2024, Retos, 60, 377-382

Comparison of physical fitness status of Ethiopian youth football players trained by coaches from formal and informal coach learning systems

Comparación del estado físico de jugadores de fútbol juveniles' etíopes entrenados por entrenadores de sistemas de aprendizaje de entrenadores formales e informales

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Abstract. The purpose of the present study was to compare physical fitness status (agility, flexibility, speed, and strength endurance) of Ethiopian youth under-17 football players trained by coaches from formal and informal coach learning system. To achieve the objective of the study a quantitative approach in harmony with purposive sampling was employed. Hence, the researchers have participated and measured the fitness level of 75 (62.5%) volunteer elite youth U-17 players. An independent sample t-test was conducted to compare the physical fitness status of players being trained by coaches from formal and informal learning system. There were statistically significant agility difference between players coached by formally learned coaches (M = 16.38, SD = .77) and players of informally learned coaches M = 16.86, SD = 1.06; t (73) = -2.16, P = .03. Conversely, the findings of the present study showed that statistically significant speed difference between players coached by formally learned coaches (M = 4.48, SD = .21) and players coached by informally learned coaches M = 4.11, SD = .31; t (73) = 6.16, P = .00. On the contrary, the findings of the present study indicated that statistically significant flexibility difference between players coached by formally learned coaches (M = 10.40, SD = 4.44) and players of informally learned coaches M = 6.10, SD = 5.30; t (73) = 3.66, P = .00. The result elucidates that players trained by formally learned coaches were significantly fast (16.38 seconds) agility mean time score than players trained by informally learned coaches (16.86 seconds). Conversely, players trained by informal learned coaches' show significantly faster (4.11 seconds) than players coached by formal learned coaches. However, players coached by formally learned coaches were significantly flexible (10.40 centimeters) than trainees of informally learned coaches. Nevertheless, there was no significant difference in strength endurance of players trained by formally learned coaches (M = 28.20, SD =10.17) and strength endurance of players trained by informally learned coaches (M = 31.29, SD = 11.69). However, there was no significant difference in strength endurance of players trained by formal learned coaches (M = 28.20, SD = 10.17) and strength endurance of players trained by informally learned coaches M = 31.29, SD = 11.69; t (73) = -1.18, P = .24. Ultimately, the result of the current study suggests that the type of coach learning surely have an impact on physical fitness status of elite youth under-17 football players. Therefore, the findings of the current study conclude that the collaborative work of formally learned and informally learned coaches recommended to bring the needed changes across all physical fitness qualities of elite youth under-17 football players of Ethiopia.
Keywords: agility, speed, flexibility, strength endurance, formal learning, informal learning

Resumen. El propósito del presente estudio fue comparar el estado de condición física (agilidad, flexibilidad, velocidad y resistencia a la fuerza) de jugadores de fútbol etíopes menores de 17 años entrenados por entrenadores del sistema de aprendizaje de entrenadores formal e informal. Para lograr el objetivo del estudio se empleó un enfoque cuantitativo en armonía con el muestreo intencional. Por lo tanto, los investigadores participaron y midieron el nivel de condición física de 75 (62,5%) jugadores juveniles sub-17 de élite voluntarios. Se realizó una prueba t de muestra independiente para comparar el estado de condición física de los jugadores entrenados por entrenadores del sistema de aprendizaje formal e informal. Hubo diferencias de agilidad estadísticamente significativas entre jugadores entrenados por entrenadores formados formalmente (M = 16,38, SD = 0,77) y jugadores de entrenadores formados informalmente M = 16,86, SD = 1,06; t (73) = -2,16, p = 0,03. Por el contrario, los hallazgos del presente estudio mostraron que la diferencia de velocidad estadísticamente significativa entre jugadores entrenados por entrenadores formados formalmente (M = 4,48, SD = 0,21) y jugadores entrenados por entrenadores formados informalmente M = 4,11, SD = 0,31; t (73) = 6,16, p = 0,00. Por el contrario, los hallazgos del presente estudio indicaron que la diferencia de flexibilidad estadísticamente significativa entre jugadores entrenados por entrenadores formados formalmente (M = 10,40, SD = 4,44) y jugadores de entrenadores formados informalmente M = 6,10, SD = 5,30; t (73) = 3,66, p = 0,00. El resultado aclara que los jugadores entrenados por entrenadores formados formalmente obtuvieron puntuaciones de tiempo medio de agilidad significativamente más rápidas (16,38 segundos) que los jugadores entrenados por entrenadores formados informalmente (16,86 segundos). Por el contrario, los jugadores entrenados por entrenadores con conocimientos informales se muestran significativamente más rápido (4,11 segundos) que los jugadores entrenados por entrenadores con conocimientos formales. Sin embargo, los jugadores entrenados por entrenadores formados formalmente eran significativamente flexibles (10,40 centímetros) que los alumnos de entrenadores formados informalmente. Sin embargo, no hubo diferencias significativas en la fuerza resistencia de los jugadores entrenados por entrenadores formados formalmente (M = 28,20, SD = 10,17) y la fuerza resistencia de los jugadores entrenados por entrenadores formados informalmente (M = 31,29, SD = 11,69). Sin embargo, no hubo diferencias significativas en la fuerza resistencia de los jugadores entrenados por entrenadores formados formalmente (M = 28,20, SD = 10,17) y la fuerza resistencia de los jugadores entrenados por entrenadores formados informalmente M = 31,29, SD = 11,69; t (73) = -1,18, p = 0,24. En última instancia, el resultado del presente estudio sugiere que el tipo de aprendizaje del entrenador seguramente tiene un impacto en el estado físico de los jugadores de fútbol de élite menores de 17 años. Por lo tanto, los hallazgos del estudio actual concluyen que el trabajo colaborativo de entrenadores con formación formal e informal recomendó lograr los cambios necesarios en todas las cualidades físicas de los jugadores de fútbol de élite menores de 17 años de Etiopía.
Palabras clave: agilidad, velocidad, flexibilidad, fuerza resistencia, aprendizaje formal, aprendizaje informal.

Fecha recepción: 05-06-24. Fecha de aceptación: 14-08-24
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Introduction

Formal coach learning is sequentially and logically structured types of learning (He, Trudel, & Culver, 2018; Hertting, 2019); and it helps to acquire critical thinking skills, knowledge and understanding of coaching (Steffen, 2021). However, formal courses should be purposefully designed and include subject matters that are directly related to specific responsibility of coaches on how they promote positive development of their trainees. According to Nelson, et al., (2006), informal coach learning lacks systematic and organized learning situations throughout process of learning. Conversely, Maclean and Lorimer (2016) stated that informal coach learning is a preferable and recommended process of learning that gives opportunity of learning by doing. As a result, coaches can develop and acquire reflective behavior by learning form their own experiences of coaching. Generally, through a process of both formal and informal coach learning, coaches can acquire knowledge and skills that conveys behavioral changes.

However, there are several differences among sport science scholars concerning styles of coach learning. For example, some of them suggest that coaches should learn coaching through formal learning (Mallett, Trudel, & Rynne, 2009; Steffen, 2021). On the contrary, other scholars also recommended that coaches should learn coaching through informal learning such as from his own experience and dialog with other experienced coaches to (Gilbert & Trudel, 2001; Nash, 2008; Maclean & Lorimer, 2016).

Likewise, in the context of Ethiopia, there are elite youth under-17 football coaches who learn coaching through formal learning and coaches who learn coaching informally form their prior experiences of playing football. Hence, both coaches also take a part in the country and involved in coaching different elite youth U-17 football clubs. This means government youth academies assign coaches based on their sport science degree qualification; whereas other non-governmental organization football clubs also merely assign coaches based on their prior experiences of play in their club.

Indeed, the knowledge and understanding as well as skill of the coach have a direct impact on the improvement of youth trainees' physical fitness (Jones et al., 2022; Stodter & Cushion, 2019). Consequently, in order to identify the impact of coach learning on the physical fitness status of elite youth under-17 football players, a total of 75 players were selected from clubs trained by formally learned coaches and clubs trained by informally learned coaches.

Tests and data gathering procedures

Based on the information from their coach and self-reported information of players, health of players was checked. Then, 75 players together with their five major coaches were selected from five volunteer elite youth U-17 football clubs. Thus, Illinois Agility Run Test, 30-meter Acceleration Test, Sit and Reach Test, and Push-up Test were used in the study. We were applied the test-retest procedure (Pye, 2005) and administer tests in similar and comfortable conditions to keep the reliability and validity of the scores. The present study was reviewed and approved by research and publication unit of Bahir Dar University Sport Academy. After an approval of Bahir Dar University Sport Academy Ethical Review Committee (S/A/D 5768/11) to ensure that, the study did not involve players who were recently injured and there were no identifiable health risks on the participants of the study. Additionally, a three-minute rest between similar and five-minute rest between different tests were guaranteed for participants' to minimize risks of injury and increase reliability of the collected data.

Preliminary analysis

The quantitative data collected through standardized performance and fitness tests such as Push-up, Illinoi's agility run test, 30 meter sprinting, and sit and reach tests was analyzed using SPSS Software (IBM SPSS, Version 21). Additionally, preliminary analysis was conducted to confirm whether violation of independent t-test is happened or not. Hence, the results indicated that analysis of homogeneity of variance was reasonably robust, healthy, and strong for violation of this assumption since the two groups are reasonably similar (Pallant, 2007).

Standard Push-up Test (SPT)

Players were prepared their body in 12 minutes using both general and specific warm-up, and dynamic stretching respectively. Immediately, following the demonstration of the researchers, they lie on the ground with hands shoulder width apart and fully extended arms and support their body in a push-up position from the toes. Then, lower their body by flexing from both hands elbow until the chest is approximately three inches from the floor, and then return to the starting position with elbows fully stretched. We were counted only the numbers of successful repetitions in a two-minute time period; and Push-ups performed without reaching to the desired position were not counted and used for analysis (Wuest & Bucher, 1999; Huber, 2005). However, test-retest procedure was used to get reliable score of players (Creswell, 2012), and the best number of push-ups performed in two minute time was selected for analysis.

Illinois Agility Run Test (IART)

IART is one of the best tests of agility, because it is very reliable and easy to administer (Pye, 2005; Davies, 2005). Hence, players were taking a five-minute rest from the previous test (Davies, 2005); and observed the demonstration of researchers as usual. Then, they were lie face down on the floor at the starting point. Following the command go (Whistle sound), they were jump-up and run through the course to finish line as fast as possible. Similar-

ly, we also applied test-retest procedure, after three-minute test between tests, and the shortest time or best result of the three was used for analysis.

30-meter Acceleration Test (30-m AT)

Speed is a key component of football conditioning (Boone et al., 2012; Buchheit et al., 2010; Rampinini et at., 2007) and 30-m AT is also one of the valid and simplest methods to determine players linear speed (Pye, 2005). Thus, players were properly warm-up their body and stretched using dynamic stretches within 12 minutes. Following the orientation of the researchers, they were sprinted to finish 30-meter marked dash. The test had three trials (3 x 30m), three-minutes were given between trials for full recovery (Davies, 2005), and the time for each run was recorded. Finally, the fastest 30-m AT was selected for analysis.

Sit and Reach Test (SRT)

According to Eston and Reilly (2009) in SRT, the distance reached is predictable and used as an assessment of back muscles and hamstrings or general flexibility of players. Therefore, players were fully recovered within five minutes (Davies, 2005) from the above (30-m AT) and we demonstrate and let players to remove their shoe and sit on the floor, and then they had flexed from hip to reach forward and push their fingers along the table as far as possible (Davies, 2005; Eston & Reilly, 2009). Similar to the above procedures, we also applied test-retest procedure to keep the reliability of test results, and the best distance reached was recorded for analysis.

Results

In order to identify the impact of coach learning and development on (strength endurance, agility, speed, and flexibility) of players, independent samples t-test was employed and results were presented in Table 1 and Table 2.

Table 1.
Descriptive Statistics for Mean and Standard deviation of Players Physical Fitness across Formal and Informal Coaches

	Types of coach learning	N	Mean	Std. Deviation	Std. Error Mean
Strength endurance	formal	30	28.2000	10.17231	1.85720
	informal	45	31.2889	11.68648	1.74212
Agility	formal	30	16.3778	.77269	.14107
	informal	45	16.8642	1.05930	.15791
Speed	formal	30	4.4755	.20657	.03771
	informal	45	4.1050	.31480	.04693
Flexibility	formal	30	10.4000	4.44002	.81063
	informal	45	6.1000	5.30394	.79067

Note. TCL= Types of Coach Learning, SEM= Standard Error Mean

As described in Table 1, the result of descriptive statistics for mean and standard deviation of each group (players of formal coach/informal coach) as well as the N values are correct. Thus, there are not missing data occurred.

Table 2.
Summary of Independent Samples t-test for the Impact of Coaches' Formal and Informal learning across Physical Fitness Level of Players

Coach learning		Levene's Test for Equality of Variances F	Sig.	t	df	Sig. (2-tailed)	MD	SED	95% CI Lower	95% CI Upper
Strength endurance Formal Informal	EVA	1.21	.27	-1.18	73	.24	-3.18	2.62	-8.3	2.13
Agility Formal Informal	EVA	.76	.42	-2.16	73	.03	-.49	.23	-.94	-.04
Speed Formal Informal	EVA not	7.62	.01	6.16	72.99	.00	.37	.06	.25	.49
Flexibility Formal Informal	EVA	1.99	.16	3.66	73	.00	4.30	1.17	1.96	6.64

SED (Standard Error Difference), EVA (Equal Variance Assumed), EVA not (Equal Variance not Assumed)

As illustrated in Table 2, an independent samples t-test was conducted to compare the impact of coach formal and informal learning on physical fitness (strength endurance, agility, speed, and flexibility) status of players. Thus, there was statistically significant agility difference between players of formally learned coaches (M = 16.38, SD =.77) and informally learned coaches (M = 16.86, SD=*1.06)* = 1.06; t (73) = -2.16, P = .03 (2-tailed). The magnitude of difference in the means (mean difference = -.49, 95% CI: -.94 to -.04) was very small (eta squared = 0.01). The result implies that agility mean time (16.38 seconds) score of players coached by formally learned coaches was significantly faster than players coached by informally learned (16.86 seconds) coaches.

Conversely, there was statistically significant speed difference between players trained by formally learned coaches (M = 4.48, SD = .21) and speed of players trained by informally learned coaches M = 4.11, SD = .31; t (73) = 6.16, P = .00 (2-tailed). The magnitude of difference in the means (mean difference = .37, 95% CI: .25 to .49) was medium (eta squared = 0.09). The result elucidates that speed mean (4.11 seconds) time score of players trained by informally learned coaches was significantly faster/shorter than speed mean (4.48 seconds) time score of players trained by formally learned coaches.

On the contrary, there was statistically significant difference in flexibility of players trained by formal learned coaches (M = 10.40, SD = 4.44) and flexibility of players trained by informal learned coaches M = 6.10, SD = 5.30; t (73) = 3.66, P = .00 (2-tailed). The magnitude of difference in means (mean difference = 4.30, 95% CI: 1.96 to 6.64) was small (eta squared = 0.03). The result suggests that players trained by formally learned coaches were significantly flexible (10.40 centimeters) than players

trained by informally learned (6.10 centimeters) coaches.

Although, there was no significant difference in strength endurance of players trained by formal learned coaches (M = 28.20, SD = 10.17) and strength endurance of players trained by informally learned coaches M = 31.29, SD = 11.69; t (73) = -1.18, P = .24 (2-tailed). The magnitude of difference in means (mean difference = -3.18, 95% CI: -8.31 to 2.13) was very small (eta squared = 0.00). The result implies that players trained by informally learned coaches had slightly better strength endurance (31.29) than players trained by coaches formally learned (28.20) coaches, but there was no statistically significant difference between them.

Discussion

Several studies indicated that knowledge, skill, and critical thinking of the coaches' are acquired through formal coach learning (Cameron & Harrison, 2012; Mallett et al., 2009; Misko 2008; Nelson et al., 2012; Steffen, 2021). For example, a very recent study by Steffen (2021) indicated that formal coach learning can be realize improvements in coaching through formal setting and means other than coaching experiences. In the contrary, (Camiré, Trudel, & Froneris, 2014; Boardley, 2017) also suggested that coaches should learn through exposing themselves to different learning situations as a source of learning to coach football.

Maclean and Lorimer (2016) identified several sources of informal knowledge such as books, watching people and learn, asking people, mentoring programs (learning from experienced coaches, coaching proficiency acquired through practice, early athletic experiences and encounter with mentors (Gilbert & Trudel, 2001; Nash, 2008). Furthermore, several scholars also recommend both informal as well as formal sources of knowledge to coach elite youth U-17 football player's physical fitness (Camiré, Trudel, & Forneris, 2014; Dray, et al., 2016).

The results of this study indicated that statistically significant agility difference between players of formally learned coaches and players of informally learned. This result implies that formally learned coaches have better knowledge and skill of coaching agility training than informally learned coaches.

Conversely, the findings of the present study shows that statistically significant speed difference between players coached by formally learned coaches and players coached by informally learned coaches. This result suggests that informally learned coaches have better knowledge and skill of coaching speed training than formally learned coaches.

On the contrary, the findings of the present study indicated that statistically significant flexibility difference between players coached by formally learned coaches and players of informally learned coaches. This result indicates that formally learned coaches have better knowledge and skill of coaching flexibility training than informally learned coaches.

Although, there was no significant strength endurance difference between players of formally learned coaches and players of informally learned coaches. However, players trained by informally learned coaches had better strength endurance than players trained by formally learned coaches. This result elucidates that informally learned coaches have better knowledge and understanding concerning strength endurance training than formally learned coaches, but there was no statistically significant difference between them.

In general, despite small samples (75 players and 5 major coaches) limited to only elite youth U-17 players and their major coaches, implications should viewed as exploratory ideas more than definitive directions for the impact of formal and informal coach learning on physical fitness status of Ethiopian elite youth U-17 football players.

Hence, elite youth U-17 Ethiopian football coaches should work and plan together to improve physical fitness qualities of players in relation to the demands of contemporary football. Additionally, the Ethiopian Football Federation and other concerned organizations should give and facilitate coach-learning opportunities by structuring materials and programs to bridge the gap between coaching theory and coaching practice.

Limitations of the study

Although an extensive quantitative data was collected from 75 elite youth U-17 football players, the result of this study is generalized to only (elite youth U-17 clubs who have been participated in U-17 Ethiopian Premier league). Thus, further study needs to include other youth U-17 football projects and their respected coaches. Moreover, further studies should be explored using large sample size as well as including other additional football specific physical fitness in the area.

Conclusion

Formal coach earning and development of coaches is basic for the development of technical and vocational skills, which is directed by critical knowledge and understanding. Hence, all these qualities of the coach are acquired through formal learning. However, informal coach learning does not correspond to an organized and systematic view of coaching knowledge and understanding. Whilst the training usually incorporate with traditional curricula and lacks in facilitating an intentional and goal-oriented training session.

However, bringing significant changes across all physical fitness of players, without experiences of coaching was a gap, which was observed in this study. As a result, it is possible to conclude that both formally learned and informally learned coaches contribute for significant improvement of different fitness variables.

For example, the results of this study indicated that

players trained by formally learned coaches were significantly better in their agility and flexibility; whereas, players trained by informally learned coaches were also shows significantly fast speed time than players trained by formal coaches. The result suggests that the type of trainings as well as philosophical differences between the coaches concerning the preparatory season physical fitness training.

Indeed, the findings of the current study conclude that the collaborative work of formally learned and informally learned coaches recommended to bring the needed change across all physical fitness variables of elite youth U-17 football players of Ethiopia.

There is a large research gap, in the context of Ethiopia, particularly on comparison of physical fitness status of Ethiopian youth U-17 football players trained by coaches from formal and informal coach learning systems. Consequently, the findings of this study motivated and recommended researchers for further studies in the area.

Ethical considerations

After an approval of research and publication committee of Bahir Dar University sport academy, the purpose of the study was explained for team administrative managers, coaches and players. Players' recent medical history was assessed to exclude recently injured players, but there was no recently injured players were found in the study sample.

Acknowledgements

This article is subset of a PhD research project, which was funded by Bahir Dar University. Additionally, we appreciate the willingness of players and their coaches while participated in the process of data collection and testing fitness level of sample players.

Contribution of the authors

- [1]Mohammednasir Yimer is the principal author of the research and he was engaged in identifying the problem, development of the proposal for the research, process of conceptualization, reviewing related literatures for the study, data collection, analysis of the results, and preparation of the manuscript.
- [2]Dr.Aemero Asmamaw (associate professor) is the major supervisor of the research and he was involved in an overall supervision of the research and development of the manuscript.
- [3]Dr.Zerihun Birhanu is a co-supervisor of the research in which he was actively involved throughout the process of the research and development of the manuscript.

Conflicts of interest

The authors of this article declared there is no conflicts of interest that could be interfered with the publication of this article.

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