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Which Assessment of Coach-Created Motivational Climate Better Predicts Young Athletes' Engagement over a Season? Athletes' Perceptions and Match Observations Do

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Abstract: This work examines athletes' and coaches' perceptions and observed behavior in training and matches of the motivational climate created by the coach over the course of a season and whether these sources of information can inform the engagement of young basketball and volleyball players. A longitudinal design and multilevel mixed-effects linear regression models were conducted. Adolescents (n = 517) of both genders (61.1% male, 38.9% female) aged between 12 and 20 years (M = 16.01; SD = 1.85) playing in the A division of the basketball (46.4%) and volleyball (53.6%) federation of Buenos Aires (Argentina) participated in the study. In addition, 48 coaches (83% male, 17% female; M age = 33.98; SD = 8.39) from these teams participated. The coaches were videotaped during the training sessions in the three waves of measurements. Observers used the Multidimensional Motivational Climate Observational System. Athletes and coaches completed a socio-demographic questionnaire, and the Empowering and Disempowering Motivational Climate Questionnaire-Coach. Athletes also completed the Athlete Engagement Questionnaire. Differences were found between perspectives and, in general, a decrease in variables characterizing empowering climates and an increase in those characterizing disempowering climates were observed over the course of the season. When all measures are considered together and the effect of time is controlled for, the assessments that predict engagement are athlete perceptions and match observations.

Keywords: motivational climate; coaches; engagement; youth sport; mixed methods

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1. Introduction

Having good health and well-being, high-quality education, and equal access to resources and working possibilities, among others, are considered crucial goals for sustainable development. During childhood and adolescence, sports and physical activity programs are recognized as valuable assets for developing essential life skills in young people, such as commitment to learning, positive values, and social skills [1]. In that sense, identifying the best ways to predict children and adolescents' engagement in sports could lead to better achievement of these sustainable development goals.

Engagement is a positive experience that an athlete can develop through practice. It is defined as a persistent and positive cognitive-affective process characterized by the belief in one's ability to achieve a level of performance and attain goals (confidence); the desire to invest effort and time in achieving goals important to one (dedication); physical, mental, and emotional energy or liveliness (vigor); and the feeling of enjoyment in the sports activity (enthusiasm) [2,3]. Moreover, engagement has been conceptualized as a persistent experience with core dimensions that involves a long period of sport participation rather than a state [2]. It has been shown that athletes engaged in their activity increase their chances of experiencing other favorable experiences for their development, such as positive affect [4], satisfaction with training performance [5], and flow [6]. Furthermore, concerning other indicators of positive development, it has been found that when adolescent athletes are engaged, they exhibit greater enjoyment [7] and lower levels of alcohol consumption [8]. As such, it is important that young athletes develop this experience that will help them to have a positive experience and thus benefit from their participation in sports.

The social environment has a central importance in the quality of sports experiences, through the role played by significant others. In the sport context, and specifically in youth sports, coaches are the most relevant social agents in the experience of these young athletes, along with mothers, fathers, and peers to a lesser extent (e.g., [9–11]). Therefore, it is considered that sport can only be a positive developmental context to the extent that the adults who lead and structure their environment create the conditions for this to happen. In recent years, a large body of research has shown that the motivational climate created by coaches in their sports teams has an impact on several important variables for the quality of athletes' experiences and development, such as well-being and performance [11–13]: specifically, an autonomy-supportive environment that fosters young athletes' competence and relatedness promotes greater engagement in sports practice [5,14,15].

Most research focused on the social environment of sport has been guided by two contemporary theories of motivation: self-determination theory (SDT) [16] and achievement goal theory (AGT) [17,18]. SDT's interpersonal styles (i.e., autonomy-supportive vs. controlling styles) and AGT's motivational climates (i.e., task-involving vs. ego-involving climates) are constructs that operationalize what coaches do and say, how they say it, how they encourage athletes to learn, and how they structure training and competitions. According to AGT, when a coach adopts a task-involving climate, the emphasis is on personal mastery, effort, and/or athlete improvement. In contrast, the ego-involving climate is characterized by the fact that rivalry among team members is encouraged, mistakes are punished, and the coach offers differentiated treatment based on the ability level of his/her athletes. Focusing on SDT suggestions, when the coach adopts an autonomy-supportive style, a rationale is provided when athletes are asked to do something, athletes' preferences are taken into account, and meaningful choices and options are offered [19]. In contrast, a controlling interpersonal style is characterized by coercing, pressuring, and intimidating athletes [20].

Both coaches' interpersonal styles and motivational climate have been assessed from different sources of information: athletes' and coaches' perceptions, and direct observation of coaches in training and competition contexts. In several studies, results have shown consistent discrepancies: between athletes' and coaches' perceptions [21–23], between exercisers' and fitness trainers' [24], between students' perceptions and physical education instructors' observations [25], between athletes' and coaches' perceptions and observation of a training session [26,27], and between training and match observation [28]. Such studies have included findings of a moderate positive, weak, or non-significant correlation at all between observed, and players' and coaches' perceptions of the motivational climates. However, these studies examined neither the correlations nor the differences over the course of a season in assessments of motivational climate or coaching behavior. Divergences in these sources of information rating motivational climate have negative repercussions for players, contributing to their discomfort and ultimately, to their dropping out of the team, and possibly, from the sport altogether [21,23].

Several studies examining the coach's environment drawing from an AGT or SDT perspective based on athletes' self-reported perceptions of the environment revealed an overall decline in indicators of optimal environmental conditions and functioning as the season progressed. In football, players perceived their coaches as providing less autonomy support over the course of the season [29,30] as well as in vocational dancers [31]. Moreover, youth and semi-professional football and ice-hockey players perceived that the task-involving climate decreased and the ego-involving climate increased at the end of the season [32–34]. Furthermore, in these studies, practitioners reported a decrease in psychological needs satisfaction, group cohesion, self-esteem, and contingent self-worth, and an increase in burnout and intention to drop out during the season. Although these studies emphasize the impact of the perceived motivational environment on athletes' experiences, they have not considered all perspectives of the motivational climate created by the coach as a whole and over the course of a season, nor their contribution to the prediction of young athletes' engagement. Møllerløkken et al. [22] argued that a possible reason for the lack of studies considering other perspectives such as that of coaches may be the caution of researchers against bias in coaches' responses, as they are aware of their players' desired motivational climate and how their behavior may negatively influence them. This awareness might prepare coaches to underestimate their (usually more performance-oriented) approach and instead show that their behavior toward their athletes is typified by the more socially desirable mastery-oriented climate [22]. However, Smith et al. [27] showed that the inclusion of athlete, coach, and observer reports of motivational climate predicting grassroots football players' autonomous motivation demonstrated a significant improvement in model fit compared to when only players' self-reports were included. Consequently, they suggest the inclusion of environmental assessments from the perspective of athletes, coaches, and observers.

A decade ago, Duda [35] proposed a hierarchical conceptualization of the coach-created motivational climate that integrates the environmental dimensions emphasized within SDT and AGT, stating that the empowering climate is one in which the coach is task-involved, autonomy-supportive, and offers social support (relatedness), while the disempowering climate includes the dimensions of ego-involving and controlling style. Duda [35] argues that the empowering climate optimizes the what, why, and how of athletes' sport participation.

Considering objective measures of the motivational climate, the use of the Multidimensional Motivational Climate Observation System (MMCOS) [36] allows for a more situational measure of the coach's environment (i.e., a one-off training or match is assessed) than that obtained through the use of self-report measures, such as questionnaires (e.g., Sport Climate Questionnaire, Controlling Coach Behaviors Scale, or Empowering and Disempowering Motivational Climate Questionnaire-Coach) that are referenced at a more contextual level (i.e., over the past 3–4 weeks).

Therefore, the use of observational measures of coach-created motivational climates in training and matches, as well as the assessment of changes throughout the season, would provide more information on how athletes construct their perceptions of the environment, as well as the relative contribution of the two contexts to those perceptions that impact the quality of sports experiences [28]. This multi-method approach, which collects parallel data from coaches and athletes as well as independent observers, should provide a more comprehensive assessment of the environment. Additionally, it can help identify where there is a shared understanding (between athletes, coaches, and observers) and more or less accurate perspectives of the prevailing motivational environment and be used to make decisions about where to focus future intervention efforts (i.e., whether to target the coach and/or the athlete) [28,37,38].

The Present Study

Consequently, this study aims to examine athletes' and coaches' perceptions and observed training and competition behavior regarding the motivational climate created by

the coach over the course of a season and whether these sources of information can report on the engagement of young basketball and volleyball players. Based on previous research, it is first hypothesized that weak or non-significant relationships will be found between the sources of information on the motivational climate created by the coach [21–28]. Secondly, it is expected to find a decrease in the variables that characterize empowering climates and an increase in those that characterize disempowering climates over the course of the season [29–34]. Finally, it is hypothesized that athletes' perceptions of the motivational climate would be the best predictor of engagement over the season, but the inclusion of coaches and observation in training sessions could provide an improvement in model fit [27,28]. Regarding match measures, their relationship with engagement in adolescent athletes has not been hypothesized. As stated in the longitudinal study by Fabra et al. [32], this type of work is of great importance because it not only provides theoretical knowledge about the psychosocial processes that favor sports practice but also contributes to the design of practical interventions to change motivational styles with the intention of improving engagement in the sports activity.

2. Materials and Methods

2.1. Participants

A convenience sample of adolescents (n = 517) of both genders (61.1% male, 38.9% female) aged between 12 and 20 years (M = 16.01; SD = 1.85) belonging to clubs participating in the A division in the u15, u17, and u19 categories of the basketball (46.4%) and volleyball (53.6%) sports federations of Buenos Aires (Argentina) participated in the study. The average number of years practicing the sport was 6.27 (SD = 3.29), the days of practice per week was 3.48 (SD = 1.07) and the average duration of the sessions was 2.42 (SD = 0.95). Of the total sample, 8.3% (n = 39) participated in the national team of their sport. The inclusion criteria were to be federated in the aforementioned categories and to have given written informed consent to participate in the research.

The 48 coaches (83% male, 17% female; M age = 33.98 (8.39)) of these teams also participated. Regarding coaching experience, 58.3% had more than 10 years of experience, 31.3% between 6 and 10 years, and 10.4% up to 5 years. Regarding the academic level, 45.8% had completed a non-university higher education, 27.1% were still in university studies, and 16.7% had completed university studies. All the coaches had practiced their sport and 43.8% were currently practicing their sport. Almost all the coaches (97.9%) had completed the qualification course granted by their respective sports federations. A total of 70.8% worked as part-time coaches (i.e., they had another job in addition to coaching).

No official data have been found on the number of participants playing in Argentine sports federations. Nevertheless, volleyball and basketball are among the five most practiced sports by the general population in Argentina [39]. In Buenos Aires (the most populated city in the country), 36.42% of clubs offer volleyball as an activity and 25.83% offer basketball [40]. Moreover, both sports are included in the physical education curriculum in high school [41], showing the importance of these sports for adolescents in this context.

2.2. Measures

Socio-demographic characteristics. Athletes completed an ad hoc questionnaire to assess gender, age, sport category (u15, u17, or u19), years, and hours per week of sport practice. Coaches completed a questionnaire to assess gender, years of coaching, academic level, and hours dedicated to coaching (part-time or full-time).

Perceptions of motivational climate. The Empowering and Disempowering Motivational Climate Questionnaire-Coach for the athletes' (EDMCQ-C) [42] and coaches' (EDMCQ) [43] perceptions in its Argentine version [44] were used. Using 19 items and a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), both scales assess the three dimensions of the empowering climate perceived by the athlete and by the coaches themselves: autonomy support (three items), task-involving (six items), and social support (two items); and the two dimensions of the disempowering climate: controlling style (three

items) and ego-involving (five items). In the coaches' version, the items are adapted to assess the coaches' self-perception regarding the climates created in their teams. It consists of the same items and dimensions as the version for athletes, written in the first person. The fit indicators obtained in this study were CFI = 1.00; NNFI = 1.02; RMSEA = 0.01; SRMR = 0.05 for the athletes' version and CFI = 1.00; NNFI = 1.02; RMSEA = 0.01; SRMR = 0.07 for the coaches' version. The internal consistency values (Cronbach's alpha) for each variable are presented in Table 1.

Table 1. Means, standard deviations, and reliabilities values for study variables.

		Time 1			Time 2			Time 3		
		M	***SD***	**R**	***M***	***SD***	**R**	***M***	***SD***	**R**
Athlete	Engagement	4.21	0.49	0.88	4.08	0.56	0.91	3.97	0.63	0.93
	Autonomy support	4.24	0.56	0.54	4.07	0.66	0.60	4.06	0.71	0.71
	Task-involving	4.24	0.53	0.73	4.14	0.62	0.82	4.04	0.63	0.83
	Relatedness support	4.27	0.70	0.57	4.05	0.85	0.74	4.05	0.81	0.69
	Controlling style	2.33	0.75	0.55	2.54	0.78	0.53	2.61	0.78	0.58
	Ego-involving	2.83	0.77	0.71	3.10	0.79	0.70	3.18	0.76	0.70
Coach	Autonomy support	4.67	0.34	0.51	4.51	0.42	0.60	4.56	0.36	0.57
	Task-involving	4.49	0.40	0.69	4.53	0.40	0.80	4.45	0.47	0.78
	Relatedness support	4.62	0.50	0.68	4.70	0.41	0.55	4.43	0.47	0.37
	Controlling style	2.00	0.76	0.48	2.06	0.75	0.69	2.31	0.86	0.72
	Ego-involving	2.68	0.78	0.75	2.79	0.92	0.87	2.88	0.75	0.78
Training observation	Autonomy support	2.79	0.77	0.64	2.50	0.73	0.58	2.57	0.80	0.69
	Task-involving	2.98	0.76	0.59	2.86	0.76	0.63	2.70	0.93	0.60
	Relatedness support	2.64	0.74	0.62	2.48	0.87	0.68	2.52	0.73	0.67
	Controlling style	2.04	1.01	0.82	1.92	1.03	0.78	1.73	0.86	0.81
	Ego-involving	1.75	0.68	0.71	1.57	0.43	0.59	1.62	0.54	0.66
	Relatedness thwarting	0.89	0.67	0.76	0.77	0.63	0.79	0.79	0.68	0.82
	Structure	2.37	0.51	0.66	2.26	0.52	0.71	2.26	0.47	0.59
Match observation	Autonomy support	2.05	0.66	0.67	2.03	0.75	0.80	1.90	0.62	0.65
	Task-involving	2.50	0.73	0.73	2.43	0.85	0.71	2.36	0.71	0.69
	Relatedness support	2.44	0.78	0.77	2.37	0.80	0.80	2.29	0.72	0.74
	Controlling style	1.64	0.51	0.70	1.70	0.49	0.63	1.70	0.63	0.53
	Ego-involving	1.66	0.69	0.67	1.76	0.57	0.70	1.65	0.55	0.49
	Relatedness thwarting	0.61	0.49	0.74	0.80	0.45	0.79	0.68	0.46	0.68
	Structure	1.76	0.54	0.79	1.79	0.58	0.78	1.94	0.52	0.77

Note. R = reliability values for athletes' and coaches' perceptions indicate Cronbach's alphas and for observations, two-way random intraclass correlation coefficients. As self-report measures were assessed on a 5-point scale and observation ratings were conducted on a scale from 0 to 3, a linear transformation of observers' ratings was performed to obtain comparable scores.

Observed motivational climate. Coaches were videotaped during training sessions and matches, and two independent observers used the Multidimensional Motivational Climate Observational System (MMCOS) [36,45] and rated the degree to which the coaching climate in training sessions and competitions was autonomy-supportive, controlling, task-involving, ego-involving, relatedness-supportive, relatedness-thwarting and structure. For training sessions, videos were split into four equal time periods, and coaches were rated according to the 32 lower-order behavioral strategies, the potency of the seven environmental dimensions, and overall based on the two higher-order factors (i.e., empowering and disempowering). For matches, game periods were used: quarters in basketball and sets in volleyball. Coders were recruited to score the collected training and match recordings. All coders were psychologists with knowledge of SDT and AGT and had a good knowledge of sports. To ensure a baseline level of understanding, all coders were given a coder-training package following the same procedure described by Smith et al. [36]. When performing the

assessments, two coders worked independently following a scoring scheme and coding sheet [36]. Previous research has supported the validity and reliability of the MMCOS in a team sport setting [27,36,45]. As in Smith et al. [27], two-way randomized intraclass correlation coefficients were used to determine the reliability of each environment dimension for training sessions and matches. Based on the cutoff points proposed by Fleiss [46], the seven environment dimensions and the overall empowering and disempowering global scores were coded with fair to good reliability for training sessions and matches (see Table 1). As inter-rater reliability was satisfactory, rater scores were averaged into an overall score for each environment dimension.

Athlete engagement. Athletes completed the Argentine version [47] of the Athlete Engagement Questionnaire (AEQ) [3]. It assesses the four dimensions of engagement (confidence, dedication, vigor, and enthusiasm) and a total engagement score using 16 items on a five-point Likert scale (1 = almost never to 5 = almost always). The scale presents validity and reliability indicators adequate for its use with the study population (i.e., young Argentine athletes). The fit indicators obtained in this study were CFI = 0.98; NNFI = 0.98; RMSEA = 0.02; SRMR = 0.05. In the present study, the total engagement score was used, with excellent internal consistency values (see Table 1).

2.3. Procedure

Prior to starting the research, approval was obtained from the Ethical Committee (Faculty of Psychology, University of Buenos Aires, Ref.: UBA-01.08.2017). This research was conducted in accordance with international ethical standards, which are consistent with the guidelines of the American Psychological Association (APA) and the Declaration of Helsinki.

Since this was a longitudinal design, the measures were collected at three points in time: the beginning, middle, and end of a sports season. Once consent was obtained from the club leaders, coaches and players included in the study's target sample were invited to participate, emphasizing that participation was voluntary and confidential and that only those responsible for the research would have access to this information. Written consent was obtained from parents of athletes under 18 years of age. The Time 1 (beginning of the season) questionnaire pack was administered when approximately the first month of the season had elapsed so that the players had enough time to form their opinions on the climate created by their coaches. The questionnaires were completed before or after training sessions at the different clubs in a space set aside for this purpose. The time required to answer the battery of questions was approximately 20 min. During the administration of the questionnaires, a group of assistant researchers was always present to provide information on how to fill out the questionnaires and to resolve any doubts that might arise during the process.

For the observational measures, all coaches signed the consent form, and they were videotaped during the training sessions and matches in the three waves of measures. The researchers were placed in an unobtrusive position at the side of the playing field. The coach could continue undisturbed until the end of the training session or match, or until all players had left the area. The coach was recorded with a digital video camera, a voice recorder, and a lapel microphone.

2.4. Data Analysis

Firstly, multilevel mixed-effects linear regression (MLM) models were conducted to examine changes in motivational climate dimensions for each perspective over the season. For each climate dimension, regression models were tested with time and perspective as predictors and in each case, the random effects of the athlete (repeated measures) and team (nesting variable) were analyzed.

Secondly, MLM models were performed to assess the predictive power of athletes' and coaches' perception of the coach-created motivational climate and observed climate in training and matches on athletes' engagement. The multilevel mixed-effects approach

was chosen due to the clustered nature of the motivational climate data (i.e., players' scores of motivational climate during three waves of measurement; one coach reporting on the team, and to account for correlation of players within the teams). Each model included the player, time, and team as random effects. Multiple models were fitted with the empowering (i.e., task-involving, autonomy support, relatedness support) and disempowering (ego-involving, controlling style, relatedness thwarting—only in observation ratings) climate variables from each of the perspectives (i.e., players, coach, training, and match) as independent and the engagement variable as dependent. We computed intraclass correlations using the random intercept model without predictors. For each model, the intraclass correlations were sufficiently large (i.e., ICC > 0.05) [48], indicating that the data were clustered and MLM analysis was appropriate. To evaluate the model fit for MLMs, different model fit information criteria were used: −2 log likelihood (−2LL), Akaike's information criterion (AIC), the Schwarz Bayesian information criterion (BIC), and R^2 [49]. In the model selection, lower values on information criteria are equivalent to a better model fit [48]. All analyses were conducted with R (v. 4.1.2).

3. Results

3.1. Descriptive Statistics, Internal Reliability, and Time and Perspective Differences

The means, standard deviations, and internal consistencies for all study variables are presented in Table 1. With respect to data normality, skewness values between −0.79 and 0.88 and kurtosis values between −1.28 and 1.10 were obtained. Regarding means, in general, athletes reported scores above the midpoint of the scale in all three waves for engagement, autonomy support, task-involving, and relatedness support, and for ego-involving in Times 2 and 3. Coaches also reported scores for autonomy support, task-involving, and relatedness support that were above the midpoint of the scale, whereas scores from training and matches observation were all below the midpoint of the scale, except for structure subscale in training sessions in all three waves.

All models showed significant interactions between time and perspective: autonomy support (χ^2 (6) = 30.73; $p < 0.001$), task-involving (χ^2 (6) = 22.16; $p < 0.001$), relatedness support (χ^2 (6) = 46.75; $p < 0.001$), controlling style (χ^2 (6) = 126.54; $p < 0.001$), and ego-involving (χ^2 (6) = 112.48; $p < 0.001$). Post hoc comparisons showed significant differences between perspectives in each wave of measure in autonomy support and task-involving climate, and in general differences in all perspectives over the season were found (Table 2). In general, coaches perceived higher scores in autonomy support, task-involving, and relatedness support, followed by athlete, training, and match scores. Regarding disempowering dimensions (i.e., ego-involving and controlling style), athletes reported higher scores.

Table 3 shows the changes in motivational climate dimensions over the season for athletes, coaches, training, and match observation. Overall, autonomy support and relatedness support decrease over the course of the season for all perspectives. In the task-involving climate, only the coach's perspective did not show significant differences, while in the others, the highest scores were reported at T1 and decreased over time. With respect to controlling style, both athletes and coaches perceived an increase over the season. In training sessions, no differences were found between T1 and T2 but the controlling style decreased at T3. In matches, no differences were found over time. Regarding the ego-involving climate, the overall results show an increase over the season except in training sessions, where this dimension decreased from T1 to T2.

All post hoc comparisons for time and perspective in each motivational climate dimension are presented in Figure 1.

Table 2. Differences in motivational climate dimensions between perspectives in the three moments of the season.

	Autonomy Support	Task-Involving	Relatedness Support	Controlling Style	Ego-Involving
Time 1					
Athlete–Coach	−0.43 (0.03) ***	−0.24 (0.04) ***	−0.33 (0.04) ***	0.33 (0.04) ***	0.14 (0.04) *
Athlete–Training	1.44 (0.03) ***	1.25 (0.04) ***	1.64 (0.04) ***	0.29 (0.04) ***	1.07 (0.04) ***
Athlete–Match	2.17 (0.03) ***	1.72 (0.04) ***	1.82 (0.04) ***	0.70 (0.04) ***	1.17 (0.04) ***
Coach–Training	1.87 (0.03) ***	1.50 (0.03) ***	1.98 (0.03) ***	−0.03 (0.04)	0.93 (0.03) ***
Coach–Match	2.61 (0.03) ***	1.97 (0.03) ***	2.16 (0.03) ***	0.37 (0.04) ***	1.03 (0.03) ***
Training–Match	0.73 (0.03) ***	0.46 (0.03) ***	0.17 (0.03) ***	0.40 (0.04) ***	0.10 (0.04)
Time 2					
Athlete–Coach	−0.44 (0.03) ***	−0.38 (0.04) ***	−0.64 (0.04) ***	0.48 (0.04) ***	0.31 (0.04) ***
Athlete–Training	1.55 (0.04) ***	1.28 (0.04) ***	1.55 (0.04) ***	0.63 (0.04) ***	1.54 (0.04) ***
Athlete–Match	2.02 (0.04) ***	1.69 (0.04) ***	1.68 (0.04) ***	0.79 (0.04) ***	1.30 (0.04) ***
Coach–Training	1.99 (0.03) ***	1.66 (0.03) ***	2.20 (0.04) ***	0.14 (0.04) †	1.22 (0.04) ***
Coach–Match	2.46 (0.03) ***	2.07 (0.04) ***	2.33 (0.04) ***	0.30 (0.04) ***	0.98 (0.04) ***
Training–Match	0.46 (0.03) ***	0.40 (0.04) ***	0.12 (0.04)	0.15 (0.04) †	−0.23 (0.04) ***
Time 3					
Athlete–Coach	−0.50 (0.04) ***	−0.42 (0.04) ***	−0.41 (0.04) ***	0.29 (0.04) ***	0.31 (0.04) ***
Athlete–Training	1.47 (0.04) ***	1.33 (0.04) ***	1.49 (0.04) ***	0.87 (0.04) ***	1.56 (0.04) ***
Athlete–Match	2.16 (0.04) ***	1.68 (0.04) ***	1.74 (0.04) ***	0.87 (0.05) ***	1.53 (0.04) ***
Coach–Training	1.97 (0.03) ***	1.75 (0.03) ***	1.90 (0.03) ***	0.57 (0.04) ***	1.25 (0.03) ***
Coach–Match	2.66 (0.03) ***	2.10 (0.04) ***	2.15 (0.04) ***	0.57 (0.04) ***	1.22 (0.04) ***
Training–Match	0.68 (0.03) ***	0.35 (0.04) ***	0.24 (0.04) ***	−0.01 (0.04)	−0.03 (0.04)

* $p < 0.05$, *** $p < 0.001$, † $p < 0.08$.

Table 3. Differences in motivational climate dimensions for each perspective over the season.

	Autonomy Support	Task-Involving	Relatedness Support	Controlling Style	Ego-Involving
			Athletes		
T1–T2	0.17 (0.04) **	0.10 (0.04)	0.23 (0.04) ***	−0.22 (0.04) ***	−0.28 (0.04) ***
T1–T3	0.19 (0.04) **	0.21 (0.04) ***	0.26 (0.04) ***	−0.29 (0.05) ***	−0.37 (0.04) ***
T2–T3	0.02 (0.04)	0.11 (0.04)	0.03 (0.04)	−0.06 (0.04)	−0.09 (0.04)
Coaches					
T1–T2	0.16 (0.03) **	−0.03 (0.03)	−0.07 (0.04)	−0.06 (0.04)	−0.10 (0.03)
T1–T3	0.12 (0.03) †	0.04 (0.03)	0.19 (0.03) ***	−0.33 (0.04) ***	−0.20 (0.03) ***
T2–T3	−0.04 (0.03)	0.07 (0.03)	0.26 (0.03) ***	−0.26 (0.04) ***	−0.09 (0.03)
Training					
T1–T2	0.28 (0.03) ***	0.12 (0.03)	0.14 (0.04) *	0.11 (0.04)	0.19 (0.04) ***
T1–T3	0.21 (0.03) ***	0.28 (0.03) ***	0.11 (0.03)	0.28 (0.04) ***	0.11 (0.04)
T2–T3	−0.06 (0.03)	0.02 (0.04) **	−0.03 (0.04)	0.16 (0.04) *	−0.07 (0.04)
Match					
T1–T2	0.01 (0.03)	0.06 (0.04)	0.09 (0.04)	−0.13 (0.04)	−0.14 (0.04) *
T1–T3	0.17 (0.03) **	0.17 (0.04) **	0.18 (0.04) **	−0.12 (0.04)	−0.01 (0.04)
T2–T3	0.15 (0.04) **	0.10 (0.04)	0.08 (0.04)	0.01 (0.04)	0.13 (0.04)

Note: T = time of measurement * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, † $p < 0.08$.

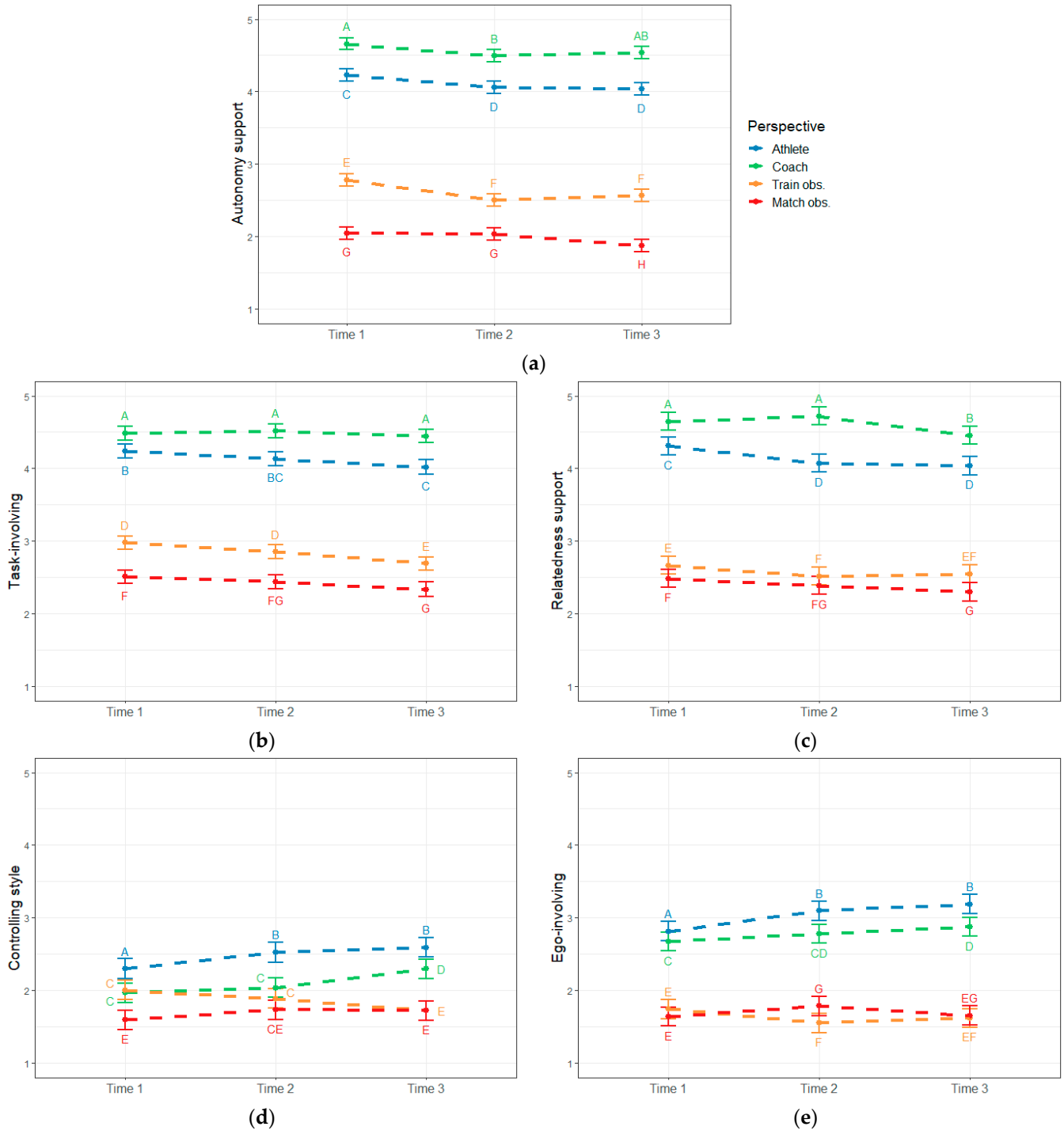

Figure 1. Differences in motivational climate dimensions and confidence intervals as a function of perspectives and time in the season: (**a**) autonomy support; (**b**) task-involving; (**c**) relatedness support; (**d**) controlling style; (**e**) ego-involving. Different letters show significant differences.

3.2. Multilevel Models of Environment Dimensions Predicting Athlete Engagement

Four models (Models 1 to 4) were tested to compare the predictive effects of athletes', coaches', and training and match observers' reports of the motivational environment on athletes' engagement (Table 4). The results showed that athletes' perceptions of task-involving and autonomy support are significant positive predictors. Neither the motivational climate variables reported by coaches nor those observed in training sessions had a significant

effect. However, the task-involving climate observed in matches significantly predicted higher athlete engagement, whereas relatedness support had a negative effect.

Table 4. Multilevel analyses between perspectives of motivational climate and athletes' engagement.

		β (*SE*)				
	Fixed Effects	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Athlete	(Intercept)	4.08 (0.05) ***	4.08 (0.06) ***	4.06 (0.07) ***	4.09 (0.06) ***	2.89 (0.38) ***
	Autonomy support	0.09 (0.02) ***	-	-	-	0.16 (0.03) ***
	Task-involving	0.12 (0.02) ***	-	-	-	0.15 (0.04) ***
	Relatedness support	−0.01 (0.02)	-	-	-	0.00 (0.03)
	Controlling style	−0.01 (0.02)	-	-	-	−0.01 (0.02)
	Ego-involving	0.00 (0.02)	-	-	-	0.00 (0.02)
Coach	Autonomy support	-	−0.00 (0.02)	-	-	−0.09 (0.06)
	Task-involving	-	−0.01 (0.02)	-	-	0.07 (0.06)
	Relatedness support	-	0.01 (0.02)	-	-	0.03 (0.05)
	Controlling style	-	−0.01 (0.02)	-	-	−0.01 (0.03)
	Ego-involving	-	0.04 (0.02)	-	-	0.06 (0.04)
Training observation	Autonomy support	-	-	−0.03 (0.03)	-	−0.05 (0.05)
	Task-involving	-	-	0.01 (0.03)	-	0.00 (0.04)
	Relatedness support	-	-	−0.00 (0.02)	-	0.02 (0.04)
	Controlling style	-	-	0.02 (0.03)	-	0.01 (0.05)
	Ego-involving	-	-	−0.03 (0.02)	-	−0.06 (0.06)
	Relatedness thwarting	-	-	−0.02 (0.03)	-	−0.01 (0.05)
	Structure	-	-	−0.01 (0.02)	-	−0.08 (0.05)
Match observation	Autonomy support	-	-	-	−0.01 (0.03)	−0.02 (0.05)
	Task-involving	-	-	-	0.07 (0.03) *	0.16 (0.05) ***
	Relatedness support	-	-	-	−0.07 (0.02) **	−0.16 (0.05) ***
	Controlling style	-	-	-	-0.02 (0.02)	−0.07 (0.06)
	Ego-involving	-	-	-	-0.04 (0.02)	−0.10 (0.05) †
	Relatedness thwarting	-	-	-	0.02 (0.03)	0.09 (0.06)
	Structure	-	-	-	0.01 (0.02)	0.03 (0.04)
	Random effects					
	Residual	0.18 (0.42)	0.19 (0.44)	0.19 (0.43)	0.19 (0.43)	0.18 (0.42)
	ID Athlete	0.08 (0.28)	0.09 (0.31)	0.10 (0.31)	0.08 (0.29)	0.07 (0.26)
	Time	0.01 (0.07)	0.01 (0.10)	0.01 (0.11)	0.01 (0.08)	0.01 (0.09)
	Team	0.02 (0.13)	0.03 (0.16)	0.02 (0.16)	0.02 (0.15)	0.01 (0.11)
	Overall model test					
	R^2	0.12	0.01	0.01	0.02	0.13
	AIC	1779.00	1983.00	1954.30	1738.90	1670.50
	BIC	1824.90	2028.90	2010.20	1793.80	1814.84
	−2LL	1761.00	1965.00	1932.30	1716.90	1613.00

Note: β = standardized beta; *SE* = standard error; ID = identification; AIC = Akaike's information criterion; BIC = Bayesian information criterion; -2LL = -2 log likelihood. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, † $p < 0.06$.

In Model 5, all perspectives (athletes, coaches, training observation, and match observation) were included as predictors of athlete engagement. This model showed a better fit than the others, calculated by the reductions of criteria in overall model tests. The task-involving and autonomy support athletes' perceptions and the observed match's task-involving and relatedness support remained significant predictors. In addition, the matches' observed ego-involved dimension emerged as a marginal predictor.

4. Discussion

The present study aimed to examine athletes' and coaches' perceptions and observed behavior in training and matches of the motivational climate created by the coach over the course of a season and how these perceptions may explain adolescent basketball and volleyball engagement. These athletes' and coaches' perspectives and the observed ratings in training and matches of the coach-created motivational climate assessed in the present study showed that sport environments tend to be more empowering (i.e., autonomy support, task-involving, and relatedness support) and less disempowering

(i.e., ego-involving and controlling style). This finding is consistent with other studies conducted with youth athletes [27,36,50] and in secondary physical education settings [51] and highlights the importance of coaches in fostering adolescents' motivation and quality of experiences through sports.

Concerning the first hypothesis (i.e., differences between the sources of information on the motivational climate created by the coach), the results showed that coaches perceived more autonomy support, task-involving and relatedness support, and less ego-involving and controlling style than the athletes on their teams. Previous studies show similar results: coaches tend to report more positively on their behaviors than those reported by their teams' players [21–23], and these discrepancies are also shown through the low correlations found between both measures [26,27]. The importance of studying these discrepancies lies in the impact they may have on the athletes' experiences, where it is observed that the most negative impact occurs when the coach held a more favorable perception of the motivational climate compared to the team [21]. Taking the concept of "perceptual agreement", it can be explained that the agreement between the team and the coach allows the latter to implement the motivational climate strategies effectively, producing positive effects on the team members. However, distance or disagreement can occur due to a lack of ability to communicate adequately and effectively with athletes with different needs or preferences, leading to negative outcomes [21]. Coaches may have the best intentions to focus on task-involving and autonomy-supportive climates, but even so, athletes perceive the climate as performance-oriented or controlling perhaps due to unintended behaviors of the former [22]. When coaches believe that their behaviors are more positive than what their athletes perceive, they are likely to put less effort into developing skills to improve their autonomy support, task involvement, or social support strategies. Considering other recent work, it can also be stated that the coach–athlete relationship is enhanced when coaches and athletes have congruent perceptions of efficacy [52], and qualitative work by Solstad et al. [53] suggests that athletes who experience a "shared reality" with their coach are more motivated and report a greater sense of psychological well-being.

Moreover, perceived coach behavior had more potency than observed, showing that although controlling style and ego-involving behaviors are low, so are those that promote motivation and well-being in adolescent athletes. This result is consistent with others using MMCOS in training sessions [27,36,45]. An interesting issue also found in the results of the present study is that the differences are greater when evaluating empowering behaviors, while it was observed that even though significant differences were found, the perceptions of the disempowering motivational climate are more homogeneous throughout the season, especially in the controlling style. This result has been explained by suggesting that individuals may be more aware of negative and punitive feedback and evaluations and, despite knowing the importance of autonomy support and task-involving strategies, coaches use these negative strategies frequently [27].

With respect to changes over the course of the season in all perspectives, our hypothesis was partially supported. A decrease over the course of the season in all perspectives for autonomy and social support was found. This result is in line with previous findings in different settings such as team sports or arts fields (e.g., [31,32,34]) by measuring the coach-created motivational climate from the perspective of athletes. However, only coach perceptions did not show significant differences in task-involving. Task involvement refers to the structure of the environment in which the standards of progress and enhancement are considered, emphasizing the importance of self-improvement. Perhaps coaches believe that this dimension that structures their team's environment and is consistent with their philosophy does not vary throughout the season, while their behaviors and their team's perception of them do.

With respect to controlling style, both athletes and coaches perceived an increase over the season, although no changes were found in the observed measurements. This result may be due to issues related to the instruments used to evaluate the motivational climate. Although in the present work the observational ratings made with the MMCOS

were taken at three points in time (i.e., beginning, middle, and end of the season), they provide a situational assessment referring to the coaches' behavior in a specific training session or match. In other words, the coach and athlete questionnaires refer to a more contextual level (i.e., during the last 3–4 weeks) where there may be multiple interactions between coaches and athletes that affect these perceptions, whereas they are not captured by the situational assessment conducted with the MMCOS [27]. Besides that, beyond the scope of this study, it could be considered that the perceptions of both athletes and coaches themselves are moderated by variables such as personality and causality orientations that objective measures of observed climate cannot assess.

Regarding ego-involving climate, an increase was found in at least one of the measurement waves, except for the training sessions, where this dimension decreased from the beginning to the middle of the season. One possible explanation linked to the aforementioned is that perhaps coaches' controlling and ego-involving behaviors are more visible or self-evaluative than task-involving behaviors and thus coaches (as well as their athletes) perceive that over the course of the season, they become more controlling and use comparison to value success. They may also be more aware of the use of punishments to give feedback and emphasizes mistakes in team performance [27].

The results from the different perspectives for predicting athletes' engagement over the course of the season support our hypothesis showing that athletes' perceptions of the motivational climate were the best predictor of engagement, but the inclusion of coaches' and observer ratings provided a better fit in the models as Smith et al. [27] suggested. This is consistent with the assumptions of cognitive-social approaches to motivation, which posit that the coach's behaviors themselves are relatively less important than how athletes perceive, interpret, and evaluate these actions, as it is all about the subjective experience of the given achievement context [21,50]. Athletes' perceptions of autonomy support and task-involving climate emerged as significant positive predictors of athletes' engagement. This result is consistent with numerous studies showing the importance of these positive environmental dimensions for the quality of sports experiences in adolescents [12,37,54]. In particular, this result sheds light on young participants in two specific sports: volleyball and basketball.

The match observation model was the only one with significant predictors, namely, task-involving and relatedness support. The inclusion of the assessment of the motivational environment created in matches complements the work of Smith et al. [27] assessing the contribution of athlete, coach, and observer perceptions in training on different forms of athlete motivation. Consistent with this study, we found that when coaches were observed to emphasize the importance of effort, improvement, and cooperative work (i.e., were more task-involving), athletes reported greater engagement, as a positive experience that, such as intrinsic motivation, can be associated with self-determined reasons for participation. However, the negative prediction of relatedness support was less conceptually coherent but consistent with some unexpected results from the work of Smith et al. [27]. In this regard, Smith et al. [28] postulate that the analysis of the most frequent strategies might provide more insight into this situation. For example, thinking that the strategy that is part of the relatedness support of "Engages in non-instructional conversation with athletes" during matches may not be functional for athletes' engagement. The Spanish validation of the MMCOS [45] also posits that there are strategies that are not frequently used by coaches. To this end, re-examining the factor structure and predictive utility of the MMCOS and confirming the factor structure in match settings using ratings made at the lower-order strategy level will be informative. If strategies predict athlete responses, their inclusion in the MMCOS would certainly be warranted and could serve as a basis for focusing intervention efforts [28]. Additionally, a question for further research may be the dimensions of the motivational climate created by the coach in specific moments of the matches, such as in time-outs, which only occur in sports such as volleyball and basketball, as well as handball, water polo, or futsal. It has been found that the greatest amount of information is given in these moments of pause, with mainly tactical and psychological

content (encouragement, confidence, etc.) [55,56]. On the other hand, further research on the characteristics of the motivational climate in matches depending on the type of sports discipline (individual vs. team) may also be an interesting line for the future [57].

Finally, for the model considering all perspectives of the coach-created motivational climate, athletes' perceptions of autonomy support and task-involving and match observations for task-involving, relatedness support, and a marginal effect for ego-involving were significant predictors of athlete engagement, controlling for time. In addition, the inclusion of all perspectives demonstrated improved model fit compared to other models. This result is consistent with that of Smith et al. [27] where observed task-involving (in that case in training sessions, in the present study in matches) is the best predictor of positive athlete experience. Moreover, although its prediction was marginal, ego-involving observed in matches had a negative effect. This is also in line with previous studies showing the maladaptive effects of ego-involving climates, such as burnout [58] and sport dropout [32]. In the present work, coaches who display strategies in matches that encourage rivalry within the team, show unequal recognition of athletes according to their ability, and use punishment when mistakes are made, thwart the engagement experience of adolescent athletes.

The present study has taken into account the guidance of Smith et al. [28], examining the extent to which observed reports of training and competition environments predict adolescent athletes' experiences in other sports, such as volleyball and basketball, providing progression to their findings. In this sense, only the match variables, added to the effect of the perceived motivational climate of the athletes, were those that had a predictive power on engagement. In the same line, Morales-Belando et al. [59] showed that over the course of a season, the result of the matches (winning or losing) did not directly affect players' enjoyment and competence but did so through the motivational climate, showing once again the role of social agents for the quality of the sports experience of adolescents in these moments of competition, which are typical and defining of sport.

Several limitations of the present work should be noted. The first is related to some lower reliability values in the perceived and observed variables, especially in the coaches' assessments. These problems have already been highlighted in other validations of all measurements [36,43,44]. To improve observational assessment, coders may benefit from regular refresher sessions to maintain a consistently high level of reliability when coding training and competitive sessions [28]. In addition, we note that measures of relatedness thwarting were not used to compare changes over the season and differences between perceptions because they are only variables in the observed measures and not in the questionnaires used. Nevertheless, they were used for predictive models. Future studies could incorporate the assessment of perceived relatedness thwarting in order to make these comparisons.

A second limitation is related to the sample. The coach sample included only eight female coaches, which did not allow us to compare by coach gender. The low number of female coaches in sports is a general situation in the country where this research was conducted and in many others, specifically in the sports considered in this study [60,61]. Regarding the sample of athletes, it would be interesting for future studies to consider the differential role of gender in the perception of the dimensions of the motivational climate created by the coach that has been addressed in different works (e.g., [15,22,62,63]) but also the interaction with the gender of their coaches (i.e., "gender match"). Although our work considers volleyball and basketball female and male equally, it has been shown that studies focusing on sport—and not exercise—psychology, significantly under-represented female athletes [64].

5. Conclusions and Practical Implications

Participation in a sport provides young people with the opportunity to engage in physical activity which in turn results in a number of positive effects, well documented through extensive research [22]. In addition, team sports have some advantages over individual sports, such as reduced social anxiety over time, social acceptance, and the de-

velopment of more character strengths such as leadership, humility, and teamwork [22,65]. However, it is well known that teachers, coaches, and other social agents in the sports environment (i.e., parents and peers) are essential for adolescents to gain these benefits from sports participation. Likewise, these processes are transferable to other teaching and learning contexts such as physical education or artistic activities. In this sense, the aim is to provide tools that contribute to facing the current challenges to achieve education for sustainable development.

The present work contributes to knowledge about the multi-method assessment of the motivational climates created by the coach, as well as their changes over the course of a season in adolescent sports. It also sheds light on which of the assessments best predicts athletes' engagement. In terms of practical implications, the results of the present study are a reminder of the importance of reflective practices and being mindful of coaching behavior as it will likely have a major influence on how young athletes experience sports through engagement [28,53]. In particular, for sport psychology professionals assisting coaches in their work, it will be important to be aware of behaviors that occur during matches, as these are specific moments when the motivational climate is created to promote or hinder sports engagement. Therefore, it seems important for coaches to strive to create supportive and task-involving climates and be aware that it is not enough to believe that they are doing so, they must also ensure that the athletes in their teams have the same perception or agree with their needs [21].

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