour pattern of coaches tends to be relatively stable and is less likely to change significantly due to factors such as player age, skill level, coach gender, or coaching experience. However, certain factors positively influence coaching behaviour, such as coaches' university academic backgrounds and the "playing form" of practice activities, both of which promote coaching behaviours conducive to players' learning. Interviews with coaches reveal that coaching behaviour is influenced by the coach's deeply ingrained cultural beliefs and pedagogical philosophies. However, most studies on coaching behaviour focus on developed football countries in West Europe and America, lacking exploration into coaching behaviour in different cultural backgrounds, particularly among coaches from non-football developed countries. The current discussion in our sample is limited to the impact of pedagogy on the choice of coaching behaviour, and there is a lack of exploration of the impact of specific cultural and historical backgrounds on coaches' behavioural motivations. Research on coaches from powerful football countries may provide a reference for coaches from non-powerful football countries, but it is difficult to shake the deep-rooted belief that coaches from less powerful football countries are subject to their specific historical backgrounds and traditional culture. Integrating the essences of Eastern and Western cultures may produce better results, specifically conducive to the current widespread cross-cultural coaching trend, that is, foreign coaches integrate into new cultural environments to carry out coaching practices. Furthermore, the current investigation reveals a tendency towards over-coaching among coaches, characterized by high levels of instruction and feedback, as well as excessive interruptions and pauses during practice for intervention. Over-coaching hinders player learning, particularly impeding the development of players' decision-making abilities. Therefore, silent observation and questioning are considered more conducive to promoting player learning. Additionally, designing practice activities based on match scenarios is seen as a more effective way to develop specific sports skills and enhance tactical decision-making abilities. Regarding coach education as a crucial avenue for bridging the gap between theory and practice, developers of coach education and researchers should collaborate to integrate the latest applicable research findings. This aims to address the

widespread epistemological gap among coaches, stimulate coaches to engage in philosophical reflection, and encourage coaches to actively improve their coaching behaviour at a deeper level, thereby continually narrowing the gap between scientific insights and real coaching practices.

This section underscores the important role of research in coaching behaviour. This information could also serve as a foundation for reflecting on and engaging in dialogic practices regarding how coaching behaviour impacts athlete learning and performance. However, most studies focus solely on the providers of coaching behaviour, namely coaches, while neglecting the recipients of coaching behaviour, namely athletes. Therefore, research on how athletes receive, adapt to, and interpret coaches' coaching behaviour is crucial for effective coaching.

2.2. Research Background in Chinese Youth Football

China has always been committed to the development of football, but it has not been smooth sailing. As reported, from 1995 to 2007, the number of teenagers participating in football training in China dropped sharply from 650,000 to 30,000 (Wang & Gao, 2009). To solve the problem of the continuous decline in the number of young football players, the General Administration of Sport of China and the Ministry of Education of China have jointly launched a School Football Programme (SFP). The purpose of this initiative is to increase the population of football, cultivate elite reserve football talent, and explore a new pathway for cultivation by introducing football into extracurricular activities.

Chinese football youth training has always followed a traditional model of "three togethers", that is, players are centralized in the football school or professional academy to train together, study together, and live together on the campus. Within this context, young players are detached from family, school, and society, and they hardly have the opportunity to spend time with their parents, classmates, and peers in another social environment, which hinders the development of adolescent psychology, academics, social skills, and normal identity development (Myer et al., 2015; Popkin, Bayomy, & Ahmad, 2019). Moreover, there exists a serious phenomenon of early specialization among young players, that is, from the time

they join the professional academy or football school, they stop playing all other sports and only receive high-intensity football training throughout the year. To initiate a new pathway for the development of young football players in China, SFP no longer adopts the "three togethers" model but chooses the "three returns" form, that is, allowing young players to return to their families, return to schools, and return to society.

The SFP aims to improve students' physical health, promote football, and cultivate reserve football talents by launching football leagues and related activities at school. According to the latest data from the Department of Sports, Health, and Arts of the Ministry of Education of China, there are currently more than 30,000 SFP-featured schools in China, and 55 million students participate in SFP training and competitions. Among them, primary school and junior high school students are the main populations. The SFP has effectively expanded the size of China's football population and strengthened the pyramid base for the development of Chinese football. Meanwhile, this Programme has made progress in popularizing football and further carries out elite training based on popularization, which is, selecting youth players in school football for elite training. In 2017, four "Man Tian Xing" ("Starry Sky") elite youth football training academies were established throughout the country, with the objective of elite training for youth players with potential talents. The Man Tian Xing Academy centralized talented student players who were scattered in different schools in a nearby place. Until 2019, 80 SFP "Man Tian Xing" academies have been established across China, gradually becoming an important pilot project to promote the improvement of school football competitions and the development of youth football players (Zhao, Xie, & Liu, 2020). In 2015, the Ministry of Education of China held the national youth school football summer camp for the first time. Each province formed a provincial school football team to participate in the summer camp and selected outstanding players from the students who participated in the summer camp to form an SFP national team to participate in international competitions.

However, elite youth football players with more potential may experience more stress than recreational football players. This pressure may stem from their

internal pressures, for example, players' inherent desire to excel and their desire to be recognized as talented by coaches, social media, the sports industry, and society (Malina, 2010; Mostafavifar, Best, & Myer, 2013). This pressure can also be extrinsic, such as parental and coaching support, in the hope that young players can gain competitive advantages at an early age (Feeley, Agel, & LaPrade, 2016; Padaki et al., 2017); the incentive of potential college scholarships and future career contracts with lucrative financial rewards (Malina, 2010; Mostafavifar, Best, & Myer, 2013; Padaki et al., 2017); and pressures for early talent identification and selection driven by national elite player development programs (LaPrade et al., 2016; Sugimoto et al., 2017). This stressful environment has resulted in an increasing number of young players choosing to specialize at an early age, with preteens, seventh graders, and/or children younger than 12 years participating in intensive training in organized sports on an annual or approximately year-round basis and/or competed for more than 8 months and played only one sport and no other or limited free play (LaPrade et al., 2016). The early specialization pathway has always been respected in China, especially influenced by the success of Eastern European communist countries in the Olympic Games (Malina, 2010), the coaches inherited its "San Cong Yi Da" training principle, that is, following rigorous, difficult, and realistic high-intensity training will cultivate future champions. The early specialization pathway helped China produce many Olympic champions, especially in individual sports. In football, too, there have been many studies showing the importance of extensive football-specific practice for reaching elite levels (Ford et al., 2012; Ford et al., 2009). In addition, the "10-year rule" (Simon & Chase, 1973), the theory of "deliberate training" (Ericsson, Krampe, & Tesch-Römer, 1993), and later the "10,000-hour rule" (Hodges, 1995) all supported athletes to engage in early specialized training.

However, the debate over early specialization has long been a hot topic in the field of youth athlete development. Many researchers believe that early specialization may be detrimental to the long-term development of adolescent athletes, and it is associated with burnout and dropout, while also increasing the risk of overuse injury (Brenner et al., 2016; LaPrade et al., 2016; Mostafavifar, Best, & Myer, 2013). For example, previous research found that sports specialization affects

lower body coordination in adolescent athletes, resulting in athletes with less stable hip and knee joints and more likely to get injured (DiCesare et al., 2019). It has also been claimed that the maturity of youth athletes in the specialization pathway affects the risk of injury (Le Gall, Carling, & Reilly, 2007).

For these aforementioned reasons, some researchers also proposed alternative pathways of early specialization, namely the early diversification pathway and early engagement pathway (Baker, 2003; Côté, Baker, & Abernethy, 2007; Ford et al., 2009). The early diversification pathway means that athletes engage in not only the primary sport but also other different sports activities during childhood with late or delayed specialization. The early engagement pathway refers to athletes engaging in high amounts of playing form activities in the primary sport, rather than in multiple other sports. However, there is a debate on whether early specialization is detrimental to athlete development or not. Recent studies showed different findings. For example, McGowan, Whatman and Walters (2020) mentioned that early sport specialization did not increase the odds of reporting an injury history; Rugg et al. (2021) surveyed athletes across multiple sports, and concluded that early specialization had no effect on scholarship, and specialized athletes have similar career lengths as the athletes who did not specialize; Similarly, Meisel et al. (2022) did not explore any significant relationship between early specialization and basketball-related injuries or mental or physical exhaustion either. Furthermore, Ford et al. (2012) surveyed 328 elite youth football players from different countries and suggested that most of them followed a mixture of the early engagement and specialization pathways; Zibung and Conzelmann (2013) surveyed 159 former Swiss football talents, players who did a great amount of specialized training at an early age were shown to be more likely to achieve high levels of football performance at their peak performance age; Likewise, Sieghartsleitner et al. (2018) surveyed 294 youth players who entered a Swiss football talent development program and found that a large number of specific learning activities increase a player's chances of achieving great success later in his football career, such as entering a junior national team.

CHAPTER 3

Objective

3. Objectives

3.1. Aims of the Thesis

The scientific literature on coaching has been steadily increasing, encompassing various sports. Professionals within a single sport domain may struggle to keep up with the latest developments and the constantly evolving databases. This challenge might contribute significantly to the persistent gap between theory and practice. To date, there are only four relevant publications that summarize and analyse these issues (Cope, Partington, & Harvey, 2017; Cushion, Ford, & Williams, 2012; Gilbert & Trudel, 2004a; Kahan, 1999), with just one focusing on a review of football coaching. The lack of systematic reviews and analyses of a substantial body of football-related research in coaching science significantly limits its influence on football practice. Therefore, conducting a reliable and systematic analysis of coaching behaviour in football would aid football coaches, coach educators, researchers, and players in accessing timely, comprehensive, and systematic research information. This effort would maximize the practical guidance offered by coaching science, bridging the gap between theory and practice. Not all coaches train in the same way. Differences in coaching behaviours reflect varying coaching philosophies, belief systems, and cultural patterns. According to Schein (1991), culture is a shared pattern of basic assumptions developed by a group to cope with its internal and external problems, which is considered valid and taught to new members as the correct way to perceive, think, and feel about those problems. Considering the worldwide nature of football, football in different countries reflects different national cultures, as cultural differences influence the style of play, pedagogy, and philosophy. These cultural and pedagogical backgrounds may affect coaching behaviour and players' perceptions and interpretations of it (Strudwick, 2016). However, few studies have compared football coaching behaviour across cultures and countries, and research on Asian

football coaching behaviour is lacking. Therefore, a cross-cultural analysis of coaching behaviour can complement the field of coaching science, especially in the context of foreign coaches cooperating with Chinese football. More research is needed to help foreign experts understand the current situation and characteristics of Chinese football, to provide more specific suggestions. Therefore, ***the first aim*** of this study is to compare the coaching behaviour and training activities of the coaches from Chinese and Spanish capitals; and to explore the impact of different pedagogies on coaches' behaviour and players' perceptions.

Given that different youth development pathways in sports may lead to different outcomes in different contexts, country- or cultural-specific contexts may also lead to inconsistencies in outcomes (Baker et al., 2003). For example, the research conducted by Ford et al. (2012) found that the development pathways of adolescents in different countries are not the same. In addition, many factors affect the development of young athletes. It not only depends on the players' technical and tactical level (Ali, 2011) but also depends on the players' physiological characteristics (Stølen et al., 2005) and psychological characteristics (Van Yperen, 2009). As mentioned above, the results of the relationship between early specialization and the risk of injury are not the same in the different national backgrounds. At present, there is no relevant research in China to investigate the early specialization of football players and the risk of injury. The background of relevant research is mostly concentrated in Europe, North America, and other regions, and there is a lack of sample research in Asia. At the same time, the growth and development characteristics of adolescents in European and American countries are different from those in Asian countries, and the responses to early specialization may be different. Therefore, ***the second aim*** of this study is to investigate the situation of Chinese elite youth football players' development; and examine the associations of early specialization, sports volume, and maturity status with musculoskeletal injury in Chinese elite youth football players. This study is expected to be the first one to investigate the early specialization of Chinese youth football players.

3.2. Structure of the Thesis

The structure of this Ph.D. thesis was organized as follows: Chapter 1 provided a general introduction; Chapter 2 provided the state of the arts; Chapters 3 described the aims of the thesis; Chapter 4 – 6 contained methods and main results for each aim of the Ph.D. thesis; Chapter 7 provided an overall discussion for each aim of the Ph.D. thesis; and Chapter 8 provided overall conclusions (See Figure 1.1).

The specific aim of this Ph.D. thesis was mainly comprised of two key portions that linked to one another. The first section focused on a case study investigating the coaching behaviour between youth football coaches from China and Spain was done. Additionally, the second section is a research survey on the Chinese youth football developmental pathway was done to identify the potential risks of current Chinese youth football development.

The above sections have been specifically written for publication in scientific journals to which they were submitted. The detailed information of each section with publications is listed in Table 1.1 below. All of the citations and references have been presented in the American Psychological Association (APA 7th) referencing format using a single bibliography at the end of the thesis.

Table 8 Articles submitted for publication in scientific journals

PhD thesis Aim	Title	Journal	JCR IF	Statues
1	Comparison of training activities and coaching behaviours in youth football coaches from Spain and China: A case study	International Journal of Performance Analysis in Sport	2.1	Published
2	The associations of early specialization, sports volume, and maturity status with musculoskeletal injury in elite youth football players	Frontiers in Physiology	4.0	Published

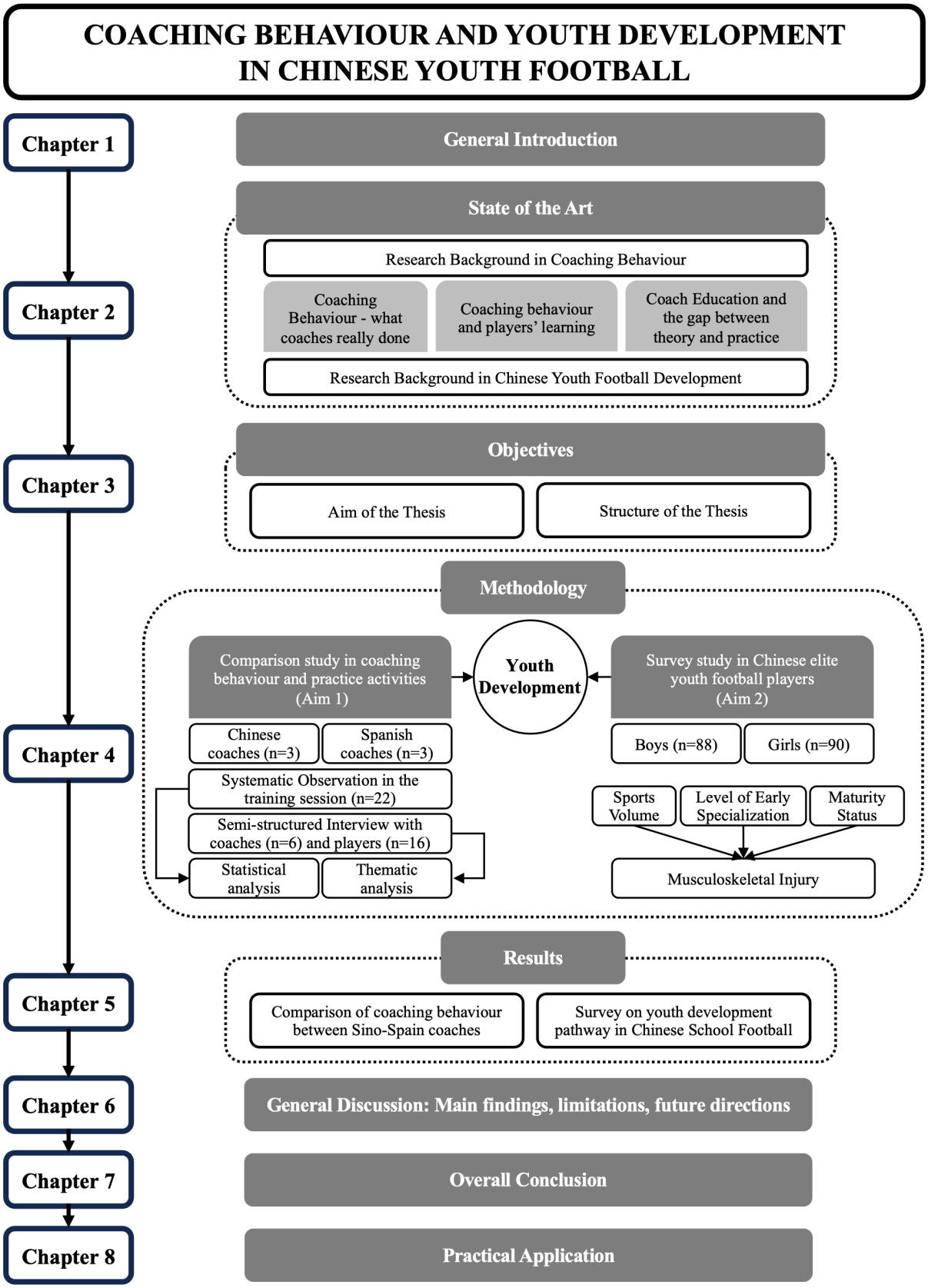


Figure 3 Overview of the structure of the thesis

CHAPTER 4

Materials and Methods

4. Materials and Methods

In order to provide a clear definition, explanation, and rationale for each aim of the thesis, the methodology section was split into two main sections focused on each aim respectively. Firstly, to compare the coaching behaviour and training activities of the youth football coaches from China and Spain, and to explore the impact of different pedagogies on coach's behaviour and players' perceptions (Aim 1), a case study was done. And secondly, to investigate the current situation of Chinese elite youth football players' development and identify the musculoskeletal injury risks in Chinese elite youth football players (Aim 2), a cross-sectional survey research was done. Therefore, the following sections try to clarify the methodology used in each section of the Ph.D. thesis.

4.1. Methodology of the Case Study of Sino-Spain Comparison (Aim 1)

4.1.1. Sample

Six football coaches from Spain and China at elite Under - 10, Under - 11, and Under - 12 teams were recruited from Rayo Vallecano football club (Madrid) and the Elementary School affiliated with Renmin University of China (Beijing), respectively (Table 2.1). Prior to data collection, the study purpose and procedures were explained to all participants (coaches, players, and parents) and their informed consent was obtained. The Ethics Committee of China Football College of Beijing Sport University approved this study. A total of 22 training sessions were recorded (n = 11 training sessions in Madrid; and n = 11 training sessions in Beijing). Despite the limited sample size and observations, the power of the results is not limited (Peñas et al., 2020). Besides, the Madrid players trained twice a week for 90 minutes per session, while the Beijing players trained three times a week for 150 minutes per session. All teams played one match per weekend.

4.1.2. Design and procedure

Before the experiment, a test was conducted at an amateur youth football club in Madrid to ensure the experimental design, equipment, and indicators were effective, and coaches' instructions were audible in the videos and recordings. After this test, some coaching behaviour indicators were adjusted to ensure they were easily identifiable in the videos and recordings.

A systematic observation method (Stonebridge & Cushion, 2018) was applied to record and count coaching behaviours, while a semi-structured interview was conducted with 6 coaches and 8 randomly selected players from both academies to gain a deeper understanding of their coaching behaviour and cognition. Coaches explained their behaviour at specific moments, and players shared their perceptions about coaches' behaviour.

Table 9 Background information of coaches in the case study

Coach	Country	Age	Coaching license	Age group	Coaching experience	Academic background	Teaching license	Professional football experience
MC 1	Spain	28	UEFA - PRO	U 12	9 years	Bachelor	No	No
MC 2	Spain	26	UEFA - A	U 11	7 years	Bachelor	Yes	No
MC 3	Spain	24	UEFA - A	U 10	8 years	Bachelor	No	Yes
BC 1	China	56	AFC - B	U 12	> 30 years	Bachelor	Yes	No
BC 2	China	24	AFC - C	U 11	4 years	Bachelor	No	Yes
BC 3	China	24	AFC - C	U 10	4 years	Bachelor	No	No

4.1.3. Systematic observation

Based on the Coach Analysis and Intervention System (CAIS) (Cushion et al., 2012) and other tools from previous research on coaching behaviour (Stonebridge & Cushion, 2018), a modified version of CAIS was developed with three states for training situations (Table 2.2) and 23 indicators (Table 2.3) related to coaching behaviour.

Table 10 State definitions of the amended CAIS

State	Definition
Training Form	Activities without a game-related focus (e.g., physiological, technical, and skill-based activities).
Fitness	Improving fitness aspects of the game (e.g., warm-up, cool down, conditioning, rest)
Technical	Isolated technical skills unopposed alone or in a group
Skills	Re-enacting isolated simulated game incidents with or without focus on particular technical skills
Playing Form	Activities with a game-related focus (e.g., phases of play, conditioned, and small-sided games).
Small-sided game (SSG)	Match-play with reduced number of players and two goals
Phase of play	Unidirectional match play towards one goal
Conditioned game	As small-sided games, but with variations to rules, goals, or areas of play (e.g., possession/ball retention only games, or teams scoring by dribbling across end-line)
Inactivity	Moments during the training session where the teams are not actively participating in either training or playing form activities. Such as the time spent on transitions between activities, water breaks, or when the coach was organising/addressing the players.

The main observer, who holds a C-level coaching certificate from the Asian Football Confederation (AFC) and has four years of football coaching experience and an academic background related to sports training, was assisted by two observers. The assisted observer in Madrid is a Chinese with a B-level coaching certificate from the Union of European Football Associations (UEFA) and a football-related occupation, who has lived in Madrid since childhood and has a Spanish proficiency equivalent to native speakers. The assisted observer in Beijing has an AFC C-level coaching certificate, three years of football coaching experience, and an academic background in physical education. During training sessions, the observers stood beside the coaches to record the training content and time spent. The coaches wore smartwatches to record their voices during training, and a GoPro camera was used to capture live footage. The observers then reviewed the videos and sound recordings in a quiet room, discussing and determining the selected indicators' category and quantity.

To check inter- and intra-observers' agreement, the reliability test was carried out using the agreements / (agreements + disagreements) method (Cushion et al., 2012) in the 20% of the sessions recorded, randomly selected. The intra- and inter-observer reliability for coaching behaviours was 96% and 88%, respectively, in all situations (training form, playing form, and in others). All these data overcome the accepted 80% agreement level (Cushion et al., 2012).

Table 11 Coaching behaviours definitions of the amended CAIS

Indicators	Definition
Positive modelling	Skill demonstration – with or without verbal instruction that shows the performer the correct way to perform.
Negative modelling	Skill demonstration – with or without verbal instruction that shows the performer the incorrect way to perform.
Positive feedback	Feedback from the coach that is positive.
Negative feedback	Feedback from the coach that is negative.
Corrective feedback	Corrective statements that contain information that specifically aim to improve the player(s) performance at the next skill attempt.
Pre-instruction	Verbal cues, reminders, or prompts given before a performance episode to instruct / direct skill or play related to player(s) performance.
Concurrent-instruction	Verbal cues, reminders or prompts given during a performance episode to instruct / direct skill or play related to player(s) performance.
Post-instruction	Verbal cues, reminders, or prompts given after a performance episode to instruct / direct skill or play related to player(s) performance.
Humour	Jokes or content designed to make players laugh or smile.
Hustle	Verbal statements or gestures related to the effort to activate or intensify previously directed behaviour.
Praise	Positive or supportive verbal statements that demonstrate the coach's general satisfaction or pleasure with a player(s) that DO NOT specifically aim to improve the player(s) performance at the next skill attempt.
Punishment	Specific punishment for a mistake.
Scold	Negative or unsupportive verbal statements or non-verbal gestures demonstrating displeasure at a player(s) that DO NOT

	specifically aim to improve the player(s) performance at the next skill attempt.
Uncodable	Not clearly seen or heard, not belonging to any other category.
Silence	Coach is silent this can be on-or off-task.
Convergent question	Limited number of correct answers/options – closed responses .
Divergent question	Multiple responses/options – open to various responses.
Response to question	Coach responds to a question that may or may not be directly related to practise.
Management	Coach behaviour contributing or not contributing directly to practise/match competition or explaining how to execute the skill, drill, or game.
Confer with assistants	Coach confers with assistants to talk, manage or reflect on something.

4.1.4. Semi-structured interview

Each coach was interviewed after the observation period to gain insights into their coaching philosophy, decision-making process, motivation, and attitude (Cushion, Ford, & Williams, 2012; Potrac, Jones, & Armour, 2002). A semi-structured interview format was used, with open-ended and probing questions adapted from the CAIS. The interview continued until no new information was added. After the interview, coaches were provided with their data. To understand the players' perceptions of training and coaching behaviours, 16 players were randomly selected from each academy for a short interview after the training session of last observation.

4.1.5. Data analysis

The systematic observation data were first input using an Excel spreadsheet for descriptive statistical analysis. Then the rate per minute (RPM) of all coaching behaviour indicators of each coach in different training activities was calculated.

This information was then used to perform independent-sample comparisons between Madrid and Beijing coaches. The RPM data were tested for normal distribution (Shapiro-Wilk test), using the independent samples T-test for variables with parametric distributions, and the Mann-Whitney U test for variables with non-parametric distributions. All tests established a p-value <0.05. The statistical software Jamovi 1.1.9.0 was used for that purpose.

The interview data were analysed thematically, using the approach developed by Braun and Clarke (2006). The authors employed qualitative analysis software NVivo R1 to assist in coding both semantic and latent meanings. The six phases of thematic analysis were conducted, including data familiarisation, generating initial codes, generating initial themes, reviewing initial themes, defining, and naming themes, and producing the report. The first author immersed in the data, conducted open and organic coding, and developed initial themes that were reviewed and defined by the research team.

4.2. Methodology of the Survey on the Development pathway of Chinese Elite Football Players (Aim 2)

4.2.1. Sample

In this study, a total of 178 elite youth football players (age = 13.3 ± 1.2 years; n = 88 boys and n = 90 girls) were collected in the form of face-to-face paper questionnaires for their sports participation and injury history in the past twelve months. Participants were recruited during the seven-day National School Football Winter Camp. Players who participate in the winter camp first go through the selection of provincial and municipal school football camps to form a representative team of each age group, representing the province and the city to participate in the national school football summer camp. During the summer camp, through two rounds of selection, the eligibility for the winter camp is finally determined. After a week of evaluation of training and competition, the players participating in the winter camp will be selected to form the SFP national teams of all ages to participate in international competitions. The total number of players

participating in this winter camp is n = 193. To ensure a sufficient sample size to represent all players participating in the national school football winter camp, an online sample size calculator from the web page of Calculator.net was used. Assuming a 95% confidence level and a 3% margin of error, a sample size of at least n = 164 out of n = 193 people is required. Ethical approval was granted by the institution of Beijing Sport University on 15th December 2020, reference number BSUCFCIRB-10043202005.

4.2.2. Design and procedure

During the winter camp, a team of seven research assistants and seven team physicians (or physiotherapists) collected data. Researchers invite participants who fit the target population to fill out a questionnaire. The participants voluntarily completed the survey, and all of them were asked for the consent of their parents and coaches before filling out the questionnaire. Some information in the questionnaire must be provided by the players' parents. Therefore, before filling out the questionnaire, the research assistant and the coaches contacted their parents by WeChat or phone call to ensure the accuracy of the information related to parents in the questionnaire.

4.2.3. Measurements

The questionnaire for this study was adapted from previous studies in the relevant field (see Figure 2.1). The questionnaire contains three sections: demographic data (containing a simple measure of athlete maturity), sports participation, and sports injury history.

Measurement for Early Specialization

To assess the level of specialization of an athlete, the questionnaire includes four questions to be answered "yes" or "no" (see Figures 1. Q1.1-1.4). One point was awarded for each "yes" answer, with athletes scoring greater than or equal to 3 being rated as "highly specialized", those scoring 2 as "moderately specialized" and those athletes with a score of 1 or 0 rated as "lowly specialized". As all participants

in this study were below the seventh grade (LaPrade et al., 2016), players rated as "highly specialized" were classified as "early specialized" for this study.

Measurement for Maturity

To assess the maturity of the players, players' gender, date of birth, height, weight, and parental height were collected from the demographic data of the questionnaire to calculate the percentage of a player's predicted adult height as an alternative indicator for maturity status (Khamis & Roche, 1994). The height of each player's biological parents was self-reported, therefore, this study used equations from Epstein et al. (1995) to adjust for possible parental overestimation. Early Pubertal was defined as between 85% and 90% of predicted adult height (PAH), and Mid-Pubertal was defined as between 90% and 95% of PAH. Subsequently, Pre-Pubertal was < 85% and Late Pubertal was > 95%.

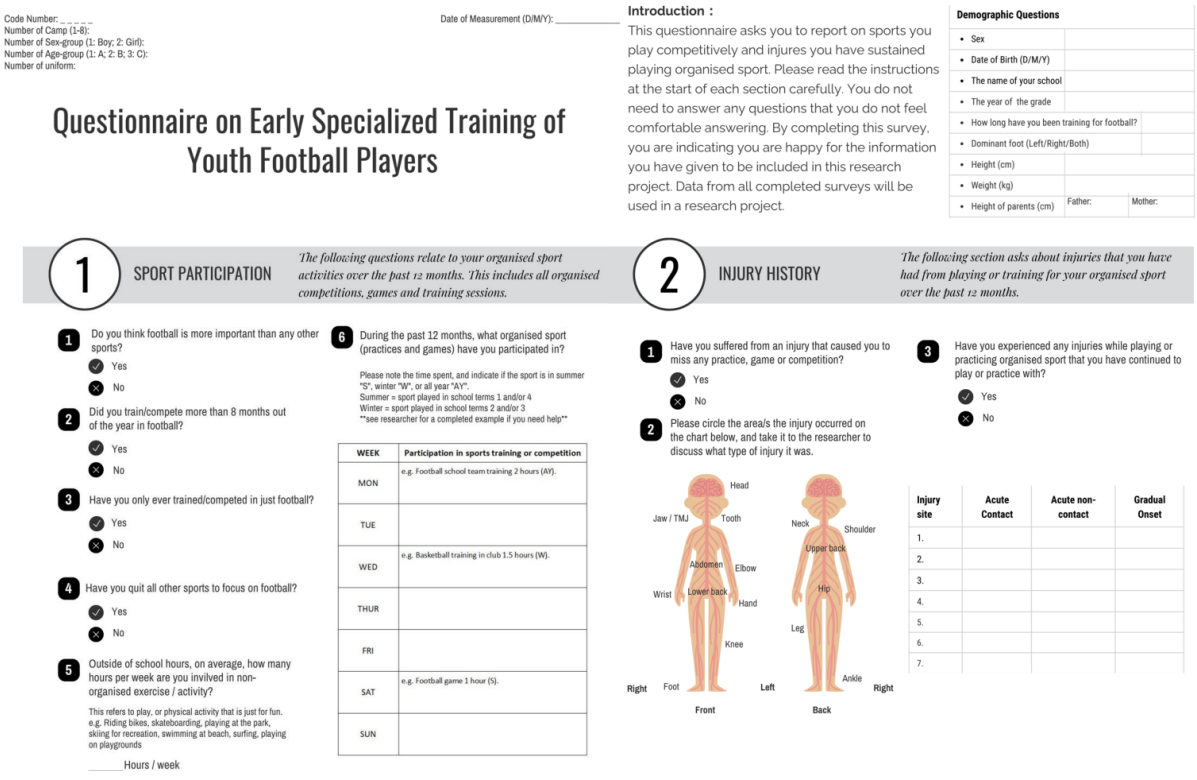
Measurement for sports participation and injury:

Sports participation which includes weekly participation in sports training, competitions, and leisure free play was recorded in Q1.5-1.6. To assess athletes' sports injuries over the past 12 months, each athlete who responded with a history of sports injuries was checked by a research assistant and a physician to confirm the location and type of the injury. An acute injury was defined as an injury resulting from a sudden, specific, identifiable event, and a gradual onset injury was defined as any physical complaint not resulting from a suddenly single, identifiable event, but from repeated microtrauma, and could include growth-related pain and overuse issues (Fuller et al., 2006). Others have included the term "overuse injury" in the definition of "gradual onset". All injuries were recorded regardless of whether time was lost from sport or not.

4.2.4. Data Analysis

The data were first input using an Excel spreadsheet for descriptive statistical analysis. All statistical data analyses were completed using the Statistical Programme for Social Sciences IBM SPSS for Macintosh (IBM Corp., Armonk, NY),

version 29. Univariate analyses were conducted for the outcome variable (injury reported or not) in seven categories: “any injury”, “gradual onset injury”, “acute injury”, “leg injury”, “knee injury”, “ankle injury” and “foot injury”. The independent variables investigated were level of specialization (low/moderate or high), annual sports volume (whether the player played one sport for more than eight months of the year, or not), weekly sports volume (whether the player participates in more organized sport per week in hours than their age in years, or not), the ratio of training and leisure (whether the player participates in more than twice the amount of organized sport to recreational free-play activity each week, or not), and maturity status (Pre/Early Pubertal, or Mid/Late Pubertal). Gender (male or female) as a potential confounding variable was controlled for in the logistic regression equation if it was significantly associated with injury in an independent chi-square analysis. To investigate the associations with injury, Pearson’s Chi-squared test and Fisher’s exact test were initially conducted. A p-value of < 0.05 was considered a statistically significant association. Phi, which is a chi-square-based measure of association, was calculated to interpret the effect size where 0.1 represents a small effect, 0.3 represents a medium effect, and 0.5 represents a large effect. Binomial logistic regression models were then built to examine the effect of the level of specialization (early specialization or not), sports volume (exceeding each recommendation or not), and maturity status (Pre/Early Pubertal, or Mid/Late Pubertal) on each injury outcome. Odds ratios (OR) with 95% confidence intervals (CI) were calculated.


Code Number: _____
Number of Camp (1-8):
Number of Sex-group (1: Boy; 2: Girl):
Number of Age-group (1: A; 2: B; 3: C):
Number of uniform:

Date of Measurement (D/M/Y): _____

Questionnaire on Early Specialized Training of Youth Football Players

Introduction :

This questionnaire asks you to report on sports you play competitively and injures you have sustained playing organised sport. Please read the instructions at the start of each section carefully. You do not need to answer any questions that you do not feel comfortable answering. By completing this survey, you are indicating you are happy for the information you have given to be included in this research project. Data from all completed surveys will be used in a research project.

Demographic Questions		
• Sex		
• Date of Birth (D/M/Y)		
• The name of your school		
• The year of the grade		
• How long have you been training for football?		
• Dominant foot (Left/Right/Both)		
• Height (cm)		
• Weight (kg)		
• Height of parents (cm)	Father:	Mother:

1 SPORT PARTICIPATION

The following questions relate to your organised sport activities over the past 12 months. This includes all organised competitions, games and training sessions.

1. Do you think football is more important than any other sports?
   - Yes
   - No
2. Did you train/compete more than 8 months out of the year in football?
   - Yes
   - No
3. Have you only ever trained/competed in just football?
   - Yes
   - No
4. Have you quit all other sports to focus on football?
   - Yes
   - No
5. Outside of school hours, on average, how many hours per week are you invilved in non-organised exercise / activity?

   This refers to play, or physical activity that is just for fun. e.g. Riding bikes, skateboarding, playing at the park, skiing for recreation, swimming at beach, surfing, playing on playgrounds

   _____Hours / week
6. During the past 12 months, what organised sport (practices and games) have you participated in?

   Please note the time spent, and indicate if the sport is in summer "S", winter "W", or all year "AY".
   Summer = sport played in school terms 1 and/or 4
   Winter = sport played in school terms 2 and/or 3
   see researcher for a completed example if you need help

WEEK	Participation in sports training or competition
MON	e.g. Football school team training 2 hours (AY).
TUE	
WED	e.g. Basketball training in club 1.5 hours (W).
THUR	
FRI	
SAT	e.g. Football game 1 hour (S).
SUN	

2 INJURY HISTORY

The following section asks about injuries that you have had from playing or training for your organised sport over the past 12 months.

1. Have you suffered from an injury that caused you to miss any practice, game or competition?
   - Yes
   - No
2. Please circle the area/s the injury occurred on the chart below, and take it to the researcher to discuss what type of injury it was.

Injury site	Acute Contact	Acute non-contact	Gradual Onset
1.			
2.			
3.			
4.			
5.			
6.			
7.			

3. Have you experienced any injuries while playing or practicing organised sport that you have continued to play or practice with?
   - Yes
   - No

Figure 4 Questionnaire on Early Specialized Training of Youth Football Players (English version)

CHAPTER 4

Results

5. Results

In order to provide a clear description of results of the Ph.D. Thesis, two main sections for each aim were described: (1) the comparison on training activities and coaching behaviours between Sino-Spain youth football coaches (aim 1); and (2) the survey study on the current situation of the development pathway for Chinese elite youth football player (aim 2).

5.1. Results of the Comparison on Training Activities and Coaching Behaviours between Sino-Spain Youth Football Coaches (Aim 1)

In terms of practice structure (Figure 4.3), Madrid coaches used more PF (47.8%) than TF (35.2%), while Beijing coaches used more TF (52.4%) than PF (22.3%). The results also showed that Madrid coaches spent less time (17.0%) in inactivity than Beijing coaches (25.3%).

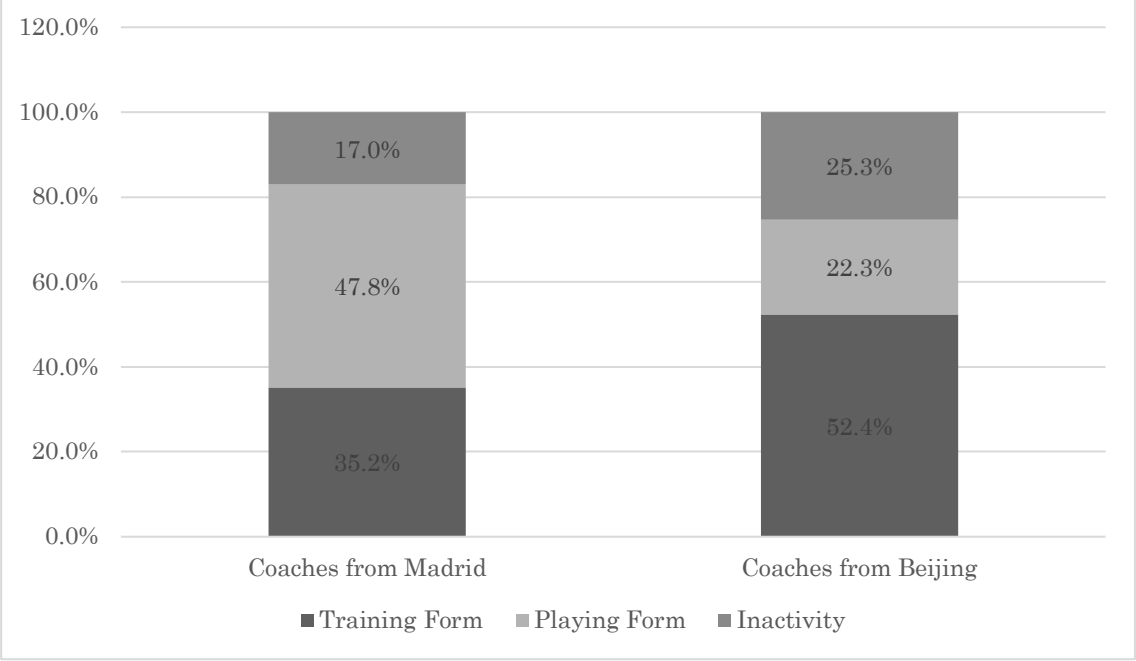


Figure 5 Time distribution in different training state

According to the coaching behaviour (Table 4.8), there were no significant differences in the indicators of "positive modelling", "post-instruction", "divergent question", and "uncodable" between Madrid and Beijing coaches, but other indicators ("negative modelling", "positive feedback", "negative feedback", "corrective feedback", "pre-instruction", "concurrent-instruction", "humour", "hustle", "praise", "punishment", "scold", "silence", "convergent question", "response to question", "management", and "confer with assistants") showed significant differences.

The six coaches were interviewed with 275 minutes recordings. A total of 16 players were interviewed with recordings of 37 minutes. Our analytic review process resulted in a final analytic structure of three themes, Appendix B shows the themes, subthemes, and example quotes. We reported three coexisting themes developed through the analytic process: 1) update and reflect on training activities to maximize training efficacy; 2) leave the decision-making opportunities for the players; and 3) different coaching philosophies create different training environments.

Table 12 Coaching behaviours of coaches from Madrid and Beijing

	Coaches from Madrid				**Coaches from Beijing**				**RPM Independent sample T-test**	
Behaviors	Total	%	SD	RPM	Total	%	SD	RPM	t	p
Positive modelling	65	1.18	1.38	0.08	128	1.33	5.18	0.10	-1.559	0.135
Negative modelling	8	0.15	0.90	0.01	32	0.33	2.07	0.03	-2.451	0.024*
Positive feedback	1,288	23.42	3.86	1.56	475	4.95	5.29	0.38	31.434	<.001*
Negative feedback	34	0.62	3.78	0.04	790	8.24	15.01	0.63	-13.670	<.001*
Corrective feedback	125	2.27	1.69	0.15	425	4.43	3.80	0.34	-14.807	<.001*
Pre-Instruction	410	7.46	3.88	0.50	350	3.65	7.51	0.28	7.446	<.001*
Concurrent-Instruction	1,343	24.42	6.89	1.62	3,225	33.62	46.60	2.58	-7.617	<.001*
Post-Instruction	279	5.07	3.96	0.34	376	3.92	6.76	0.30	1.467	0.158
Humour	31	0.56	1.78	0.04	173	1.80	2.97	0.14	—	<.001*
Hustle	219	3.98	3.56	0.26	780	8.13	15.88	0.62	-8.053	<.001*
Praise	17	0.31	0.93	0.02	5	0.05	0.52	0.00	—	<.001*
Punishment	0	0.00	0.00	0.00	234	2.44	8.01	0.19	—	<.001*
Scold	3	0.05	0.81	0.00	394	4.11	4.53	0.31	—	<.001*
Uncodable	17	0.31	0.93	0.02	61	0.64	3.01	0.05	—	0.004

Silence	758	13.78	8.23	0.92	312	3.25	7.41	0.25	19.549	<.001*
Convergent Question	13	0.24	0.75	0.02	88	0.92	3.79	0.07	-5.097	<.001*
Divergent Question	3	0.05	0.47	0.00	6	0.06	0.69	0.00	—	0.716
Response to question	45	0.82	2.02	0.05	7	0.07	1.21	0.01	5.312	<.001*
Management	654	11.89	6.36	0.79	1,728	18.01	15.80	1.38	-11.953	<.001*
Confer with assistants	187	3.40	4.02	0.23	4	0.04	0.67	0.00	—	<.001*
Total	5,499	100.00			9,593	100.00				

Notes. "—" means that the test method of this indicator is Mann-Whitney U test; * statistically significant difference ($p<0.05$)
Abbreviations: RPM = Rate per Minute

5.2. Results of the Survey on Current Situation of the Development Pathway for Chinese Elite Youth Football Players (Aim 2)

5.2.1. Early Specialization and Sports Volume

80.3% of the athletes (n = 143) were classified as early specialization (highly specialized), 19.7% of the athletes (n = 35) were classified as not early specialization, which includes 16.9% of the athletes (n = 30) were moderately specialized, and 2.8% of athletes (n = 5) were lowly specialized. Almost all athletes (n = 172) participated in a sport for more than eight months in a year. Most athletes (n = 135) spent more than twice of the time on organized sports than leisure activities. In addition, 30.3% of athletes (n = 54) trained exceeding average weekly hours per week based on age in years.

5.2.2. Maturity

Regarding the maturity status of athletes, 20.8% of athletes (n = 37) were classified as pre-Pubertal, 23.0% of athletes (n = 41) were classified as Early Pubertal, 39.9% of athletes (n = 71) were classified as Mid-Pubertal and 16.3% of athletes (n = 29) were classified as Late Pubertal.

5.2.3. Injury

All participants reported a total of 370 unique sport-related injuries over the past twelve months. Of these, 81.3% were acute injuries (n = 301) and 18.7% were gradual onset injuries (n = 69). Overall, the majority of all reported injuries were lower limbs (71.6%, n=265), and a few were upper limbs (16.2%, n=60) or torso and head (12.2%, n=45). Please refer to the supplementary documents for specific injury distribution.

5.2.4. Univariate Analysis

The results of statistical analysis showed that there were significant differences in the odds ratios (OR) of reporting a history of injury among athletes with different levels of specialization (see Table 4.9); there were significant differences in the OR of reporting a history of leg injury among players with different weekly sports volumes (see Table 4.10); The OR of players reporting foot injuries were significantly different between players with different maturity state (see Table 4.11); The OR of reporting acute injuries were significantly different between players with different levels of specialization and weekly activity (see Table 4.12). The binomial logistic regression was not statistically significant ($p > 0.05$) between the remaining dependent variable (knee injury, ankle injury, and gradual onset injury) and the independent variables (specialization, sports volume, and maturity) (See Table 4.13 – 4.15).

Table 13 the association of any injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% Confidence Interval)	p	χ^2	p	Phi
Level of Specialization	No ES	0.326 (0.124 - 0.860)	0.024*	4.309	0.038*	0.156
	ES	3.066 (1.162 - 8.090)				
Week Sport Volume	≤ Age	0.435 (0.134 - 1.413)	0.166	3.221	0.073	0.135
	＞ Age	2.301 (0.708 - 7.484)				
Annual Sport Volume	≤ 8 months	762295468.7 (0.000 -)	0.999	1.062	0.596	0.077
	＞ 8 months	0.000				
Training Leisure Ratio	≤ 2 : 1	1.008 (0.365 - 2.788)	0.987	0.127	0.721	0.027
	＞ 2 : 1	0.992 (0.359 - 2.742)				
Maturity	Pre / Early Pubertal	1.187 (0.468 - 3.009)	0.717	0.028	0.866	0.013
	Mid / Late Pubertal	0.842 (0.332 - 2.135)				

Table 14 the association of leg injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% CI)	p	χ 2	p	Phi
Level of Specialization	No ES	1.113 (0.481 - 2.577)	0.802	0.007	0.932	0.006
	ES	0.898 (0.388 - 2.080)				
Week Sport Volume	≤ Age	0.488 (0.248 - 0.962)	0.038*	4.524	0.033*	0.159
	＞ Age	2.047 (1.040 - 4.031)				
Annual Sport Volume	≤ 8 months	0.797 (0.121 - 5.269)	0.814	0.027	0.869	0.012
	＞ 8 months	1.254 (0.190 - 8.289)				
Training Leisure Ratio	≤ 2 : 1	0.775 (0.363 - 1.653)	0.509	0.966	0.326	0.074
	＞ 2 : 1	1.291 (0.605 - 2.754)				
Maturity	Pre / Early Pubertal	0.860 (0.452 - 1.637)	0.646	0.023	0.880	0.011
	Mid / Late Pubertal	1.163 (0.611 - 2.214)				

Table 15 the association of foot injury with specialization, sports volume and maturity

Independent variable		Odds Ratio (95% CI)	p	χ^2	p	Phi
Level of Specialization	No ES	0.339 (0.074 – 1.549)	0.163	0.915	0.339	0.072
	ES	2.946 (0.646 -13.444)				
Week Sport Volume	≤ Age	0.580 (0.248 - 1.359)	0.210	2.884	0.089	0.127
	＞ Age	1.723 (0.736 - 4.034)				
Annual Sport Volume	≤ 8 months	6.298 (0.636 - 62.317)	0.116	1.203	0.267	0.082
	＞ 8 months	0.159 (0.016 - 1.571)				
Training Leisure Ratio	≤ 2 : 1	1.315 (0.523 - 3.302)	0.560	0.672	0.412	0.061
	＞ 2 : 1	0.761 (0.303 - 1.911)				
Maturity	Pre / Early Pubertal	2.356 (1.015 - 5.471)	0.046*	5.581	0.018*	0.177
	Mid / Late Pubertal	0.424 (0.183 - 0.985)				

Table 16 the association of acute injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% CI)	p	χ^2	p	Phi
Level of Specialization	No ES	0.417 (0.171 – 1.015)	0.054	3.900	0.048*	0.148
	ES	2.398 (0.985 - 5.839)				
Week Sport Volume	≤ Age	0.392 (0.147 - 1.042)	0.061	5.283	0.022*	0.172
	> Age	2.554 (0.959 - 6.797)				
Annual Sport Volume	≤ 8 months	3.122 (0.305 - 31.934)	0.337	0.100	0.752	0.024
	> 8 months	0,320 (0.031 - 3.276)				
Training Leisure Ratio	≤ 2 : 1	1.097 (0.456 - 2.636)	0.837	0.060	0.806	0.018
	> 2 : 1	0.912 (0379 - 2.192)				
Maturity	Pre / Early Pubertal	1.209 (0.547 - 2.671)	0.639	0.158	0.691	0.030
	Mid / Late Pubertal	0.827 (0.374 - 1.827)				

Table 17 the association of knee injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% CI)	p	χ^2	p	Phi
Level of Specialization	No ES	0.809 (0.353 - 1.855)	0.617	0.041	0.839	0.015
	ES	1.236 (0.539 – 2.833)				
Week Sport Volume	≤ Age	0.600 (0.307 - 1.172)	0.135	1.752	0.186	0.099
	＞ Age	1.668 (0.853 - 3.260)				
Annual Sport Volume	≤ 8 months	3.020 (0.462 - 19.742)	0.249	1.249	0.408	0.084
	＞ 8 months	0.331 (0.051 - 2.165)				
Training Leisure Ratio	≤ 2 : 1	1.537 (0.754 - 3.130)	0.237	1.056	0.304	0.077
	＞ 2 : 1	0.651 (0.320 - 1.325)				
Maturity	Pre / Early Pubertal	0.825 (0.443 - 1.538)	0.545	0.035	0.851	0.014
	Mid / Late Pubertal	1.212 (0.650 - 2.258)				

Table 18 the association of ankle injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% CI)	p	χ^2	p	Phi
Level of Specialization	No ES	0.843 (0.367 - 1.938)	0.688	1.374	0.241	0.088
	ES	1.186 (0.516 - 2.724)				
Week Sport Volume	≤ Age	0.714 (0.358 - 1.424)	0.339	2.258	0.133	0.113
	＞ Age	1.400 (0.702 - 2.792)				
Annual Sport Volume	≤ 8 months	0.251 (0.025 - 2.545)	0.242	2.578	0.211	0.120
	＞ 8 months	3.985 (0.393 - 40.410)				
Training Leisure Ratio	≤ 2 : 1	0.685 (0.323 - 1.451)	0.323	3.089	0.079	0.132
	＞ 2 : 1	1.460 (0.689 - 3.093)				
Maturity	Pre / Early Pubertal	1.218 (0.630 - 2.355)	0.558	0.001	0.970	0.003
	Mid / Late Pubertal	0.821 (0.425 - 1.588)				

Table 19 the association of gradual onset injury with specialization, sports volume, and maturity

Independent variable		Odds Ratio (95% CI)	p	χ^2	p	Phi
Level of Specialization	No ES	1.113 (0.477 -2.596)	0.804	0.057	0.811	0.018
	ES	0.899 (0.385 - 2.096)				
Week Sport Volume	≤ Age	0.957 (0.475 - 1.927)	0.902	0.020	0.888	0.011
	＞ Age	1.045 (0.519 - 2.104)				
Annual Sport Volume	≤ 8 months	0.943 (0.146 - 6.107)	0.951	0.002	0.968	0.003
	＞ 8 months	1.060 (0.164 - 6.865)				
Training Leisure Ratio	≤ 2 : 1	1.003 (0.475 - 2.118)	0.994	0.000	0.997	0.000
	＞ 2 : 1	0.997 (0.472 - 2.105)				
Maturity	Pre / Early Pubertal	1.053 (0.551 - 2.013)	0.875	0.035	0851	0.014
	Mid / Late Pubertal	0.949 (0.497 - 1.815)				

CHAPTER 5

General Discussion

6. General Discussion

The general objective of the PhD. thesis is to explore the best development approach for Chinese youth football players in both dimension of coaching and training pathway. So as to investigate the coaching behaviour and training activities of Chinese youth football coaches, and the development pathway of Chinese youth football players were also taken into account. To pursue the research aims, the PhD. thesis can be mainly composed by the two tightly connected studies, each section focusing on a different part of youth football development.

6.1. Discussion of the case study on the comparison of training activities and coaching behaviour between Sino-Spain youth football coaches

6.1.1. Update and reflect on training activities to maximize training efficacy

The findings of training activity between Madrid and Beijing coaches revealed that Beijing coaches spent more time improving youth players' basic skills in TF than in PF, while Madrid coaches used PF more in their training sessions than Beijing ones. Earlier studies indicated that coaches used more TF in their training practice (Ford, Yates, & Williams, 2010; Partington & Cushion, 2013), performing traditional tasks mainly associated with technique or skill practice. These skills are first mastered and then serve as the foundation for competition (Cassidy, Potrac, & Rynne, 2023; Harvey et al., 2010). According to the interview data, Beijing coaches are heavily influenced by traditional coaching methods. For instance, BC1 believed that "*TF enables players to practice techniques and tactics effectively, which serves as a foundation for the subsequent PF activities*". Previous research noted that TF activities may promote the acquisition of techniques (Schmidt et al., 2018) but at the expense of cognitive skills like

anticipation and decision-making (Abad Robles et al., 2020). PF may be more effective in developing perceptual-cognitive skills since it resembles real-game situations (Ford, Yates, & Williams, 2010). Furthermore, PF activities are more variable and random, with situational factors that are beneficial for long-term learning and skill retention (Lee & Simon, 2004). This aligns with the skill acquisition theory, which suggests that randomness in practice promotes long-term learning (Ford & Williams, 2013; Schmidt et al., 2018; Williams & Hodges, 2005). Although TF may improve short-term performance, it may fail to transfer these improvements to real-game situations and may hinder skill development with fewer PF activities (Cushion, Ford, & Williams, 2012). Recent studies also show that coaches in football-developed countries tend to use more PF (O'Connor, Larkin, & Williams, 2018; Roca & Ford, 2020). According to the interview data, the Beijing coaches viewed PF as a regular football game and were unaware that it could also take the form of SSG with varying rules which can maintain the values of football-specific self-efficacy and collective self-efficacy (García-Angulo et al., 2020). Consequently, they rely on traditional TF activities, overlooking the potential benefits of PF.

This study also found that Beijing coaches spent more time in "inactivity" than Madrid coaches. Previous research suggested that this period was important for players' reflection and awareness, and can be part of the training session for asking convergent and divergent questions (Stonebridge & Cushion, 2018). In this study, Madrid coaches asked more questions during the "inactivity" moment, and players were more willing to interact with coaches. In contrast, Beijing coaches rarely asked questions, and players showed fewer questioning behaviours. It was also found in the interview that Beijing coaches are not aware of a more efficient use of this period and see it only as a water break. Thus, the quality of this time is more important than the quantity, and coaches should use it effectively for interaction and learning (asking questions, summarizing, giving feedback, etc.).

Both Madrid and Beijing coaches mentioned the importance of post-training reflection. For example, MC3 highlighted that "*After each training session, I gather with my coaching staff to review each exercise. We evaluate its effectiveness*

and identify any areas for improvement. Post-training reflection is very important, and as we recognize that if an exercise doesn't work out, it could be due to the coaching rather than the players' fault". Therefore, constant reflection and updating of training activities are critical to maximizing training efficacy. Coaches should also possess updated pedagogical skills and use effective coaching methods that prioritize long-term learning over short-term performance results (Barrero, Robles, & Fuentes-Guerra, 2022).

6.1.2. Leave the decision-making opportunities for the players

Five coaching behaviours that are the most relevant to players decision-making show in the Figure 6. Concurrent instruction is the most frequently used coaching behaviour among previous studies (Cushion & Jones, 2001; Ford, Yates, & Williams, 2010; Kahan, 1999; Millard, 1996; Miller, 1992; Partington & Cushion, 2013; Potrac, Jones, & Armour, 2002; Potrac, Jones, & Cushion, 2007; Stonebridge & Cushion, 2018), this study also found concurrent-instruction to be the most common behaviour used by both Beijing and Madrid coaches, and mainly in Beijing. Specifically, Madrid coaches behaved in silence a lot while Beijing coaches hustled a lot. The approach of Beijing coaches is associated with short-term performance improvement and hinders long-term learning according to skill acquisition theory (Williams & Hodges, 2005). Excessive instructions and feedback may have an adverse effect on long-term learning, whereas silence provides players with opportunities to learn by doing (Stonebridge & Cushion, 2018), and coaches with the chance to observe and reflect. If a player made errors during training, the coach could wait and see what was going on, rather than give directions right away. Both coach groups recognized the importance of "silence" and wanted to improve the players' self-decision-making ability which is the fundamental factor in talent development (Martín Barrero, Giménez Fuentes-Guerra, & Abad Robles, 2022).

"*I am trying to coach by the hands-off approach and deliberately remain silent and observe, giving the players maximum decision-making opportunities. If I am always directing, then it is my football, not theirs. Moreover, in the game, it is*

useless for the coach to just yell; it is still up to the players to deal with the ball themselves." (BC3)

"*The player's decision-making ability is crucial in distinguishing outstanding from ordinary players. Those who make the best decisions or fewer mistakes tend to succeed in professional football. I try to coach with a hands-off approach, intentionally remain silent to observe them rather than controlling players like a remote control. This allows players to make more decisions and solve problems independently.*" (MC1)

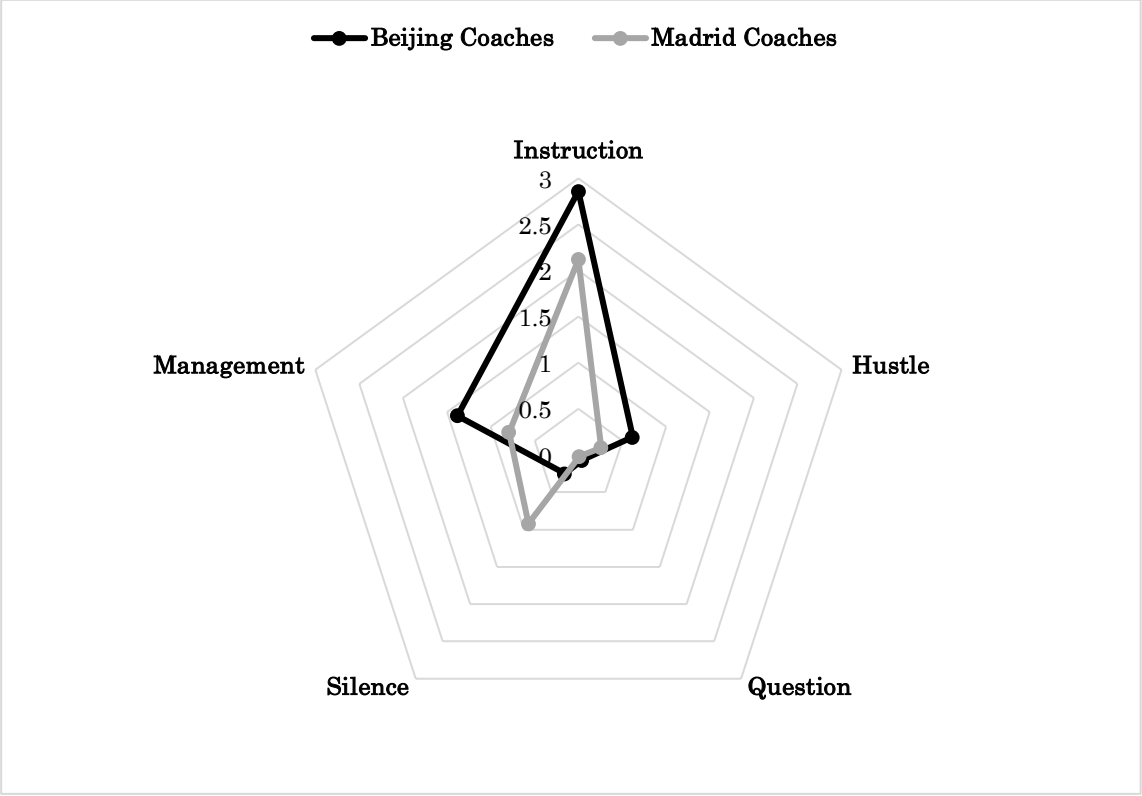


Figure 6 The most relevant coaching behaviours to players decision-making

However, perhaps due to a lack of understanding (Davis & Sumara, 2003; Light, 2008), some coaches continued their traditional way to train. For young players, a more "hands-off" approach may be more appropriate and was suggested to be implemented (Cushion, Ford, & Williams, 2012; Stonebridge & Cushion, 2018; Williams & Hodges, 2005).

"Questioning" is a valuable coaching behaviour that can promote active learning and reflection among players, particularly, effective divergent-question can enhance learning and better develop players' decision-making and problem-solving abilities (Harvey & Light, 2015; Kidman, 2010).

"*Asking players is because they need to know why things are the way they are, due to the different decisions they make. They must think and reflect on which decision led to this result. Moreover, asking players what decision they would make based on this situation.*" (MC1)

However, through actual observations, a common phenomenon has been identified: coaches tend to dominate the questioning process by guiding players toward predetermined answers through a series of closed questions (Harvey & Light, 2015). These questions are often asked in a "quick-fire" style, leaving players with insufficient time to contemplate their responses due to the limited training time available. Coaches are encouraged to pose more divergent questions (Cope et al., 2016). However, critical thinking and reflection require a certain amount of time (Kidman, 2010), coaches need to give players time to think, to effectively stimulate their decision-making and problem-solving capabilities.

On the other hand, "hustle" is a widely used coaching behaviour to motivate youth players and intensify their efforts (Lacy & Goldston, 1990; Zeng & Leung, 2008). Coaches use much "hustle" is to increase the pace of training. "*My demand is for them to accelerate the pace and speed of connection. I believe this habit should be cultivated during regular training because it reflects real game situations. In these fast-paced situations, I expect them to make quick reactions and decisions*" (BC3). However, some coaches are also concerned that excessive "hustle" can be dangerous (lower ratings of prosocial behaviours and higher ratings of antisocial behaviours) (Allan & Côté, 2014). Therefore, the appropriate use of "hustle" during training sessions should be carefully considered, as sometimes players need to be calm and rational to make decisions, not always in the situation where coaches push them to do so blindly or hastily, at this time, "silent" can be appropriate behaviour.

6.1.3. Different coaching philosophies create different training environments

Coaching behaviours, particularly feedback, are crucial in shaping the training environment, which can impact the players' self-esteem, autonomy, anxiety, competence, confidence, and character (Côté et al., 2010; O'rourke et al., 2014). Concerning the type of feedback, Madrid coaches liked to give more positive feedback, while Beijing coaches used almost twice as much negative feedback as positive feedback. Verbal feedback plays a critical role in developing players' technical and tactical skills (Lagestad, Sæther, & Ulvik, 2017), cognitive abilities, and future performance (Connolly, 1970; Haywood & Getchell, 2021; Piaget & Cook, 1952). Moreover, the content of feedback is vital to the player's motivation (Cushion, Ford, & Williams, 2012; Ford, Yates, & Williams, 2010; Weiss, Amorose, & Wilko, 2009). Positive feedback enhances players' self-confidence, which can positively affect sports participation and performance (Vealey & Chase, 2008). According to the interview, Beijing coaches gave more negative feedback because they had higher expectations for their players' performance. However, this approach may negatively impact their self-confidence and lead to abandonment.

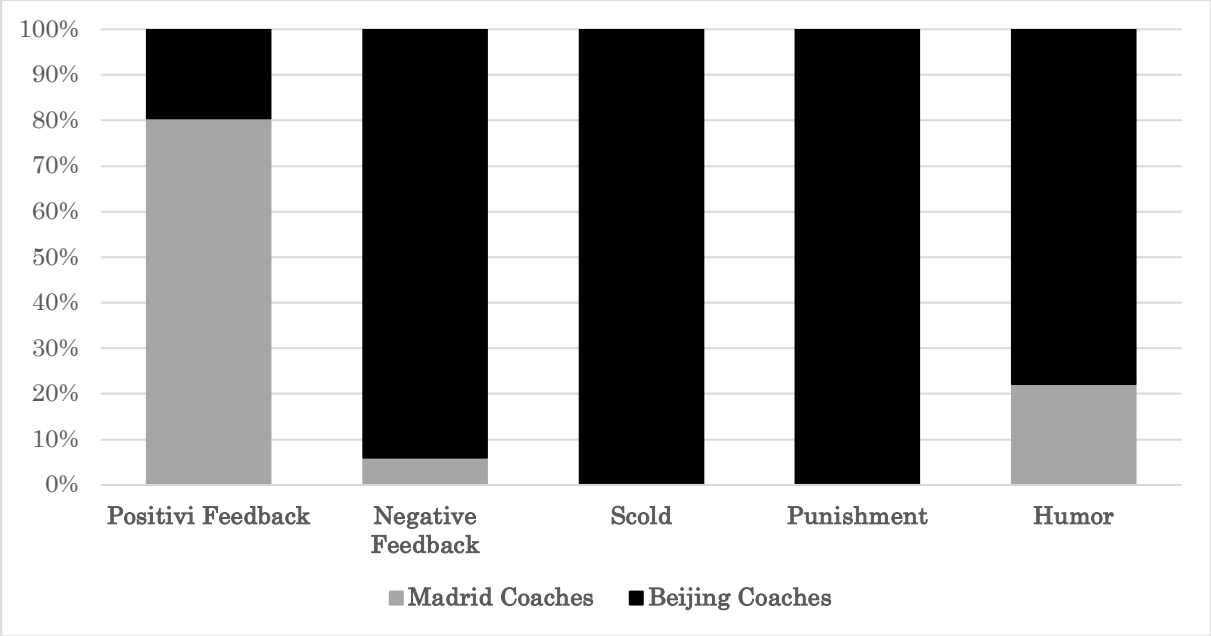


Figure 7 The most relevant coaching behaviours to players decision-making

As shown in Figure 7, this study highlights a stark contrast between the coaching behaviours of Beijing coaches, characterized by negative feedback, blame, and punishment, and those of Madrid coaches, who primarily use positive feedback. These differences reflect distinct educational models and leadership styles. Despite different coaching styles, both aim to develop and improve the skills of youth players. The interviews revealed that Beijing coaches view negative feedback, blame, and punishment as teaching strategies to stimulate players' self-esteem, motivation, and diligence while preventing them from repeating mistakes.

"*Punishment is a form of tough love, and scolding is a form of caring, for it is only through strict discipline that a great student can be formed.*" (BC2)

In fact, this is the most common way to educate children in China. Punishment has been used as a moral training technique since ancient China (Wilson, 1981). So far, regardless of family education or school education, Chinese parents/teachers still tend to use this method to induce the correct behaviour of children (Fung, 1999). These interview results were consistent with previous research (Fung, 1999) that punishment and scolding were utilized merely as tools to educate children through their mistakes. Although punishment and scolding are ostensibly fraught with threats of exclusion and abandonment, from the perspective of the caregiver (parent or teacher), its ultimate purpose is to motivate children to take responsibility for their behaviour and to progress and improve. Therefore, it is not hard to understand why Beijing coaches are more inclined to use these coaching behaviours. In contrast, Madrid coaches disagree with these coaching behaviours, arguing that punishment and blame do nothing for skill learning. Punishing athletes for poor performance seems to prevent the accumulation of mastery experience. And most concerns about the use of punishment are the recipient's misunderstanding (Seifried, 2008).

Even professional football players also welcome more positive feedback (Høigaard, Jones, & Peters, 2008), and so are kids. According to the interview, both Beijing and Madrid players preferred more positive feedback from their coaches. Although Beijing coaches used more negative feedback, punishment, and blame, interviews

revealed that most Beijing players understood these behaviours as helpful and caring, even if they did not like them. Therefore, it cannot be denied that the "negative approach" strategy of Beijing coaches has a positive effect on Beijing's youth players. In contrast, Madrid players did not understand this kind of behaviour because their coaches rarely used it. Previous studies have shown that Chinese children understand the word "shame" earlier than European and American children (Dunn, Bretherton, & Munn, 1987; Fischer, Shaver, & Carnochan, 1990; Wang & Leichtman, 2000), they are exposed to shame-related educational methods earlier and more frequently (Fung, 1999). Therefore, Chinese children can better explain this kind of behaviour of their caregivers - they tend to interpret strict discipline (e.g., blame, punishment and negative feedback) as an expression of care or involvement by the caregiver (Chao, 1994).

Another important finding from the interviews is that both Beijing and Madrid coaches hope to improve players' mental toughness, that is, the ability to achieve personal goals in the face of stressors (obstacles, distractions, pressure, and adversity) (Gucciardi & Gordon, 2011; Hardy, Bell, & Beattie, 2014; Strycharczyk, Clough, & Perry, 2021). However, they employ different strategies to achieve this. Beijing coaches claim that they seek to expose athletes to punishment-conditioned stimuli through "blame and punishment" to improve their ability to cope with stress, while Madrid coaches put some pressure on the players in terms of time employing "hustle" to improve the players' ability to make quick decisions and respond under "time stimulation".

"*I did these to make them mentally stronger. Blame, punishment, and scold are things that players will face and bear at any time in future competitions. If they cannot bear it in training, they will also be crushed by pressure in real competitions.*" (BC3)

The Beijing coaches' responses are consistent with previous research findings when the purpose of punishment is to provide players with an opportunity to deal with the pressures, threats, and disappointments that are common in the world of elite competitive sports (Bell, Hardy, & Beattie, 2013). While the coaching

behaviour of Madrid coaches develops "unshakable confidence" by focusing on a mastery environment that rewards success rather than punishing failure, more in line with the more prevalent self-efficacy-enhancing interventional program that focuses on maximising to enhance the mastery experience (Connaughton et al., 2008; Duda, 2013). This issue can be partially explained by the huge cultural differences between the two countries which shaped different coaching philosophies. Chinese pedagogy has been greatly influenced by Confucianism and is often associated with a focus on discipline and punishment (Chu, 1972). This influence can be observed in modern Chinese life (Bell & Ham, 2003; Lee & Morrish, 2012; Leung, 2010). Contrarily, western cultures generally promote individualism and independence compared to Asian cultures, where collectivism and obedience are highly valuable. Therefore, the "negative approach" of pedagogy, such as corporal punishment and blame, is unfair in European countries (Wang & Tamis-Lemonda, 2003). However, previous studies suggest that many modern development programmes fear negative emotional and motivational consequences, lack exposure to punishment-conditioned stimuli, and thus do not prepare players for the threats they often face in the world of elite sports (Seifried, 2008; Smith, Smoll, & Curtis, 1979). While other researchers believe that players who are regularly exposed to punishment-conditioned stimuli in training environments will be expected to be able to cope with the threatening situations they may face in actual competition (Bell, Hardy, & Beattie, 2013). Specifically, the practice of perceptual–motor tasks at mild anxiety levels can prevent choking when players compete at higher anxiety levels (Bell, Hardy, & Beattie, 2013). Therefore, the strategy of Beijing coaches to develop players' mental toughness has certain rationality and effectiveness, but it is important to explore how to develop mental toughness without negatively impacting players' self-confidence, self-esteem, and autonomy.

6.2. Discussion of the potential risks of current youth development pathway in Chinese football

This survey research aimed to 1) investigate the training situation of Chinese elite youth football players under the new youth football player development model

(SFP), exploring the category to which this model belongs; and 2) examine the associations of early specialization, sports volume, and maturity status with musculoskeletal injury in Chinese elite youth football players. The results showed that within the context of SFP, most elite football players (80.3%) followed the early specialization pathway. This study found that most injuries occurred in the lower limbs, the most common location of injury was the ankle, and the most common type of injury is an acute injury. To our knowledge, this is the first research that specifically examines the early specialization and maturity of Chinese youth players.

6.2.1. Relationship between injury and early specialization

The first contribution of this study is to identify early specialization was weakly associated with the odds of reporting at least one injury history. Early-specialized players have been found significantly to be more likely to report at least one injury in the past twelve months and more likely to report an acute injury than non-early-specialized players, which has been proved in previous studies (Brenner et al., 2016; Jayanthi et al., 2015; Post et al., 2017). Therefore, this study provides further evidence that early specialization increases the risk of injury in athletes. At present, the reasons why early specialization will increase the risk of injury to athletes can be divided into three categories: 1) Improper training load (Drew & Finch, 2016); 2) Youth players did not yet fully grow physically and were not prepared for high-intensity specialized training. Sport specialization might lead to biomechanical deterioration before maturity, which could worsen through the different phases of maturation of young players (DiCesare et al., 2019; Le Gall, Carling, & Reilly, 2007); 3) Sport specialization in adolescence limits the abilities of athletes. Instead of experiencing the varied load-adaptive stimuli of a variety of sports, they only focused on the motor skills to repeat their sport and neglected the development of other "basic" motor skills, thereby limiting the development of neuromuscular patterns of injury prevention and potentially developing exercise strategies that increase the risk of injury (DiCesare et al., 2019; LaPrade et al., 2016; Mostafavifar, Best, & Myer, 2013). As a result, researchers have proposed alternative pathways to early specialization, the early diversification pathway and

the early engagement pathway (Baker, 2003; Côté, Baker, & Abernethy, 2007; Ford et al., 2009), which aimed at increasing the participation of athletes in other sports or self-led sports by adolescents for fun. Because some studies have supported the idea that a variety of sports participation may limit the potential risk of injury (Coté et al., 2009; Jayanthi et al., 2015). An important task of football youth training is to prevent injuries due to the high cost of injuries. Injuries may not only lead to functional impairment and reduce sports participation (Gabbe et al., 2003) but also increase the possibility of future injuries and long-term health risks (Swain et al., 2018), thereby undermining the potential benefits of sports. Athletes experiencing a greater injury burden may be due to experiencing frequent injuries early in their athletic careers (Krabak et al., 2021). Therefore, for players who choose the early specialization pathway, preventing injuries is even more important.

6.2.2. Relationship between injury and sports volume

Early specialization may lead to injuries in athletes, which is linked to sports volume (Jayanthi et al., 2015; Post et al., 2017). The sports volume indicators collected in this study were those suggested by previous studies: whether athletes train more hours per week than their age or not (Brenner et al., 2016; Jayanthi et al., 2015; Post et al., 2017), whether athletes train more than eight months a year or not, and whether the ratio of organized training to free play exceeds 2 : 1 or not (DiFiori et al., 2014; LaPrade et al., 2016). Our finding showed that players who trained more hours per week than their age were more likely to report leg injuries and acute injuries, which was similar to the finding of the research of Jayanthi et al. (Jayanthi et al., 2015). They claimed that players with a ratio of > 2: 1 organized training to free play were at greater risk for serious overuse injuries. However, our study did not find any significant correlation between other sports volume indicators and injuries, which may be related to the small sample size of this study and its uneven distribution on the other two sports volume indicators, because most of the participants in this study trained more than eight months a year and exceeded a 2: 1 training-to-play ratio. However, the lack of higher injury rate in young athletes may also be related to the changes in training load and the

distribution of sports volume (Myer et al., 2016). Therefore, the planning and monitoring of athletes' sports volume is the key to preventing injuries. For athletes who choose the early specialization pathway, how to reasonably arrange and distribute their large amount of sports volume in the macrocycle of the year and the microcycle of the week is of great importance.

6.2.3. Relationship between injury and maturity

Early specialization may lead to injuries in athletes, which is also linked to the maturity of the player (Van Der Sluis et al., 2014). The maturity status of young players affects their structural body changes and functional growth capacity such as neuromuscular (Dupré et al., 2020; Van Der Sluis et al., 2014), thereby affecting their injury risk. This study found that players who were pre-pubertal and early pubertal were more likely to report foot injuries. Similar to the results of this study, previous studies have also suggested that Sever's disease often occurred in athletes during pre-pubertal and early pubertal (Price et al., 2004), and this injury was considered a growth-related injury. Overuse and changes in height, weight, and body composition were considered potential causes of this type of sports injury (Adirim & Cheng, 2003; Read et al., 2018). The findings of this study provide further support for the fact that the maturity of youth players affected their sports injuries. These maturation-related sports injuries were largely thought to be preventable (Read et al., 2018). The causes of such injuries are often controllable or intervening: Teenage players experience a height spurt during puberty, and the increased leg length results in a greater moment of inertia, which in turn increases the demands on the muscles (Adirim & Cheng, 2003). The immature musculoskeletal system of young players cannot handle repetitive biomechanical stress properly, which may result in temporary delays or regressions in sensorimotor mechanisms and motor control and injuries (Jayanthi et al., 2015). An imbalance between muscle and tendon growth may also lead to an increased risk of overuse injuries (Dupré et al., 2020). During the period of the maximum growth rate of the pubertal growth spurt, changes in joint stiffness and temporary changes in bone density may result in temporary "skeletal fragility" (DiFiori et al., 2014; Swain et al., 2018; Van Der Sluis et al., 2014). As age increases, the longer

time that players get exposed, the greater the training load (exercise volume and exercise intensity) they experience, the accumulation of load and the need for physical activity in young players overlap with maturity and growth, resulting in a higher incidence of injury in more mature players (Van Der Sluis et al., 2014). Previous research has also found that male youth football players allocated most of their time to matches or outdoor training, and relatively little time to strength training, so players may not be physically prepared to meet the demands of these higher training loads (Wrigley et al., 2012). The lack of scientific injury monitoring of young football players is also an important reason for their susceptibility to injury (Faude, Rößler, & Junge, 2013). Therefore, it is particularly important to design injury prevention strategies for young players based on the above reasons.

6.2.4. Injury in Chinese School Football Programme

The goal of the Chinese School Football Programme is two-fold. The primary purpose is to popularize and expand the youth football population while improving the physical and health level of students and promoting the overall physical and mental development of students; The second purpose is to discover and cultivate talents in school football. Within the SFP context, students who are interested in football can play football at school and student players who are talented in football can have the opportunity to receive high-quality training. The sample in this study has been through multiple selections, representing the highest level of school football in their age group. The results of the study show that even in the context of school, the vast majority of elite football players still choose the early specialization pathway. In our sample, choosing an early specialization pathway increases injury risk; and different levels of exercise and player maturity also affect player injury. Therefore, school football practitioners (coaches and managers) should strengthen the monitoring of players' sports volume and maturity status and provide targeted protection and intervention for players who follow the early specialization pathway, to reduce their risk of injury.

6.3. Limitations

Throughout this Ph.D. thesis, there were several limitations associated with the studies that should be addressed in further research:

(1) Despite these interesting findings, the case study has a limitation in the number of coaches analysed. Moreover, the gender and age of the team analysed led to a careful understanding of the main results. Future research studies should increase the sample including different categories and countries. Moreover, the influence of competitive contexts and families' implications should also be taken into consideration.

(2) The sample of the survey study can represent the highest level of school football players in this age group, the sample size is not big enough that the distribution in some indicators is uneven. Moreover, the Khamis-Roche method for predicting maturity status is based on calculations of North American white ancestry, and the average error in the age group 4.0-17.5 years is about slightly above 2 cm in boys and slightly below 2 cm in girls (Cumming et al., 2017; Cumming et al., 2018). However, the sample of this study is East Asian youth football players, considering the differences of different races, and the recruitment of youth players in specific game positions may include ideal physical characteristics such as height, which may reduce the accuracy of the method.

6.4. Future Direction

(1) Given that culture serves as a significant factor influencing individuals' behavioural motivations, the trend of cross-cultural coaching brought about by globalization has seen an increasing number of coaches from football-developed nations coaching in football-developing countries. Therefore, future research should explore how culture deeply impacts a coach's ingrained coaching behaviours and philosophies, as well as how foreign coaches adjust their coaching behaviours and strategies in diverse cultural contexts.

(2) Research on coaching behaviour has been extensively and rapidly conducted in football-developed countries, but there is still a lack of corresponding evidence for

football-developing nations, particularly in Eastern Europe and Asia where countries are influenced by different cultures. Athletes' interpretations of coaching behaviour may vary in these regions. Therefore, future research should supplement more data from Eastern Europe and Asia, as well as data on athletes' perceptions and understanding of coaching behaviour.

(3) In the football coaching industry, there exists a professional bias where coaches with experience as professional athletes are perceived to possess higher levels of football tactical and technical skills. Consequently, they tend to receive more resources for coaching certification education. However, the impact of coaches' experience as professional athletes on their coaching behaviour and their pedagogical approach towards youth players remains to be further explored.

(4) Future research on youth development pathways should consider comparing players' responses to early specialization in different talent development environments (such as academies of professional clubs and football schools, etc.), to know whether the SFP can protect against or buffer the potential risks of early specialization or not. The potential risks of early specialization are not only injuries but also psychological burnout. Therefore, future research can try to explore if the SFP can alleviate the players' burnout which may be caused by early specialization. Research on effective interventions and protective measures is important when early specialization options are the majority choice or unavoidable.

CHAPTER 7

Overall Conclusion

7. Conclusions

In order to present the conclusions of this Ph.D. Thesis, these were split according to each aim/ section:

Aim 1: to compare the coaching behaviour and training activities of the coaches from Chinese and Spanish capitals, and to explore the impact of different pedagogies on coaches' behaviour and players' perceptions.

This study revealed significant differences in coaching behaviours and training activities between Madrid and Beijing coaches. Madrid coaches had shorter training sessions and used more PF than Beijing coaches and used more positive feedback. Moreover, concurrent-instruction was the most commonly used coaching behaviour among coaches from Madrid and Beijing. Madrid coaches used more positive feedback, but Beijing coaches used more negative feedback. Although youth players in Beijing can better accept and explain this teaching strategy under Chinese culture, and play a certain positive role, it cannot deny the side effects caused by this method. The result of this study suggests that Beijing coaches should train efficiently and use more PF. Furthermore, positive feedback is recommended for Beijing coaches, and "silence" should also be used while instruction and hustle should be carefully used to help players learn to "think". Both Madrid and Beijing coaches should strive to develop players' mental toughness scientifically and rationally with minimal negative consequences.

Aim 2: to investigate the situation of Chinese elite youth football players' development; and examine the associations of early specialization, sports volume, and maturity status with musculoskeletal injury in Chinese elite youth football players.

Our questionnaire survey data on Chinese school football elite players show that although the development environment of athletes is based on the school background, the vast majority of school football elite players still follow the early specialization pathway. However, in the context of SFP, early specialization still

increases the risk of injury, especially acute injury. A player's maturity and sports volume can affect their injury situations, specifically, pre-pubertal and early pubertal players have a higher incidence of foot injuries; players who train more hours per week than their age have more leg injuries and acute injuries. Therefore, priority protection and intervention should be carried out for groups with a high risk of injury.

CHAPTER 8

Practical Application

8. Practical Application

From the results of the Ph.D. thesis, some practical applications can be derived, mainly related to coaches' behaviour, and development pathways in Chinese youth football.

Firstly, the Positive Athlete Development Approach has been endorsed in Western countries over the past few decades, emphasizing the creation of a positive environment for youth athlete development. Coaches are encouraged to provide positive feedback not only for performance outcomes but also for effort and improvement (Smith & Cushion, 2006). In regions where East Asian culture prevails, it is advised that coaches minimize negative feedback and punitive approaches to prevent players from developing fear of making mistakes or diminishing their confidence and enjoyment of football (Feng et al., 2023). Considering studies suggesting that some negative behaviours by coaches aim to foster positive outcomes, such as helping youth athletes adapt to pressure and enhance mental toughness, it is proposed that coaches carefully evaluate the necessity, methods, and specific issues targeted by negative coaching behaviours. Severe behaviours should be reserved for significant problems like ethical issues or training attitude problems, and coaches should enhance their emotional control, responding to player errors more effectively and positively, for instance, utilizing the "positive–corrective–positive" sandwich method.

Secondly, addressing the issue of over-coaching, adopting a somewhat "hands-off" approach may grant players more autonomy. This approach does not advocate laissez-faire leadership but rather emphasizes reduced frequent interventions and concurrent instructions, replaced by silent observation. Players should be given the chance to solve problems themselves before coaches offer solutions (O'Connor, Larkin, & Williams, 2018). Before intervening, coaches should calmly observe and think before deciding when, how, and what kind of feedback or instruction to give, thereby ensuring that the coach's interventions are clear, concise, and specific, and

improving the effectiveness of communication (Smith & Cushion, 2006). Avoiding over-coaching also involves maintaining training flow, minimizing stoppages, and avoiding continuous interruptions for individual issues. Coaches can address specific problems with individual players who do not need to be immediately involved in the practice activity and can be contacted individually while the team practice continues, or use cue words and the name of the game or activity to minimize the need for lengthy explanations (O'Connor, Larkin, & Williams, 2018; Raya-Castellano et al., 2022). Designing activities that provide immediate feedback from the activity itself helps reduce the team's inactivity (O'Connor, Larkin, & Williams, 2018).

Thirdly, adopting a player-centered approach is crucial (Feng et al., 2023), with coaches serving as learning facilitators to enhance players' roles as learners (Nelson, Potrac, & Groom, 2014). Several player-cantered methods, such as the Constraints-Led Approach (Renshaw & Chow, 2019) and the motivational model of the coach–athlete relationship (Mageau & Vallerand, 2003), have been suggested to promote coaches as facilitators. Another popular player-centered approach is the Game-Based Approach (Light, 2012), incorporating core coaching practices into skilled delivery. This approach emphasizes questioning, creating spaces for player-led discussions, encouraging players to propose tactical plans, and promoting peer coaching, which is vital for player engagement and learning experiences (Metzler, 2017; Pill, 2015).

Fourthly, coaches' critical reflection and learning are emphasized. Changes in coaching practice are long-term processes, extending beyond coach education courses. Coaches' self-reflection or discussions with others contribute to enhanced self-awareness, behaviour change, and learning triggers (Partington et al., 2015).

Fifthly, this study recommends that football practitioners should understand, pay attention to, and promptly communicate the potential risks and evidence of early specialization to parents and players, and create a more "appropriate" environment for the healthy development of young players in daily training and competition. For example, arrange the amount of exercise reasonably, including

the frequency, duration, and intensity of training, as well as adequate rest and recreational time; arrange periodized strength and conditioning (e.g., Integrative Neuromuscular Training [INT]) to prevent injuries, to help athletes make full body Preparation; timely monitoring and evaluation of athletes' health, growth and development, recovery, and response to training games, especially for young players who are in a sensitive stage of growth and development and players who have chosen an early specialization pathway.

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Appendix

Appendix A

Themes, subthemes, and the papers in which they were found.

Article	Research Objectives	Sample	Setting	Duration	Context	Method	Instrument
Wandzilak, Ansorge and Potter (1988)	Determined selected coaching behaviours of youth soccer coaches in game and practice settings and compared the perceived behaviour of the coaches to actual observed behaviour.	17 coaches, coaching U11-U14	NR	69 practices and 60 games were observed (Each coach was observed 2-4 games; 2-5 practice sessions) 129 in total.	In both practice and game	Questionnaires	Coaching Behaviour Assessment Inventory (R. E. Smith et al, 1977)
Miller (1992)	To determine if a significant difference in coaching behaviours existed in youth sport soccer coaches in respect to the time within the practice season (early/late), gender (male/female), team grade level (1 & 2 grade/3 & 4 grade), and experience level (under 5 years/over 5 years).	12 youth coaches, six were female and six were male	12 volunteer youth sport head coaches from the Missoula, Montana YMCA Spring Co-Ed Soccer Program.	Two 40-minute data collection observations were made during practice sessions with each coach. 12 sessions in total?	practice session	Systematic observation	ASUOI
(Millard, 1996)	To extend the knowledge base regarding gender differences in coaching behaviour when controlled for years' experience coaching, past athletic participation, and age.	29 male and 29 female youth coaches 58 in total	NR	each coach was observed one complete interscholastic contest, 58 matches in total.	during contest	Systematic observation	CBAS
Cushion and Jones (2001)	To examine and compare the working behaviours of top-level English professional youth coaches from both the Premier and Nationwide Leagues, thus contributing to the expanding empirical database on what good youth coaches do.	8 male coaches	Each worked with either an F.A. Carling Premiership (N = 5) or a Nationwide League (N = 3) youth team (the top two professional soccer divisions in England)	Each coach was observed three times during typical practice sessions, each coach being observed for a total of 135 minutes, 24 sessions in total.	Practice sessions	Systematic observation	ASUOI
Smith and Cushion (2006)	To investigate the working behaviours of six top-level professional soccer coaches.	6 male youth coaches	the top professional soccer leagues in England	Each coach was observed four times during competitive matches (total 24 matches).	In-game	Systematic observation and semi-structured interviews	ASUOI
Ford, Yates and Williams (2010)	To examine the practice activities and instructional behaviours employed by youth soccer coaches during practice sessions.	25 coaches, coaching U9, U13, and U16	Professional clubs and amateur and semi-professional clubs in UK.	Total 70 different coaching sessions were recorded	Training	Systematic observation	ASUOI
Partington	To not only identify the pedagogical	12 male	English Football	Record over 28 games, each	In-game	Systematic	CAIS

and Cushion (2012)	strategies of elite youth football coaches within the competition environment, but to also investigate how such behaviours are influenced by social, contextual and experiential factors	coaches, coaching U9-16	Association Premier League Centre of Excellence	participant was filmed during two to four (M=2.82) competitive games; Each interview lasted between 30 and 60 minutes.		observation Interpretive interview	
(Partington & Cushion, 2013)	To investigate the coaching behaviours of elite English youth soccer coaches in different practice settings and gain insight into the coaches' cognitive processes underpinning these behaviours.	11 male coaches, coaching U10-U15/16	English Football Association Premier League Centre of Excellence, the highest division of professional football in England.	Each participant was filmed during training sessions between 5 and 9 times. 61 training sessions in total were filmed. Each interview lasted between 30 and 60 min.	Training	Systematic observation and semi-structured interviews	CAIS
Worsfold (2013)	To objectively analyse coaching behaviour within three playing squads at an elite-level soccer club during two competitive seasons.	3 coaches, coaching U14, U15, and U16	One English professional soccer club.	72 training sessions, each lasting 60-90min.	Training	Systematic observation	Coach Analysis Instrument' (Franks et al., 1988)
Lewis, Groom and Roberts (2014)	To investigate the value of a coach intervention process programme within women's youth soccer in the UK.	1 female coach, coaching players aging 10-12 years old	UK	8 training sessions over an 8-week period	Training	Systematic observation, interviews, and questionnaire	CBAS
(Partington, Cushion, & Harvey, 2014)	To investigate the behaviours, cognitive processes and practice activities of English youth professional soccer coaches across 6 different age groups.	12 male coaches, coaching U10-U15/16	the highest division of professional male football in England.	Total 67 training sessions. Each participant was filmed between 5 and 9 times. Each interview lasted between 30-60 min.	Training	Systematic observation follow-up interpretive interviews	CAIS
Partington et al. (2015)	To take a longitudinal approach to investigate changes/stability in coaches' practice over time; understand how video-based feedback can inform coaches' interpretations of their experiences; and generate critical reflection on the process by which meaning and knowledge are used to guide actions	5 male coaches, coaching U10, U11(x2), U12 and U14	at a Football Association (FA) Premier League Academy over three English football seasons	Each coach was filmed in seasons one and three a minimum of three times. In total 30 coaching sessions were observed over the three seasons. In total 15 interviews were carried out (each lasting between 30 and 70 min).	Practice	systematic observations semi-structured interviews	CAIS
Vinson et al. (2016)	To examine the contexts, coach behaviours and parental perceptions of non-linear coaching approaches within youth sport.	2 male coaches, coaching U14-16, and U11	Case 1: a weekly extra-curricular soccer club open to all 14-16-year-olds based at a comprehensive school in the South-West of England.	Each case was systematically observed for approximately 4h – up to two with each instrument.	Training	Systematic and semi-structured qualitative observation, supplemented by semi-structured	ASUOI, a modified version of the SOTG-PE

			Case 3: a U11 squad from a professional football league club Centre of Excellence in the West Midlands of England.			individual and group interviews.	
Cope et al. (2016)	To investigate coach questioning practices.	5 male coaches, coaching U10-U14	The study was set inside a professional English youth football academy.	three practice sessions for each coach (15 in total)	Practice session	Conversational analysis (CA)	Conversational analysis transcription symbols (Groom et al. 2014).
O'Connor, Larkin and Williams (2017)	To investigate the pedagogical approaches coaches used to develop player decision-making.	29 coaches (U12, n = 5; U13, n = 8; U14, n=4; U15, n=4; U17, n=8)	All teams competed in the Australian National Premier League News South Wales Youth competition.	In total, 58 coaching sessions were recorded.	Training	Semi-structured conversations, supported by field notes and coach dialogue during the practice session.	CAIS, and MATS (Larkin, O'Connor, & Williams 2016)
O'Connor, Larkin and Williams (2018)	To explore the structure and sequencing of football coaching sessions in Australia following the implementation of a new National Curriculum. To identify whether the type and duration of coach behaviours change over the course of the session.	34 coaches, U11–U13 (n = 19); U14–U17 (n = 15)	New South Wales and Tasmania, Australia	Participants were filmed twice, resulting in a total of 66 coaching sessions being recorded	regular coaching session	Systematic observation	CAIS
Stonebridge and Cushion (2018)	To compare youth soccer coaches with and without tertiary-level qualifications, examining their coaching behaviours and practice activities.	10 male coaches, coaching U9-U18	Youth Academy of a League Two club (the fourth division of professional soccer in England) in the North-East of England.	Total of 39 practice sessions were filmed. Each coach was observed a minimum of three times. Interviews ranged from 56-76 min.	Training	Systematic observation follow-up interviews	CAIS
Santos et al. (2019)	To identify the expectations of the coaches on the instruction and behaviour of athletes, and to correlate the expectations of the coaches with the instruction behaviour of coaches and with the behaviour of athletes in competition.	4 coaches	in Portugal national championship 13/14	Data were collected in total playing time in two competitions by coach, 8 matches in total.	In-game	Systematic Observation & Questionnaire	SAIC, SOCAC and questionnaire (Expectations of Instruction & Behaviour of Athletes in Competition)
Stodter and Cushion (2019)	To address these challenges by examining the impact of coaches' learning, through the assessment of changes in the coaching	8 coaches (7 male and 1 female),	UK	Each participant was filmed during at least two training sessions at each time point.	Training	Systematic observation Stimulated	CAIS

	knowledge and behaviours of groups of coaches undertaking, and not undertaking formal education.	coaching U9-U18				recall interviews	
Teques, Duarte and Viana (2019)	To examine the mediation effects of coaching efficacy beliefs on the associations between EI and reactive behaviours in soccer games.	258 coaches (Male=246, Femal =12), coaching U9-U17	Portugal	258 soccer games over two seasons.	In-game	Observations in situ Questionnaire	CBAS WLEIS (Wong and Law, 2002; Rodrigues et al., 2011) CES (Feltz et al., 1999; Duarte et al., 2012)
(Agusti et al., 2020)	To explore the relationship between the academic backgrounds of youth soccer coaches in Spain and the type of verbal behaviour used during training sessions.	70 male U10-12 coaches (half with university studies, half not)	non-professional soccer clubs in the Region of Valencia (Spain).	Only one training session per coach, total 70 training sessions.	main part of the training (excluding warm up and cool down)	Systematic observation	CAIS
Raya-Castellano et al. (2020)	To explore junior coaches' behaviours and their underlying rationales during team-based video-feedback	4 male coaches, coaching U13, U14, U15, and U16	an English Premier League category-one football academy.	Twenty-two in-season sessions; Interviews lasted between 36 min 52s and 52 min 40s.	Video-based feedback sessions	Systematic observation and Semi-structured interviews	Adapting CAIS and ASUOI
N. Eather et al. (2020)	T to target existing gaps and investigate the impact of a novel 15-week coach development intervention (MASTER) for improving coaching practices of junior representative football coaches.	Six coaches (5 male; 1 female), coaching U8-U12	All coaches in the Northern NSW Football Australia entry-level representative program.	NR	Training	Systematic observation	CAIS
Raya-Castellano et al. (2021)	To investigate changes in coaches' knowledge and understanding during a longitudinal coach development program, developed and delivered by a sport pedagogy researcher-practitioner.	2 male coaches, coaching U9 and U13	This study was conducted at the academy of a club competing at the Spanish La Liga 123. The academy comprised eleven teams (under 9 to under 19) all playing in competitive leagues.	Total of 10 post-match team based VBF sessions analysed. Five sessions for each coach were used to define coaches' baseline behaviours.	Post-match video-based feedback sessions	Systematic observations and interview	Adapting CAIS) and ASUOI
Hall et al. (2022)	To build on the existing critical sociological research into coaching to provide insight into the mechanisms underpinning the transmission and reception of an instituted	13 male youth coaches	This season-long study involved a single site investigation of the academy within a	Each coach was observed coaching on three separate occasions, resulting in 39 sessions being recorded in	Training	Systematic observation Interpretive interviews	CAIS

	coaching philosophy within a coaching academy, an area popular for discussion within coach learning and practice.		professional football club from the north of England.	total.			
Raya-Castellano et al. (2022)	To explore coaches' perceptions concerning potential 'teachable moments' to ask convergent and divergent questions during training at three data collection points, and to associate changes between knowledge and behaviour after a work-based CDP.	6 male coaches, coaching U9-U19	academy of a Spanish La Liga 123 Football Club	The eight training sessions for each coach (4 pre-intervention and 4 post-intervention), 48 training sessions in total	Training sessions	Systematic observations and interview	Adapting CAIS) and ASUOI
(Feng et al., 2023)	a) to compare the coaching behaviour and training activities of the coaches from Chinese and Spanish capitals; b) to explore the impact of different pedagogies on coach's behaviour and players' perceptions.	6 coaches (5 Male, and 1 Female), coaching U10, U11, and U12	China and Spain	A total of 22 training sessions were recorded (n = 11 training sessions in Madrid; and n = 11 training sessions in Beijing)	Training	systematic observations semi-structured interviews	CAIS
Jones et al. (2023)	To evaluate the impact of a coach development intervention (MASTER) on game-based coaching practices of football coaches.	20 coaches (17 males and 3 females), coaching U9-U12	A convenience sample of four football clubs (including the coaches of their junior teams and players) from New South Wales, Australia	NR	Training	Systematic observation & Questionnaires,	CAIS
Raya-Castellano et al. (2023)	To explore the behaviours of elite youth football coaches and underpinning perceptions regarding their half-time talks.	5 male coaches, coaching U10, U13, U14, U15, and U18	Spanish La Liga Santander football club academy	four half-time talks per coach including various match outcomes 20 in total	half-time talks	Systematic observations and qualitative interviews	CAIS

Appendix B

Results of thematic analysis. (BC: Beijing coach; MC: Madrid coach; 8MP: eight Madrid players; 3BP: three Beijing players)

Theme 1: Update and reflect on training activities to maximize training efficacy	
Subtheme	**Example quotes**
Understanding of training form and playing form	*TF enables players to practice techniques and tactics effectively, which serves as a foundation for the subsequent PF activities.* (BC1) *In my opinion, isn't PF just a normal game? Most of my training sessions end with a certain amount of time for them to play a game. The kids love playing games. I'm not sure what other forms of PF there are, but I think the most important thing is to let them experience a real soccer game at the end of the training session.* (BC2) *Developing techniques and tactics is the key factor in the period of adolescence. Most tactics are based on techniques. I need them to strengthen this basic skill.* (BC3) *For youth soccer, you need a lot of patience and always think in the long term. In the short term, we can set the work plan, methodology, and work structure. It's important to be clear about the objectives, teaching method, and purpose of the session.* (MC1) *That the players have fun in each training activity in order to enhance their qualities and reinforce possible shortcomings, so that they learn something new in every training session.* (MC2) *We need to design the training activities to be more like the actual game which are full of decision-making situations rather than mechanical, rigid activities.* (MC3)
Use of inactivity	*This period is very important, we must avoid unnecessary waste of time. If their rest time is too long, their attention will be distracted.* (MC1) *This time is a very good opportunity to interact with the players. I always talk with players during water break, ask them how everything*

	is going on, how they feel this training session etc. And we always discuss with the players at the end of the session, correct all the mistakes and problems we have had. (MC3) *The transitions between tasks should be as short as possible for the optimization of session time. The explanations should be as clear and brief as possible to optimize the time between tasks*. (MC2) *We spend quite a long time on training sessions, so I would like the players to take a long break between practices.* (BC1) *I think the summary at the end is necessary, but I won't do it every time. Because I want to give them more chances to practice.* (BC2) *I believe it's time for a water break. I want them to take a moment to relax, rehydrate, and give their bodies enough time to recover and get ready for the next exercise.* (BC3)
Source of training activities	*I gather information from a little bit of everything, especially from other coaches you've worked with. Any source of information is good and necessary, some leave a greater influence on you, but it can come from colleagues, former professors, courses, and everywhere.* (MC1) *They come from the experience and studies acquired in the years that I have been training*. (MC2) *I think it's almost innate since childhood.* (MC3) *The main approach to obtain my coaching contents is my own training experience. I gave guidance to my players in a way that my coaches did to me*. (BC2) *I learned them from internet. Sometimes I created them by myself.* (BC1) *When I was a player, I learned from my coach, and when I became an assistant coach, I learned from the head coach. Also, I learned from coach education courses.* (BC3)
Individualized coaching	*I believe coaches should adjust their training activities and behaviour according to the situation of each child. Different adjustments should be made based on their different states.* (BC3)

	I think that different children have different requirements, for high-level players, I will focus more on the results of their training, while for beginners, I will focus more on the process of their training. (BC1) *I will give them different feedback, criticism or encouragement based on their different personalities and tolerances.* (BC2) *In my opinion, everything depends on the player. There are players who need more praise and others who don't need it. It depends on each player's personality. Personally, I use praise to highlight a player's behaviour, attitude, and effort more than a specific technical skill.* (MC3)
Self-reflection	*After each training session, I gather with my coaching staff to review each exercise. We evaluate its effectiveness and identify any areas for improvement. Post-training reflection is very important, and as we recognize that if an exercise doesn't work out, it could be due to the coaching rather than the players' fault. (MC3)* *All coaches should record themselves and then watch and analyse their behaviours, actions, and corrections to know what we have done well and what we have done wrong.* (MC1) *I will actively observe and think about the issues in training, constantly improving my own training methods so that the players can adapt and improve. Every day and at certain stages, I will reflect on my own training.* (BC3) *Self-reflection is very important for coaches. Without reflection, it is difficult to identify problems and without identifying problems, it is difficult to make changes and improvements.* (BC1)
Theme 2: Leave the decision-making opportunities for the players	
Subtheme	**Example quotes**
Decision-making ability	*The player's decision-making ability is crucial in distinguishing outstanding from ordinary players. Those who make the best decisions or fewer mistakes tend to succeed in professional football.* (MC1)

	During games, I try to communicate less and leave more room for the creativity of the players during the game. It's very important that they make the decision themselves and not be constantly guided by the coach. I do set up exercises where the player decides how to act. (MC3) *I consider it really important to implement decision-making in training to stimulate players and help them progress intellectually*. (MC2) *It's very important. I will encourage children to make decisions and guide them to use their brains to play soccer and cultivate their overall view.* (BC1) *Every player should have the decision-making ability. Actually, I don't have a particularly good method to encourage them to make decisions. So, I'm still struggling with this issue, what kind of method is useful and can help them make better decisions for themselves*. (BC2)
Use of instruction	*I Encourage players to make decisions. On the field, I try to reduce concurrent-instruction and let players make their own decisions. If their decisions are not reasonable, I will stop the training and recreate the scene, then let them make a choice. If their choice is good, I will tell them that there are more choices and let them decide for themselves. Yes, I am conscious of this.* (BC3) *I think I give more concurrent-instruction on the field. Actually, this may affect their ability to make decisions on their own. However, since I also started playing football from a young age, sometimes I really don't know what to do on the field, and I need the coach to tell me what to do.* (BC2) *Pre-instruction, concurrent-instruction and post instruction are step-by-step processes. Children may not fully understand them, but post-instruction is used for solving their questions*. (BC1) *I give instructions at moments that I consider very necessary and effective.* (MC2) *I talk a lot, give instructions, correct, order, encourage, and positively reinforce execution. Usually, when we play 100% soccer, the level of instruction decreases and we only focus on very specific aspects related*

	to corrections or bad executions to avoid repetition during the weekend game. (MC1) *During matches, I try to give less instruction and let the boys be more creative during the game.* (MC3)
Remain silence	*At certain times, keeping silence and observing the group and letting them do things on their own can be productive for them to find solutions themselves.* (MC2) *If necessary, I do it, especially when the task is going well or the group is not working correctly, some silence from time to time is necessary, if it can be intentionally used.* (MC1) *I think that in many training sessions, it's a way of concentration for both players and coaching staff.* (MC3) *Silence and observation are necessary. In a game, relying only on the coach's instructions is useless. It's important for players to learn to solve problems on their own.* (BC3)
Hustle to speed up the pace	*My demand is for them to accelerate the pace and speed of connection. I believe this habit should be cultivated during regular training because it reflects real game situations. In these fast-paced situations, I expect them to make quick reactions and decisions.* (BC2) *In technical exercises, I tend to give more hustle and reminders to increase the pace of their movements, which is what they lack. I do this through verbal cues to help them improve. The negative aspect is that it may lead to too much intervention in training, and players may blindly follow the coach's instructions to make a decision.* (BC3) *However, this is necessary to motivate the children and encourage them to be more proactive.* (BC1) *I consider hustle is necessary to increase the pace of training.* (MC2) *I think that it's important to know how to use them correctly. The appropriate use of these statements or gestures can be good and have a positive impact on the training or player. However, excessive use can be dangerous.* (MC3)

Questioning behaviour	*Asking players is because they need to know why things are the way they are, due to the different decisions they make. They must think and reflect on which decision led to this result. Moreover, asking players what decision they would make based on this situation.* (MC1) *I think it's appropriate and a way of learning for both the player and the coach. I ask when I want the decision to be theirs, to see their point of view on the field. For example, in three attackers against two defenders scenario, which of the three attackers should carry the ball? I want to see if they can solve it and then give them my opinion.* (MC3) *I think asking them questions is to oblige them to think about different situations for real game and improve their decision-making ability.* (MC2) *I often ask players questions, some of which have been covered before. I want to see if they can recall the same scenario or if they are still making mistakes with problems that have been previously discussed. Generally, I ask more divergent questions because they are more likely to occur in game situations. The choices players make on the field are not singular.* (BC3) *Asking players questions is a good thing because it encourages them to think. This allows children to follow the coach's thoughts and is a good method.* (BC1) *Asking questions to players during training is necessary to see if they understand the training, if they understand what I am saying, or if they are thinking while doing the training.* (BC2)
Hands-off approach	*I am trying to coach by the hands-off approach and deliberately remain silent and observe, giving the players maximum decision-making opportunities. If I am always directing, then it is my football, not theirs. Moreover, in the game, it is useless for the coach to just yell; it is still up to the players to deal with the ball themselves.* (BC3) *I try to coach with a hands-off approach, intentionally remain silent to observe them rather than controlling players like a remote control. This allows players to make more decisions and solve problems independently.* (MC1)

	To be honest, I don't think this method is suitable for China's situation. I believe that Chinese children's self-discipline is relatively poor. Sometimes during training or games, my behaviour becomes automatic and inertia, and I instinctively start giving instructions to the players. (BC2) *At certain moments, observing the group and letting them do things can be productive so that they can find solutions on their own.* (MC2)
Theme 3: different coaching philosophies create different training environments	
Subtheme	**Example quotes**
Positive and negative feedback	*To be honest, I give my players a lot of negative feedback because my expectations and demands of them are quite high. I believe that they are capable of achieving and completing certain things, but when they fail to do so, I provide them with negative feedback.* (BC2) *When the players perform well, I give them positive feedback to reinforce their good choices. When they play without thinking, I give them negative feedback. In fact, the negative feedback is to put pressure on them and stimulate their potential and fighting spirit.* (BC1) *I make negative feedback mostly on the attitude of the players or when the kid is playing without thinking. Negative feedback is also given to stimulate and motivate the players to do well. Too much positive feedback makes players not serious.* (BC3) *Positive feedback is very important for players' learning. I never react aggressively, and I avoid giving negative feedback. I prefer everything to be positive. If something does not go well or the player behaves badly, we must see why this behaviour occurs, I do not think it is only the fault of the player.* (MC3) *From my perspective, feedback is essential in any learning process in all aspects. I try not to behave aggressively, but instead be firm so that the player does not have doubts. The most important thing is the process that will lead to an improvement in the results.* (MC2)

	I must publicly reward successes and congratulate the player who does their job well and use them as an example if necessary. If I must criticize something to a player, I do it in private and with a lot of calmness and tranquillity, so they understand from coherence and common sense what they did wrong. We must earn the respect of the player through education and logical arguments without disrespecting them with shouting and threats. (MC1) *I prefer him to say "vamos", well done, good job, excellent, you are great, you can do it.* (8MP) *I prefer him to say well done, good job, excellent, you are great…* (7BP) *I prefer him to point out my weakness and help me to improve it.* (1BP) *I don't like him to point out my fault, even though I know it is good for me.* (1MP)
Use of punishment and scold	*I feel that proper punishment or blame should be necessary. Let them learn to withstand the pressure. There is an old saying, "Give a slap and a sweet jujube." This means telling them that demands are orders, and if they cannot meet them, they should receive corresponding punishment, but it is also hoped that they can do better to meet these expectations. Punishment is a form of tough love, and scolding is a form of caring, for it is only through strict discipline that a great student can be formed.* (BC2) *Punishment and blaming are only intended to encourage children to take training seriously and improve themselves. I only blame children with bad attitudes and no sense of responsibility. I don't blame children with poor technical skills, as this will undermine their motivation.* (BC1) *Strict teacher will nurture outstanding students. I know that blaming children is sometimes not good, but I become more anxious in training sessions, so I often can't control my temper.* (BC3) *I don't like to punish. If I punish, it's because there's an inappropriate behaviour, but we need to understand why that behaviour is happening. Speaking louder to get someone's attention seems like a*

	good action, but I don't believe in punishing with push-ups, for example. (MC3) *I'm not in favour of that type of public punishment. If something goes wrong, I gather the players in a circle and explain to them that things should not be done that way. I make them see, from common sense, that the task was not performed correctly and that I want a change of attitude.* (MC1) *I don't believe in punishing players during training by making them do push-ups or any other type of non-constructive reinforcement. Correcting behaviour is not the same as punishment, and I believe that using physical exercise as punishment is unfair. This approach was used in Spain in the past, and while some coaches still use it now, but it is old school.* (MC2) *I don't want him to scold me even though I know that coaches are helping us, they want us to be better.* (4BP) *I don't want to be blamed, but I know that means coach caring about us.* (3BP) *He always scolds me, maybe it is because I didn't do well. I know it's good for me. I know it is because coach wants me to improve.* (1BP) *He never speaks bad words.* (2MP) *I don't understand. He never scolds us.* (6MP)
Self-control and emotion management	*I become more anxious and aggressive in training, so I often can't control my temper.* (BC3) *Sometimes during training or games, many of my behaviours are unconscious. Sometimes it's hard to control myself, and I'm not even aware of it.* (BC2) *I never react aggressively, and I avoid giving negative feedback.* (MC3) *I try not to behave aggressively.* (MC2)
Mantel toughness	*I did these to make them mentally stronger. Blame, punishment, and scold are things that players will face and bear at any time in future competitions. If they cannot bear it in training, they will also be crushed by pressure in real competitions.* (BC3)

	I considered mental toughness is important, so hustle is necessary to increase the pace of training. Players need to learn to make decisions as soon as possible under such pressure. (MC1) *He helps me to be braver and stronger.* (1BP) *He teaches us how to face win and lose.* (1BP)
Use of Humour	*I feel that humour is very important. But too much "humour" makes players be so relaxed that they will dare to do anything.* (BC2) *I think humour is great, and I am humorous when I coach. Humour can regulate the atmosphere and make players happier.* (BC3) *At certain moments, yes, we can give a positive stimulus like humour to reduce the tension.* (MC2) *Yes. It depends on the training. There are trainings that require more concentration, but in most of them you can do some humorous behaviour to relieve the pressure on the player. For example, making a joke with the bibs, or with a stick or tricking a player etc. Relieving pressure on the player so that he feels more liberated and dares to do more things.* (MC3) *I'm not a fan of that type of behaviour. If the moment requires it, I can use it, but very rarely. I want the player to come and face the training with seriousness and order. If I make a joke, it's in the locker room or at the end of the training during the cool-down period.* (MC1)
Positive training environment	*In training, we should prioritize positive reinforcement over negative reinforcement to create a climate of trust and progression among the players.* (MC2) *It's essential to create a positive working environment, if we have motivated players everything is going to go much better. It's not easy to achieve it, through motivating tasks, challenges, exercises of improvement, and treating the player with normality and respect. I like to transmit and encourage my players with positive reinforcement, words of encouragement, and activation. They are always necessary. The player needs a dynamic, motivating coach with a positive attitude.* (MC1)

	Extremely important. I believe that without that positive atmosphere, it would not be possible to work at 100%. We achieve it by being positive and good people with the players. (MC3)

PhD candidate's publications and Conference Presentations

Publications in scientific journals

Feng, R.*, Gómez-Ruano, M. A., Liu, T., Li, C., & García-de-Alcaraz, A. (2023). Comparison of training activities and coaching behaviours in youth football coaches from Spain and China: a case study. *International Journal of Performance Analysis in Sport* (**Published**)

Li, X., **Feng, R.***, Luo, S., Li, C., & Gómez-Ruano, M. A. (2023). The associations of early specialization, sports volume, and maturity status with musculoskeletal injury in elite youth football players. *Frontiers in Physiology*. (**Published**)

Presentations in International Conferences

Feng, R., Gómez-Ruano, M. A., Li, C., Liu, T., García-de-Alcaraz, A. (2023). A Case Study Comparing Training Activities and Coaching Behaviors of Sino-Spain Youth Soccer Coaches. *World Congress on Science and Football (WCSF)*. (**Oral**)

Feng, R., Gómez-Ruano, M. A., García-de-Alcaraz A., Li X., Li C. (2022). Potential Risks of Early Specialization and High Training Volume among Elite Youth Football Players in Chinese School Football. *European College of Sport Science (ECSS)*. (**Oral**)

Feng, R., Peng, W., Gómez-Ruano, M. A., García-de-Alcaraz, A. (2022). Analysis of Spanish La Liga Soccer Players' Performance before Signing a New Contract. *World Congress on Science and Soccer (WCSS)*. (**Oral**)

Feng, R., Edgaras Stankeviciu, Gómez-Ruano, M. A., Li, C., Liu, T., García-de-Alcaraz, A. (2023). A Comparative Study of Coaching Behavior among Sino-Spanish Youth Football Coaches. *14th International Conference of Coaching Science*. (**Oral**)

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