

An insight into Short-sprint coaches' knowledge and use of periodisation models and training methods - Sri Lankan context

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim Periodised training strategies, due to their demonstrated success in improving athletic performance, have become increasingly utilised by coaches, athletes, and strength and conditioning practitioners as a key training methodology. As a consequence, a coach's knowledge of periodisation and training methods have become increasingly important for improvement of sport-sprint performance. Despite their importance of performance at the elite level, it was suspected that little is known about the Sri Lankan context. As a result, the purpose of this formative exploratory study was to examine knowledge about, and application of, periodisation and training methods by Sri Lankan elite-level coaches working with short-sprint athletes.

Material and Methods With institutional ethics approval, ten (n=10) expert short-sprint coaches volunteered to participate in the study, with data collected via semi-structured interviews. Data were analysed inductively, to identify 'patterns', 'themes' and 'categories' using the NVivo 12 qualitative software.

Results Four primary themes emerged from the interview data. These included "Periodisation models", "Monitoring training", "Strength development", and "Speed development". Findings revealed that coaches reported minimal or inadequate knowledge of periodised training and consequently, there did appear to be a gap between coach knowledge of periodised training, but additionally in regard to general training methodology; including aspect such as prescribing strength and speed training loads and, monitoring of training loads. The coaches believed that their knowledge was inadequate to support athletes with Olympic level potential.

Conclusions The findings identified a potential knowledge gap in coach education and development for elite sprint coaches in Sri Lanka.

Keywords: coaches' knowledge, periodised training, sprint training, sports performance, elite level

Introduction

A significant challenge in sports training is to effectively manipulate training loads [intensity and volume] to maximise athletes' physical performance while avoiding overtraining and injury over the competitive season [1]. Periodisation was developed as a systematic manipulation of training variables [load, sets, and repetitions] with the goal of maximising training adaptations and avoiding overtraining syndrome [2–5]. There appears to be common agreement regarding the importance of appropriate periodisation for achieving optimal performance outcomes [1, 6, 7]. Therefore, the concept of periodisation continues to gain increased popularity across different parts of the world to enable athletes to perform their very best when it comes to competition. The use of periodisation models in the planning of training programmes for athletes has enabled feasible in enabling coaches to effectively manage the training variables during

each phase [8, 9]. Periodized training is essential in high-performance sports to achieve high levels of maximum strength, power and speed [10]. Track and field coaches have access to a range of training planning models [11]; they must fully understand these and choose the best approach based on the athlete's event, age, level of training maturity, and competition needs [12]. Therefore, sprinters use periodized programmes that include strength training, plyometrics, and sprint practice in order to improve performance [8, 13–15].

The distance, athletes cover in short-sprint competitions in track and field athletics, ranges from 60 to 200 metres [16]. Dynamic interaction of technical and physiological variables is the factor responsible for the determination of sprint performance [17]. Other factors to consider include starting strategy, stride length, stride frequency, physiological demands, biomechanics, neurological impacts, muscle composition, anthropometrics, as well as track and ambient conditions [18]. It is possible to employ numerous training modalities

to increase sprint performance. However, strength and conditioning coaches should choose the most effective model for their athletes, considering the competition distance. The analysis of relevant literature sources indicates that sprint training should be specific [free sprinting, resisted sprinting with bands, sleds, or incline running, assisted sprinting with towing devices or a downhill slope], nonspecific [resistance and plyometric training], or combined [a combination of specific and nonspecific] methods on various sprint distances (0–10, 0–20, 0–30, and 31+ m) [8,19,20]. The speed development methods are usually classified into primary (performing proper movement technique of a specific motor ability), secondary (sprint resistance and sprint assistance), and tertiary (flexibility, strength, and speed-endurance) [21]. Although the training methods for the sprint are highly variable, they are not the same [22]. The coach must apply the knowledge of training methods, matching them to the individual needs of an athlete.

In high-performance sport, coaches play a critical role in the development of elite athletes and their engagement in sport [23]. Sprint coaches look at sprinting performance through different lenses based on their own experiences; they combine a wide range of knowledge to increase performance [24]. Planning is a crucial and fundamental part of the coaching process [25]. The effectiveness of the coaching process directly depends on knowledge and abilities of a coach who must be aware of the training philosophy [26], pedagogical strategies [27] and ways to enhance the improvement and development of athletes [28]. It assists in helping athletes to reach their potential and gain specific knowledge of their sport. Moreover, the ability to respond to changing circumstances requires from coaches to develop a solid knowledge base [29]. Consequently, many individuals involved in coaching have expressed their interest to expand their experience and skills on how to prepare sprinters. Finally, knowledge and understanding of periodized training and training methods, which are vital for the effective short-sprint performance, may help athletes to improve their overall sporting outcomes.

Scientific literature shows that researchers dedicate their studies to the coaches' knowledge of sport-specific themes, including verbal feedback [27], growth, maturation, and training load [30], resistance training principles and methods [31], eccentric resistance training [32], and sport volume [33]. Furthermore, special attention is paid to technical knowledge [34], nutrition [35], maximum velocity sprinting technique [24] and talent identification [36]. However, it remains unknown whether the knowledge of coaches and their application of periodization models and training methods assists in improving optimum short-sprint performance, either in Sri Lanka or elsewhere.

Recent developments in training theory and methodology for short-sprint athletes have likely seen significant improvement in performance for short-sprint athletes [37]. It is possible, however, perhaps due to the lack of a formal coach education system, that these improvements have not been widely adopted by coaches in Sri Lanka. As a result, Sri Lankan athletes may be at a disadvantage because of their preparation for the competition, when compared with international competitors. Therefore, the *purpose* of this study was to qualitatively examine the knowledge and use of periodised training and training methods made by Sri Lankan short-sprint coaches. These findings may contribute to the development of future coach education programmes and make practical recommendations to assist other coaches in critically evaluating and exploring the use of contemporary best practices in their practise.

Material and Methods

Participants

Following institutional ethics approval, ten (n=10) expert short-sprint coaches were stratified and selected representatively from eight different provinces who are located throughout the country using criterion-based sampling [38]. They were identified as the most knowledgeable and respected coaches in Sri Lanka by the Sri Lanka Track and Field Coaches Association, having produced athletes at the national and international levels in past years. The average age of the coaches' age was 47.5 years and had coaching experience for an average of 18.7 years. Out of ten, nine were male participants. Demographic information of the participant coaches is provided in Table 1. Most of the coaches that were involved in the study were male genders. This was because the country possessed more experienced male coaches than female coaches. In line with previous studies [34, 39, 40], the coaches were classified as an expert or elite level based on three criteria related to experience, achievement, and qualification. First, a minimum of 10 years' sprint coaching experience was considered necessary. Second, each coach was required to hold a valid IAAF Athletics coaching certificate; the recognised IAAF coaching award available in the athletics, or a national sprint coaching position [either currently or previously]. Finally, each coach was required to have coached at least two international-level athletes.

Data collection

Interview guide: An interview guide approach was adopted where topics and issues were specified in advance to ensure that the same basic lines of inquiry were followed by each of the interviewed coaches [41]. An interview was developed, by an experienced T&F coach with a background in

qualitative research, in order to provide a basic structure for the interviews. A list of potential research questions linked to the research topic was gathered using relevant literature and personal experience. During the interview, the researcher determined the order and wording of the questions. The first section of the schedule includes a brief description of the coaches to assist the researcher in keeping track of who responded to what during the interviewing process. This methodology has already been used in qualitative research studies on the use of training periodization models by professional judo coaches [42].

Prior to the start of the data collection period, the guide was pilot tested with two short-sprint coaches who met the criteria for full study participation. The pilot interviews allowed minor changes to the clarity of some questions and highlighted the need for further explanation and clarification probes to be included.

The final interview guide consisted of three sections: periodisation models [e.g., “Do you plan your athlete’s season? If yes, can you describe the type of periodisation model that you use to plan an athlete’s season?”, “How do you monitor training loads (volume and intensity) across different phases of the season?”], training methods for strength development (e.g., “Can you describe the variety of training methods you use to develop strength and power? ”), and, training methods for speed development (e.g., “Can you describe the variety of training methods you use to develop speed?”). A social validation process was also used to assess the interview process to see whether participants felt

they could completely tell their story, whether their responses were affected, and whether they had the opportunity to provide comments or suggestions on the process and format [43].

Procedure.

After receiving consent from the Sri Lanka Track and Field Coaches Association invitations were sent to the short-sprint coaches who met the criteria. Coaches were given a detailed explanation of the study and asked to give their consent to participate before starting each interview.

Coaches who accepted to be interviewed expressed their consent through the return of a signed reply form. This included a section providing the interviewer permission to use the coaches’ contact details in confidence. Each coach, who returned the signed consent form, were contacted three days prior to the interview by phone as a courtesy reminder or to reschedule, if necessary, in the event the participant needed to change the date, time, or place of the interview [38]. Prior to the actual interviews, participants received the interview guide to familiarize themselves with it and have time to reflect on their responses to the questions [44]. The interview took place at a time and location convenient to the respondents, in a comfortable setting free of any disturbances and noise. [45].

Face-to-face semi-structured interviews were conducted with each coach to elicit information about their various knowledge domains and insights [46], concerning the periodisation models and training methods used by short-sprint coaches.

Table 1. Demographic profile of the short-sprint coaches interviewed

Name of the coach	Gender	Years of experience	Highest level of education	Highest level of coaching certificate	Training frequency
C1	Male	12	Diploma in Sports	IAAF Level 1	10x/week/90 min *
C2	Male	14	Higher Diploma in Sports	IAAF Level 1	09x/week/90 min
C3	Male	18	Diploma in Sports	IAAF Level 1	10x/week/90 min
C4	Male	32	Diploma in Sports	IAAF Level 4	08x/week/90 min
C5	Male	22	Diploma in Sports	IAAF Level 1	09x/week/90 min
C6	Female	13	Diploma in Sports	IAAF Level 2	09x/week/90 min
C7	Male	19	Higher Diploma in Sports	IAAF Level 1	10x/week/90 min
C8	Male	14	Diploma in Sports	IAAF Level 2	10x/week/90 min
C9	Male	26	Diploma in Sports	IAAF Level 1	09x/week/90 min
C10	Male	17	Diploma in Sports	IAAF Level 2	10x/week/90 min

* Each training session

The principal investigator, who has familiarity with qualitative research and interviewing techniques and an in-depth understanding of periodisation models and training methods with the coaches' history and the nature and terminology, conducted all of the interviews. This method ensured the trustworthiness of the data collection [47]. The semi-structured nature of the interviews enabled for a more flexible approach to data gathering, allowing researchers to explore deeper into the coaches' experiences [48]. Interviews have been already used to explore elite coaches' knowledge used in training [49]. The number of interviews was continued until no new analytical information emerged – the study provides maximum information on the phenomenon known as 'data saturation' [50].

The methods of data collection were semi-structured interviews of short-sprint coaches, gym/field observations, and documentation [Training schedules and dairies]. The respondents' data were handled with the strictly confidential, since their identities were anonymized and made private. Interviews, which lasted 60 to 90 minutes, were transcribed verbatim resulted in over 210 pages. Interviews were transcribed immediately after completion in order to find analytical frameworks that connected the experiences of different interviewees [45]. Transcripts were returned to participants for member checking in order to determine the quality and accuracy of their experiences [51]. Minor changes were made to the statements to ensure confidentiality and increase transparency. Finally, participants' confidentiality was safeguarded by a coding scheme that substituted each name with a number [for example, coach @ 1 - 10]. Any possibly identifiable details [such as coaches' names, their athletes' name, hometown, and so on] was also de-identified to prevent coaches' identity being revealed.

Data analysis

The data collected during the interviews were then subjected to thematic analysis, a very simple and flexible method of qualitative analysis [38], in order to identify patterns of meaning across the dataset. Qualitative coding and theme development procedures were adapted from the use of the six-stage process by Braun and Clarke [52] which provides such a clear and usable framework for conducting thematic analysis. These stages include; idea familiarization, the generation of initial codes, theme identification, reviewing of the themes, and defining and theme naming. Key themes were identified concerning the various codes in the analysis using a qualitative analysis software (QSR NVivo 9). This allowed the researcher to come up with a thematic map (Figure 1) that would best examine the application of the periodization training approach for sprinters in the country.

Results

Overview

This study is the first to assess the knowledge and use of periodised training made by Sri Lankan short-sprint coaches. Themes and sub-categories emerged following the process of thematic analysis can be seen in Figure 1. Four higher-order constructs emerged: "*Periodisation models*", "*Monitoring training*", "*Strength development*", and "*Speed development*". Each of these constructs will now be explored in greater depth as to their precise meaning while being simultaneously located, where appropriate, within the existing body of knowledge. The following section will detail the major findings within each category and sub-theme concerning the range of knowledge on periodisation and training methods held by the expert short-sprint coaches interviewed. Where relevant, quotes from interviewees are included with the pseudonyms C1 through to C10. The gender-neutral pronoun "they" has been used throughout to hide the gender of the coach.

Periodisation models

Periodisation models included the use of type of periodised training they employed and the knowledge about it. Eight of the ten coaches are unaware of the model. "As a coach, I feel not prepared to use the periodisation models in my training even though heard about it" (C2). "We do not do periodisation because we do not have proper knowledge" (C5). Another coach (C1), who produced South Asian junior gold medallist, said the following:

"I do have athletes who can qualify for the Olympics. They can qualify. Nevertheless, my knowledge of periodization and strength and conditioning is not perfect. In addition, the microcycle knowledge also is not enough. Those areas all should be developed. Nevertheless, we do not have the facilities and opportunities to develop that knowledge".

Monitoring training

Monitoring training included knowledge about monitoring and the facilities for it. All the coaches mentioned that they do not have sufficient knowledge about monitoring. "I do not perform monitoring or testing properly as I do not have depth idea about it" (C6). "I do not use anything because our science side is weak" (C5). "No, I do not do that because I do not have knowledge" (C1). Another coach (C3), said the following:

"I have some idea about monitoring, but I do not have a big idea about this. Just a normal level idea".

Strength development

Strength development included training plan, training method and the load they used. Nine of the ten coaches use non-periodized training. Seven

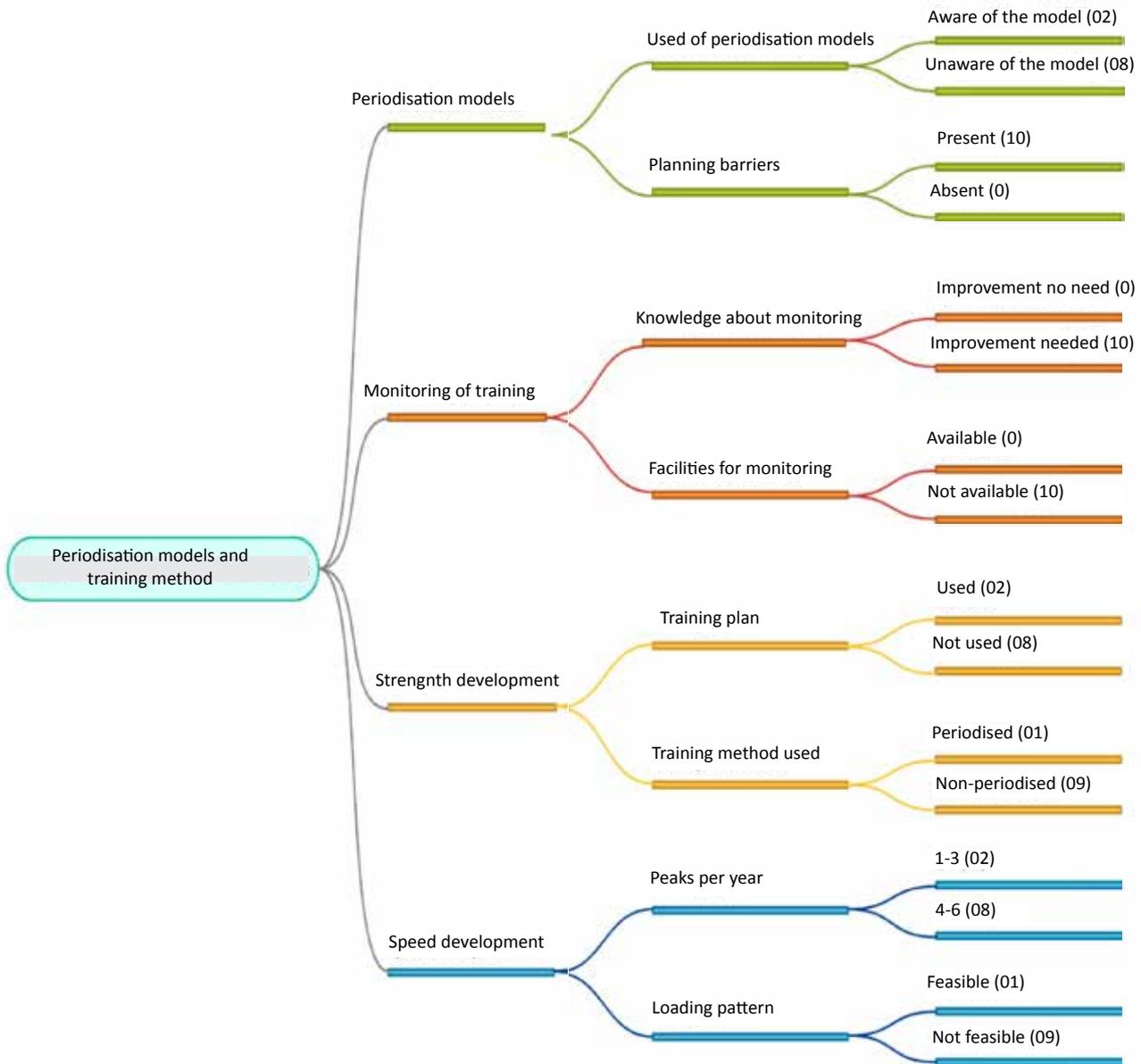


Figure 1. Thematic mind map of semi-structured interview.

of the ten do not have a clear plan for strength development. “I do not plan my training as I do not have a big idea about intensity and volume for developing strength. I do the way I know” (C3). “During special preparation, the percentage is 80%, repetition is 8 and 2 sets. For pre-competition, the load is 95% with 3 reps and 1 - 2 sets. During the competition period, 98%” (C4). Another coach (C9), who produced Asian junior gold medallist, said the following:

“I start with about 35-40% with 10 to 12 reps and 3-4 sets in general preparation. In special preparation, 60- 65% with 8 – 10 reps and 3 sets. In pre-competition intensity is about 80 – 85% with 6 reps and 2 sets. Intensity during the competition, we do not use 100%. Maybe 98%. This is during competition training 95% – 98% with 1- 4 reps and 1 to 2 sets”

Discussion

The purpose of this formative exploratory study was to examine knowledge about, and application of, periodisation and training methods employed by Sri Lankan elite-level coaches working with short-sprint athletes.

The majority of participants in this study did not possess the minimal knowledge necessary to design, implement, and supervise periodized strength and conditioning programmes for short-sprint athletes based on the findings of this study. The results of this study indicate that coaches need further training and continuing education specific to periodisation training. Periodised training is more effective than non-periodised training in trained subjects, according to scientific research and training practice [53–55]. According to the findings

of the study, despite the fact that a few coaches confirmed that they had adopted periodization approaches to training athletes, they believed that they lack the necessary knowledge to translate their athletes to the Olympics. Even though coaches believed that knowledge about periodisation and training methods are very essential, they reported that their knowledge is inadequate to transfer their athletes to Olympics. The main reason for this was that they bore inadequate resources in terms of expertise. In this case, the coaches' knowledge was derived from their extensive personal experiences. Due to this, Sri Lanka has experienced significant challenges associated with training its top athletes over the years. This problem has made it particularly difficult for these competitors to win in the international arena. For this reason, it is essential to ensure that the country bears a suitable means of training coaches on enabling them to gain relevant knowledge and skills.

Coaches were able to recognize the importance of periodization of training as opposed to using non-periodization, which had little impact on athletes' physical well-being due to a lack of adequate monitoring techniques [37, 56] including for youth athletes [57]. This also goes to show that athletes should be able to understand what is required of them at any particular time of the training process to ensure that they experience overall growth in terms of fitness development. Sri Lankan short-sprint coaches often deal with an increasingly large number of competitions throughout the year, which also subsequently reduces the use of periodisation.

On the other hand, most coaches in Sri Lanka lacked relevant expertise concerning advanced knowledge and skills on matters of training in general. Although a considerable percentage of the respondents proved they had sufficient experience concerning having been part of a training team in their past experiences, it was evident that they were unaware of how to go about to effecting essential periodized techniques in training [58]. Such being the case, this has often made it difficult for them to effectively guide athletes on essential means of enabling them to be competitive enough not only in the Olympics but also in the Asian Games. Therefore, relevant stakeholders need to find logical solutions concerning rectifying this problem. One of how this can be made possible is by enrolling them in proper and advanced learning in the field of sports and, more specifically, what to do when it comes to ensuring that they are capable of conducting effective training sessions for their athletes.

The results also highlighted that a majority of coaches lacked proper training plans. Although quite a number of the respondents confirmed that they had proper ways of conducting their training programs, it was evident that most of their plans were not probable and feasible. The plans were not

in any way, capable of meeting the requirements of coming up with informed periodization models. A majority of coaches, therefore, need to be guided on how to come up with plans that may allow their athletes to be in a position of training under similar conditions as their competitors in other countries.

Despite the fact that most coaches work with groups of athletes, it is important to focus on each athlete's responses to training rather than the group's overall performance [59]. Monitoring training load during a macrocycle is an important strategy to increase physical performance and reduce possible risks of overtraining. Even though monitoring the progress of athletes is a vital component of the training process [15, 60], coaches neglect monitoring due to lack of knowledge and facilities. All the coaches, who are not implementing monitoring methods, reported knowledge or financial constraints. Athletes should be closely monitored during preparation to ensure that the desired results on athlete's performance and well-being are achieved [61]. Monitoring of training leads to improved sports skill, which results in increased sports performance. Therefore, coaches should include strategies to monitor the training load in order to improve the accuracy of training periodization and reduce the risk of over- or under-training [62].

Most of the coaches apply inadequate intensities and volume for their athletes. According to most experts, advanced athletes should perform 2 to 6 repetitions of 85% 1RM (of 1 repetition maximum [RM]) for strength gains and 6 to 12 repetitions at higher loads [75% -85% 1RM] for power conversion [63-66]. However, when beginning strength training with boys and girls start with a mild to moderate weight (60 percent of 1RM).

Conclusions

As a foundation for further research, the current exploratory study aimed to examine the knowledge and use of periodised training made by Sri Lankan short-sprint coaches who are considered as being expert coaches. The coaches sampled in the study believed that they lack adequate knowledge to translate their athletes to the Olympics suggesting that our study is heuristically significant. Future research should investigate the potential of coach education for short-sprint coaches in Sri Lanka. Additionally, research should be conducted with Sri Lankan short-sprint athletes to investigate the benefit of periodised strength and conditioning on their performance. Government should aim to optimize social and economic resources to provide learning opportunities for Sri Lankan coaches in order to develop a coaching education system in Sri Lanka. This requires collaboration from international experts and a commitment to research in order to produce knowledge firmly grounded in the specific needs of Sri Lankan coaches.

Limitations

This study had a Sri Lanka sample and only considered the knowledge of elite short-sprint coaches. Therefore, the findings cannot be generalised to other countries, coaching cultures, sports, contexts, or novice coaches.

Acknowledgements

Our thanks to the Athletics Association of Sri Lanka and the Sri Lanka Track and Field coaches'

association for their collaboration in this study. The authors want to thank national coach Y.K. Kularatne for his valuable input during the data collection.

Conflict of interest statement

The authors declare no conflict of interest regarding this manuscript.

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Cite this article as:

Sellathurai J, Draper N. An insight into Short-sprint coaches' knowledge and use of periodisation models and training methods - Sri Lankan context. *Pedagogy of Physical Culture and Sports*, 2022;26(1):38–46. <https://doi.org/10.15561/26649837.2022.0105>

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Received: 07.12.2021

Accepted: 21.01.2022; Published: 26.02.2022