Correlation between strength and speed in young adult professional soccer players during the pre-season period.

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Soccer | Speed | Strength

Headline

Sprinting is one of the motor skills involved in soccer player performance (1). Sprinting requires the expression of a high amount of ground force during lower extremity thrust. Recently, the development of horizontal strength has been considered crucial to improve sprinting. In this regard, studies have been performed involving the use of relatively heavy loads to improve horizontal strength production and consequently sprinting (2, 3, 4).
Several studies have verified the correlation between sprinting and strength, showing that athletes with greater strength are able to perform better in sprinting (5, 6, 7, 8). Strength capability has several ways of expression, and during a soccer match it is expressed through accelerations, changes of direction, jumps, contrasts, shots, requiring explosive and/or reactive actions (1). Athletes' ability to produce force may decrease during the off-season if they do not carry out training aimed at maintaining it. An eventual decrease in strength capability, could also cause a decrease in sprinting given the correlation between the two components (5, 6, 7, 8), so it is necessary to investigate this phenomenon during the pre-season to provide accurate indications for training.

Aim

The aim of this study is to evaluate the possible correlation between strength and speed during the pre-season in young adult professional soccer players.

Design

Observational study

Participants

Twenty (n=20) soccer players aged between 17 and 18 years old belonging to the professional league: "Primavera Serie A" were recruited. Inclusion criteria were as follows:

-Participation in professional soccer leagues for at least 5 sports seasons.
- Absence of injury.
Subjects were informed about the modalities of the study, which emphasized the experimental nature of the procedure with consequent informed consent prior to data collection in accordance with the code for the protection of personal data. All data collected were treated strictly anonymously and used exclusively for research purposes. Four players (n=4) did not complete the entire battery of tests.

Methods

Twenty (n=20) soccer players were submitted to a battery of functional assessment tests of strength and speed capability. Explosive strength was assessed through the Squat Jump (SJ), while explosive-elastic strength was assessed with Countermovement Jump (CMJ), Countermovement Jump with free upper limbs (CMJ L). As for speed, it was assessed by linear sprints over 10, 20 and 30 m. The battery of tests was performed at the start of the pre-season period. The tests were given after an adequate warm-up of 10 minutes.

Statistical analysis

Statistical analysis was performed with the Jamovi data processing software (9). To verify the correlation between the results obtained in the functional assessment tests, Pearson's correlation (Pearson r) was used, with confidence interval estimated at 90% (10) considering $p<0.05$ as threshold of statistical significance. Data were expressed as mean and standard deviation. In the graphs showing the correlation between the variables the standard error is also indicated.

Results

CMJ correlates with sprinting over 10 m ($p<0.05$; r= -0.655; -0.829 to -0.368), 20 m ($p<0.05$; -0.695; -0.850 to -0.429) and 30 m ($p<0.05$; r= -0.550; -0.769 to -0.216). CMJ L correlates with sprinting over 10 m ($p<0.05$; r= -0.618; -0-808 to -0.311), 20 m ($p<0.05$; r= -0.692; -0.848 to -0.424) and 30 m ($p<0.05$; r= -0.612; -0.804 to -0.303). SJ correlates with sprinting over 10 m ($p<0.05$; r= - 0.546; -0.789 to -0.155). No correlation emerged between SJ and sprint over 20 m ($p>0.05$; r= -0.450; -0.736 to -0.029) and 30 m ($p>0.05$ r= -0.300; 0.146 to 0.259). Table 1-2 and Graph 1-9 summarizes the results obtained.

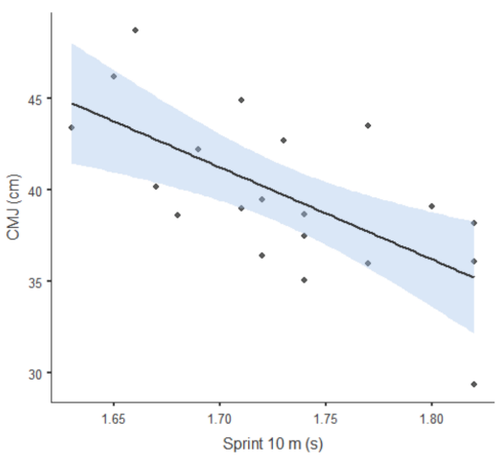

Fig. 1. Correlation CMJ (cm)-Sprint 10 m (s)

Table 1. Descriptive analysis

	Sprint 10 m (s)	Sprint 20 m (s)	Sprint 30 m (s)	CMJ (cm)	CMJ L (cm)	SJ (cm)
N	20	20	20	20	20	16
Missing	0	0	0	0	0	4
Mean	1.73	2.98	4.13	39.8	47.6	43.0
Standard Deviation	0.0574	0.0960	0.159	4.41	4.47	6.65

Table 2. Correlation

		Sprint 10 m (s)	Sprint 20 m (s)	Sprint 30 m (s)
CMJ (cm)	Pearson's r	-0.655 **	-0.695 ***	-0.550 *
	p-value	0.002	<.001	0.012
	90% CI Upper	-0.368	-0.429	-0.216
	90% CI Lower	-0.829	-0.850	-0.769
	N	20	20	20
CMJ L (cm)	Pearson's r	-0.618**	-0.692 ***	-0.612**
	p-value	0.004	<.001	0.004
	90% CI Upper	-0.311	-0.424	-0.303
	90% CI Lower	-0.808	-0.848	-0.804
	N	20	20	20
SJ (cm)	Pearson's r	-0.546*	-0.450	-0.300
	p-value	0.029	0.080	0.259
	90% CI Upper	-0.155	-0.029	-0.146
	90% CI Lower	-0.789	-0.736	-0.644
	N	16	16	16

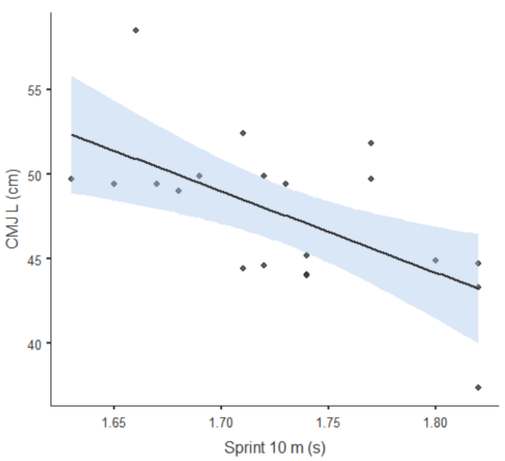

Fig. 2. Correlation CMJ L (cm)-Sprint 10 m (s)

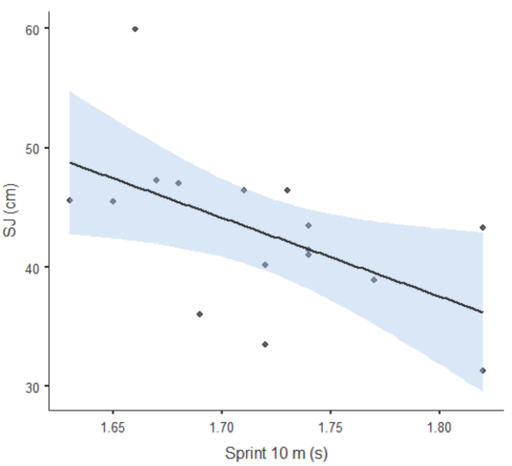

Fig. 3. Correlation SJ (cm)-Sprint 10 m (s)

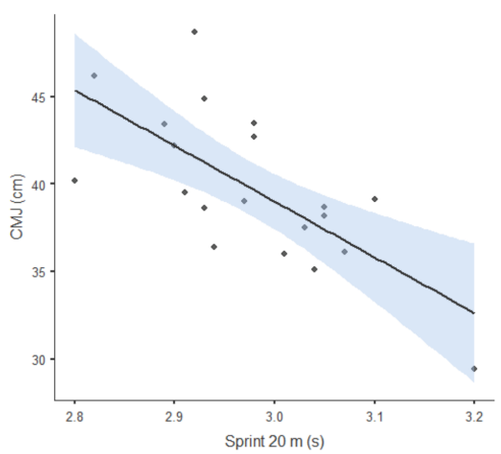

Fig. 4. Correlation CMJ (cm)-Sprint 20 m (s)

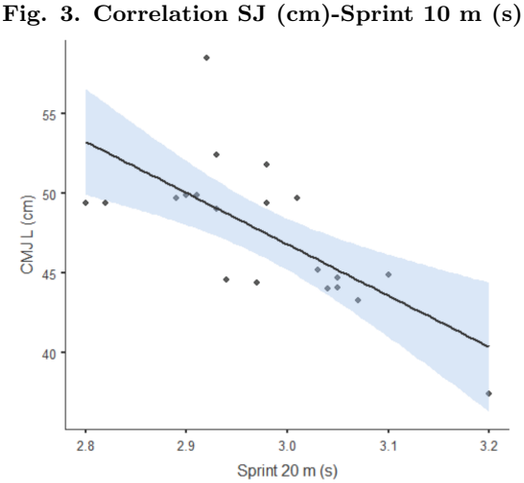

Fig. 5. Correlation CMJ L (cm)-Sprint 20 m (s)

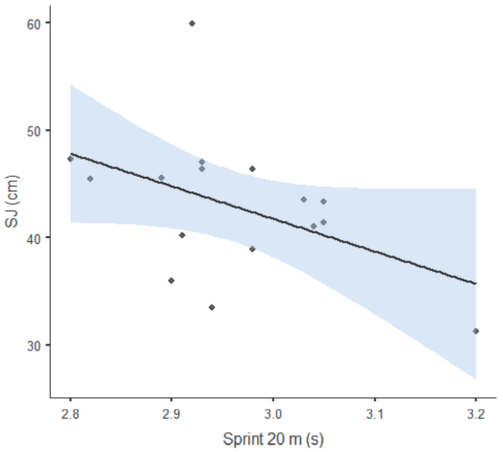

Fig. 6. Correlation SJ (cm)-Sprint 20 m (s)

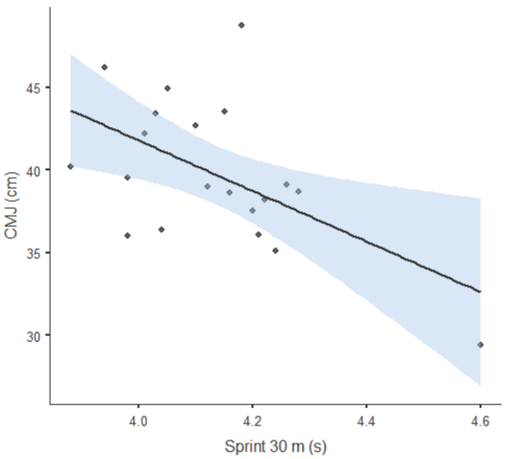

Fig. 7. Correlation CMJ (cm)-Sprint 30 m (s)

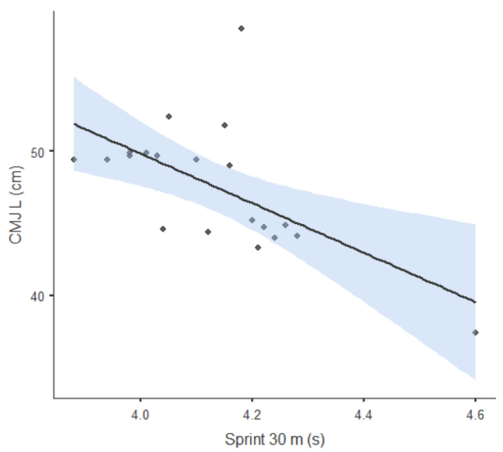

Fig. 8. Correlation CMJ L (cm)-Sprint 30 m (s)

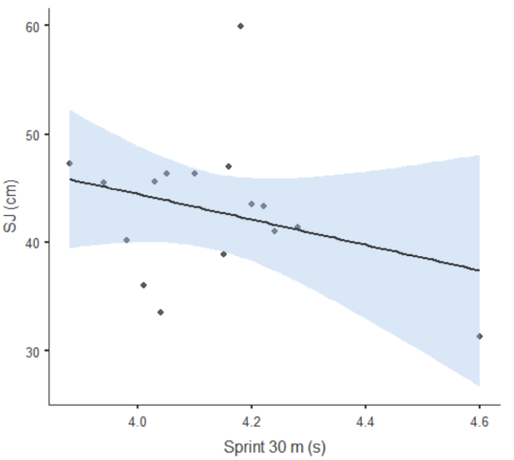

Fig. 9. Correlation SJ (cm)-Sprint 30 m (s)

Discussion

The aim of this study is to investigate the correlation between strength and speed in young adult professional soccer players during pre-season. To date, there is few research in the scientific literature for the age group, but only in adult professional athletes, in which it has been shown that there is a strong correlation between sprint times and muscle strength (8, 11). In adolescent athletes, there is a correlation between the sprint speed of 5, 15, 20 meters and the muscular strength of the lower limbs (7) even if it is evaluated only through bilateral knee extension with leg extension: this is not really specific with respect to the performance model of soccer and also evaluates in an analytical manner the knee extensors and not the strength understood as a global motor component in its various ways of expression. From data analysis, the first two strength tests (CMJ and CMJ L) correlate with all three sprint distances, which would mean there is a correlation between strength and speed, just like in the study of Morris C.G. (12). As for SJ, a correlation can be seen only with the 10 meters sprint distance. The results obtained therefore coincide with those found in the scientific literature in adult athletes (7, 8, 11, 12) and therefore it is possible to state that there is a correlation between strength and speed even in young football players during the pre-season period: this is crucial for practical applications in view of an athletic preparation aimed at the development of general and specific athletic skills.

Practical applications

- Training strength during the off-season could help maintain good levels of sprinting ability ahead of the next pre-season period.
- Training strength at a young age could improve sprinting performance in young athletes.

Limitations

- The examined sample is small.
- The data collected allowed only one evaluation of the correlation between strength and speed at one point in the season: it would be appropriate to evaluate the same phenomenon at other stages of the season and after strength and speed training protocols have been performed.

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