Coaches’ and Players’ Perceptions of Training Dose: Not a Perfect Match

Michel S. Brink, Wouter G.P. Frencken, Geir Jordet, and Koen A.P.M. Lemmink

Purpose: The aim of the current study was to investigate and compare coaches’ and players’ perceptions of training dose for a full competitive season. Methods: Session rating of perceived exertion (RPE), duration, and training load (session RPE × duration) of 33 professional soccer players (height 178.2 ± 6.6 cm, weight 70.5 ± 6.4 kg, percentage body fat 12.2 ± 1.6) from an under-19 and under-17 (U17) squad were compared with the planned periodization of their professional coaches. Before training, coaches filled in the session rating of intended exertion (RIE) and duration (min) for each player. Players rated session RPE and training duration after each training session. Results: Players perceived their intensity and training load (2446 sessions in total) as significantly harder than what was intended by their coaches (P < .0001). The correlations between coaches’ and players’ intensity (r = .24), duration (r = .49), and load (r = .41) were weak (P < .0001). Furthermore, for coach-intended easy and intermediate training days, players reported higher intensity and training load (P < .0001). For hard days as intended by the coach, players reported lower intensity, duration, and training load (P < .0001). Finally, first-year players from the U17 squad perceived training sessions as harder than second-year players (P < .0001). Conclusion: The results indicate that young elite soccer players perceive training as harder than what was intended by the coach. These differences could lead to maladaptation to training. Monitoring of the planned and perceived training load of coaches and players may optimize performance and prevent players from overtraining.

Keywords: periodization, session RPE, training load, overtraining, football

In European soccer, a dense schedule of play with at least 1 match a week characterizes the competitive season. Between these matches, coaches carefully plan their training to prepare individual players for each game. In elite youth academies, this periodization of training is even more complex, as long-term development of junior players is required across the seasons. Usually, a progressive buildup of training dose is applied over the different age categories.

When compiling an annual cycle, coaches apply the concept of periodization, which is based on the interaction between load and recovery. This model assumes that when a training load exceeds the capacity of the player, performance will initially decrease. After sufficient recovery, the capacity of the player increases beyond the baseline level. This effect is known as supercompensation and considered the building block of training periodization.

When this cycle is repeated periodically for the various capacities that are required, it is assumed that players develop over time. If, however, a training stimulus fails to exceed the capacity of a player, performance will not increase. This is known as undertraining and eventually results in deconditioning. Overtraining, on the other hand, occurs if too much training is followed by too little recovery. In this situation players are more likely to become injured or get ill. Furthermore, overtraining may result in a state of nonfunctional overreaching, resulting in stagnation or decrease of performance combined with symptoms such as fatigue, a disturbed mood, and altered eating and sleeping patterns.

To adequately perturb a player’s homeostasis, coaches plan to apply training loads that exceed the individual capacity of a player. Through adjusting intensity and duration, coaches vary the training doses. This can be done between workouts within a week (microcycle), between weekly blocks (mesocycle), and from year to year (macrocycle). To improve performance in team sports like soccer, elite youth coaches usually start the preseason with sport-specific endurance and speed training. This phase may last 6 to 8 weeks and can be seen as the foundation of physical fitness. Thereafter, focus of training shifts toward technical and tactical skills during the competitive season. This phase lasts around 8 months.
and ends with a postseason break. It is important to realize that after this break, some of the youth-academy players transfer to a higher age category. As the training load progressively builds up across age categories, these players are often exposed to a sudden increase in training load after the postseason break.

Within a training program, one can distinguish external load from internal load. The external load is known as the load prescribed by the coach. The internal training load is known as the actual training load imposed on a player and depends on individual characteristics such as age, body composition, and physical fitness. In addition, it is assumed that psychosocial factors such as an exam at school also affect the internal training load. In team sports it may even be more difficult for coaches to be aware of the internal load of all individual players, as many of the exercises are completed in groups. In addition, since each player has different internal characteristics, individuals respond differently to the same training. As a consequence, players are likely to undertrain or overtrain.

So far, the relation between planned and perceived training load has not been widely investigated. Stewart and Hopkins studied 1 training session in swimming athletes and confirmed that athletes perceived their training sessions as harder than what was intended by the coach. Their main finding was that on hard training days the athletes’ intensity was lower than prescribed by coaches and on recovery days the opposite occurred. Therefore, they concluded that there are significant differences between the external and internal load, which could lead to maladaptation to training athletes. Finally, Wallace et al observed the agreement between planned and perceived training dose of a coach and elite swimmers. They confirmed that athletes perceived their training sessions as harder than what was intended by the coach.

In team sports like soccer, information about the association between external and internal load is lacking. In addition, there is a need for studies that examine perception of training doses across longer time periods that include different types of training cycles. Therefore, the aim of the current study was to investigate and compare perceptions of the same training doses in coaches and players for a full competitive season. Because differences in external and internal load exist in individual sports, it is hypothesized that it would be even more pronounced in team sports. In addition, we hypothesized that first-year players would perceive training as harder than intended compared with second-year players due to the physical differences and the sudden increase in training dose between age categories.

**Methods**

**Subjects**

Sixteen under-19 (U-19) players and seventeen under-17 (U-17) elite-standard soccer players playing at the highest level in the Netherlands participated. For each team, 1 professional coach was responsible for the training program. The 2 coaches had numerous years of experience at the highest level and possessed a UEFA A and PRO license, respectively.

The characteristics of the U-19 players and the U-17 players were mean ± SD height 178.3 ± 7.1 and 174.5 ± 7.9 cm, weight 71.1 ± 8.6 and 61.7 ± 6.5 kg, and percentage body fat 8.9 ± 2.0 and 7.8 ± 1.8, respectively. They received a training program with aerobic, speed, agility, technical, and tactical aspects. Both teams competed in the Dutch premier league. The study was approved by the Dutch Central Committee on Research Involving Human Subjects. Written informed consent was obtained from the subjects and both of each subjects’ parents.

**Experimental Protocol**

Before each training, coaches filled in the session rating of intended exertion (RIE) on a scale from 6 (no exertion) to 20 (extreme exertion) for all individual players, as well as the planned duration (min) of the training. This concerned all training activities, from the beginning of the warm-up till the end of the training session. After each training, players evaluated their own training by a session rating of perceived exertion (RPE) together with training duration. It is known that this perception of effort is affected by a combination of external and internal factors such as the distance covered and heart rate. Subjects were asked to rate their perceived exertion after approximately 30 minutes, to prevent exercises at the end of the training being dominant in the player’s ratings. Both coaches and players were given verbal and written description of the procedures and were supervised on a weekly basis across the season.

**Data Analyses**

Means and standard deviations were calculated for intensity, duration, and training load (intensity × duration) for both coaches and players. Pearson correlation coefficients were calculated to assess the association between coaches’ and players’ perception of training dose. In addition, training sessions were divided into those intended by the coaches to be fairly easy (session RIE <13), intermediate (session RIE 13–14), and hard (session RIE >14). This distribution was based on the anchors of the scale. They were then compared between the coaches’ and players’
perceptions of intensity, duration, and training load by using 2-way ANOVA. Finally, first- and second-year players of an age category, both for the entire group and for the U-19 compared with U-17, were analyzed. Bonferroni-corrected pairwise comparisons were used for post hoc analysis if there was a significant main effect of intensity level or interaction effect. Statistical analyses were performed using SPSS 18.0. *P* values lower than .05 were considered statistically significant.

**Results**

Data from 2446 training sessions were collected from both coaches and players. Average intensity, duration, and training load as prescribed by coaches were 13.6 ± 1.59, 67.6 ± 11.41 (min), and 923 ± 207 (arbitrary units [AU]), respectively. Average intensity, duration, and training load scored by the players were 14.0 ± 1.72, 67.3 ± 10.94 (min), and 944 ± 204 (AU). Coaches’ perception of intensity (*F*<sub>1,4886</sub> = 205.21) and load (*F*<sub>1,4886</sub> = 35.16) were significantly lower than that of the players (*P* < .0001). No differences were found for duration. As presented in Figure 1, there were weak correlations (*P* < .0001) between coaches’ and players’ estimates of intensity (*ρ* = .24), duration (*ρ* = .49), and training load (*ρ* = .41).

**Intended Intensity Levels**

When comparing the 3 intensity levels as intended by the coach and experienced by the players, results revealed significant (*P* < .0001) interaction effects for intensity (*F*<sub>2,4886</sub> = 395.68), duration (*F*<sub>2,4886</sub> = 7.70), and training load (*F*<sub>1,4886</sub> = 133.87). Post hoc analysis showed that the intensity (Figure 2) of training sessions intended to be easy (11.3 ± 1.1 vs 13.3 ± 1.0) and intermediate (13.4 ± 0.5 vs 13.9 ± 1.6) were perceived as significantly harder by players (*P* < .0001). In contrast, sessions that were intended be hard were perceived as significantly less intense by the players (15.3 ± 1.1 vs 14.4 ± 1.7).

In the case of training duration (Figure 2), no differences were found for sessions that were intended to be easy (65.6 ± 10.1 vs 66.0 ± 10.5) and intermediate (65.8 ± 10.6 vs 66.4 ± 10.2). Sessions that were intended to be hard (71.4 ± 12.3 vs 69.2 ± 12.5) were significantly shorter (*P* < .0001). Finally, training load (Figure 2) was significantly higher than intended by coaches for easy (743 ± 130 vs 884 ± 182 AU) and intermediate (885 ± 147 vs 927 ± 185 AU) sessions. For sessions that were intended to be hard, training load was significantly lower (1091 ± 194 vs 1004 ± 265 AU).

**First- and Second-Year Players**

When comparing the first- and second-year players of the U-19 and U-17 squad separately, a significant interaction effect (coach or player × first or second year) appeared in the U17 squad for intensity (*F*<sub>1,1970</sub> = 8.33, *P* = .004) and duration (*F*<sub>1,1970</sub> = 5.25, *P* = .02). More specifically, first-year players perceived the intensity of training sessions as significantly harder (Figure 3) than the coach had intended (13.3 ± 1.6 vs 13.7 ± 1.6). No differences were found in second-year players. For duration, first-year players reported significantly shorter duration of training than their coach (71.1 ± 9.8 vs 66.7 ± 9.0). Although less pronounced, second-year players also reported shorter training duration (70.6 ± 9.8 vs 66.7 ± 9.0).
Figure 2 — Comparison of intensity, duration and load between coaches and players for easy, intermediate and hard training sessions. Abbreviations: S-RIE, session rating of intended exertion; S-RPE, session rating of perceived exertion; AU, arbitrary units. *P < .0001.

Figure 3 — Comparison of intensity, duration, and training load between coaches, first and second-year players. Abbreviations: S-RIE, session rating of intended exertion; S-RPE, session rating of perceived exertion; AU, arbitrary units. *P < .0001.

Discussion

The aim of the current study was to investigate and compare perceptions of training dose between soccer coaches and players. In general, players perceived sessions as harder than what was intended by coaches, with weak correlations on intensity, duration, and training load. Moreover, for coach-intended easy and intermediate sessions, players reported a significantly higher intensity and training load. For intended hard days, players reported lower intensity, duration, and training load. Finally, first-year players from the U17 squad perceived training sessions as more intense than second-year players did.

In line with our hypothesis, the agreement between coaches’ and players’ perception of training dose in a team sport like soccer appeared to be weaker than in individual
sions into numbers. Indeed, Impellizzeri et al.\textsuperscript{23} showed that individuals may find it difficult to translate their perceptions in a shorter training duration than initially planned. During training force players to quit training early, resulting in a shorter training duration than initially planned. When looking at the distinction between the 3 intensity levels intended by the coaches, even more pronounced results were found compared with Foster et al.\textsuperscript{16} and Wallace et al.\textsuperscript{17} Not only were the easy sessions as perceived harder, but so, too, were the sessions that were planned to be of intermediate intensity. The fact that soccer is a team sport and players are selected for matches by their coaches every week may partially explain this phenomenon. To convince the coach, players may feel the need to perform maximally to show their superior qualities compared with teammates. On the other hand, training sessions intended by the coaches to be hard were perceived as less intense and were reported as being shorter. Players may refrain from heavy exercise when sessions become too hard and they are able to hide during group exercises. Another explanation is that the content of the training program is not suitable to impose a high intensity and coaches actually oversupervise these sessions.

From a theoretical standpoint both findings have a significant effect on the outcome of training.\textsuperscript{6} As previously discussed, performance is expected to improve when training load and recovery alternate. However, when players train harder during planned easy and intermediate sessions they may not recover and fully adapt to a previous training stimuli. In contrast, if players do not perform maximally on intended hard days the training stimuli may not be sufficient to disturb their homeostasis adequately. The result of such a pattern is a highly monotonous training program, which is known to increase the risk of overtraining, injuries, and illness.\textsuperscript{10,15}

Finally, first-year players from the U17 squad experienced their trainings as heavier than intended by their coach compared with the second-year teammates. Thus, it seems that the transfer from the U-15 team to the U-17 team is considered harder than the transfer from U-17 to U-19. This difference may be explained by the large physical differences between the age categories as a result of the growth spurt together with a marked increase in training doses.\textsuperscript{15} This finding can be useful in the debate about whether to separate first-year players from second-year players within youth academies to prevent them from systematically overtraining.

**Practical Applications**

Monitoring coaches’ and players’ perception of training dose provides insight into emerging discrepancies. If necessary, heart-rate monitors can help young players match their perceptions with the intensity of their training.\textsuperscript{28} In this way, inconsistencies between coaches and players can be discovered and solved early on, possibly improving performance and preventing injuries and illness. This should be evaluated periodically, for instance, by using a performance test battery and a careful monitoring of medical problems. Furthermore, it is essential to inform young players on the principles of periodization. If players are aware of the necessity to alternate high training loads with sufficient recovery they will possibly better understand why sessions intended to be easy must not be experienced as hard and vice versa. Especially in elite youth programs, the long-term development of players outweighs short-term success.

**Conclusions**

The results show poor agreement between coaches’ and players’ perceptions of training dose. Furthermore, for coach-intended easy and intermediate sessions, players reported higher training intensity and training load. For intended hard days, players reported lower intensity, duration, and training load. Finally, first-year players from the U17 squad perceived training sessions as more intense compared with second-year players. These differences could cause maladaptation to training. Monitoring the planned and perceived training load may optimize performance and prevent young elite soccer players from overtraining.

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