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Intra-individual changes in 3x2 achievement goals, friendship goals, motivational regulations and consequences in physical education

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KEYWORDS
Achievement goals, social goals, motivation, intraindividual change, satisfaction with life, physical education

Abstract **Introduction:** This research examines intraindividual changes in 3x2 achievement goals in physical education classes during one semester, as well as the relationship of these changes with those in other motivational and outcome variables. **Method:** A total of 334 (178 boys and 156 girls) high school students (*M* = 13.12, *SD* = 1.05) completed five questionnaires in two different school years. **Results:** The results of the *true intraindividual change* model (TIC) provided unequivocal support for the separation of task-based and self-based goals, as well as the structures based on both valences of approach and avoidance. They also showed different intraindividual change patterns in the 3x2 achievement goals, indicating a progression in the stability of the goals depending on their definition. Intraindividual variability in achievement goals is directly related to intraindividual variability in dependent variables, with the task-approach goals TIC being the most adaptive. **Conclusions:** These goals should be prioritized.

Cambios intraindividuales en las metas de logro 3x2, metas de amistad, regulaciones motivacionales y consecuencias en educación física

PALABRAS CLAVE
Metas de logro, metas sociales, motivación, cambio intraindividual, satisfacción con la vida, educación física

Resumen **Introducción:** Este artículo examina el cambio intraindividual de las metas de logro 3x2 en las clases de educación física durante un semestre, así como la relación de estos cambios con los producidos en otras variables motivacionales y de resultado. **Método:** Un total de 334 (178 varones y 156 mujeres) estudiantes de educación secundaria (*M* = 13.12, *DT* = 1.05) completaron un cuestionario en dos cursos escolares diferentes. **Resultados:** Los resultados de la aplicación del modelado del verdadero cambio intraindividual (TIC) proporcionaron un claro apoyo a la separación de las metas basadas en la tarea y en el yo, así como a las estructuras basadas en ambas valencias de aproximación y evitación. También mostraron patrones de cambio intraindividual diferentes en las metas de logro 3x2 que parecen indicar una progresión en la estabilidad de las metas en función de su definición. Se observa que la variabilidad intraindividual en las metas de logro está directamente relacionada con la variabilidad intra-

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individual en otras variables dependientes, siendo el TIC de las metas de aproximación-tarea el más adaptativo. **Conclusiones:** Se reafirman los beneficios de promover las metas de aproximación-tarea por encima del resto..

Achievement goals are one of the most influential constructs in research on school motivation (Hulleman et al., 2010; Linnenbrink-García et al., 2012; Senko et al., 2011). They have been shown to be related to a series of processes and critical outcomes in education (Linnenbrink-García et al., 2012). Although there has been a significant amount of research on achievement goals, few studies have focused on the changes in these orientations throughout school years (Schwinger et al., 2016). Therefore, our understanding of how achievement goals change over time and their implications for student achievement is incomplete. Some studies have examined the development processes of achievement and achievement goals with longitudinal research designs and growth curve analytical techniques that incorporated changes in the predictor variables as well as the outcome variable (Shim et al., 2008). However, few studies have addressed the true intraindividual change in achievement goals and its relation to outcome variables (Cecchini & Méndez-Giménez, 2017).

The 3x2 achievement goal model

The achievement goal construct begins with the differentiation of two qualitatively dissimilar behaviours in achievement contexts. *Mastery goals*, in which the objective is to develop competence and mastery in the task, and *performance goals*, in which the goal is to demonstrate competence to others (Ames, 1984). In this *Dichotomy model*, both the mastery and performance goals were conceptualized as approximation goals, focused on success, where the regulation involves trying to move towards or maintain that success.

Elliot and Harackiewicz (1996) proposed that the performance goal construct was divided into approximation-avoidance valences, giving rise to three different goals: mastery, approximation-performance, and avoidance-performance (*Trichotomous model*). Avoidance focuses on failure, and its regulation involves trying to prevent or avoid failure. Later, the model was modified again when the mastery goal construct also split into approach-avoidance valences, and a fourth goal (the avoidance-mastery goal) was added to the trichotomy (*2x2 achievement goal model*; Elliot & McGregor, 2001).

In the last decade, the 3x2 achievement goals model has emerged (Elliot et al., 2011). This model posits that mastery-based goals can be divided into two different evaluation standards: competence based on the *task*, and competence based on the *self*. Therefore, competence can be evaluated according to three definitions: the *task*, the *self* and the *other*. For task-based goals, competence is defined according to doing what the task itself requires well, or badly. Self-based goals use one's intrapersonal trajectory as an evaluation reference, and therefore competence is defined according to how well one has done in the past or has the potential to do so in the future. For other-based goals, competence is defined according to how well one does relative to others. Additionally, competence and therefore achievement goals, can be differentiated by two key components: how it is defined, and how it is valenced (Elliot & McGregor, 2001). Combining the three standards used to define competence with the two ways that competence may be valenced yields the six achievement goals representative of the model (Elliot et al., 2011). *Task-approach goals* focus on the attainment of task-based competence, *task-avoidance goals* focus on the avoidance of task-based incompetence, *self-approach goals* focus on the attainment of self-based competence, *self-avoidance goals* focus on the avoidance of self-based incompetence, *other-approach goals* focus on the attainment of other-based competence, and *other-avoidance goals* focus on the avoidance of other-based incompetence.

With regard to the structural validity of this model, Elliot et al. (2011) proved that the six goals represent empirically different constructs and that the 3x2 model offers a better fit to the data than a series of alternative models, including the 2x2 model, the trichotomous, or the dichotomous. The results of this study provided explicit support for the separation of task-based and self-based goals and the more general 3x2 achievement goal model. Subsequent studies have corroborated these results (Mascret et al., 2015, in sports, Méndez-Giménez, Cecchini & Fernández-Río, 2014, in a physical education context; Méndez-Giménez et al., 2017, in an academic context).

In academic contexts, some studies have examined the 3x2 achievement goals as simultaneous potential predictors of various relevant achievement variables (Méndez-Giménez, Cecchini, Méndez-Alonso, et al., 2018). The intrinsic motivation in the 3x2 model revealed that task-approach goals were a positive and unique predictor (Elliot et al., 2011). In a more integrative context of motivation, the self-determined motivation index in the 3x2 model revealed that task-approach, self-approach, ego-avoidance, and other-approach goals were positive predictors, while other-avoidance goals were negative predictors (Méndez-Giménez et al., 2017). In the 3x2 model, task-approach, self-approach, and other-approach goals predicted life satisfaction (Méndez-Giménez et al., 2017). The friendship-approach goals were explained by task-approach and the other-avoidance goals were explained as positive predictors. Finally, the avoidance-friendship goals were explained by the other-avoidance goals as a positive predictor (Méndez-Giménez, Cecchini & Fernández-Río, 2014).

In physical education contexts, Méndez-Giménez, Cecchini and García-Romero (2018) found that the three approach goals positively predicted empathy and emotional control-regulation; while only task-approach goals predicted emotional recognition. Méndez-Giménez, García-Romero and Cecchini (2018) also showed a significant decrease in achievement goals (except other-approach) and friendship goals due to development. Boys scored higher on task-approach, other-approach, and other-avoidance goals than girls. Cecchini et al. (2019) showed the predictive value (transversal and longitudinal) of the six goal orientations on the satisfaction of the need for competence, and established differences depending on definition and valence. Finally, the results of a recent study (Méndez-Giménez et al., 2020) have supported the postulates of a three-dimensional achievement goal model and also suggest the differentiation of three competence standards from primary education.

However, according to Elliot et al. (2011), the 3x2 achievement goal model needs to be tested in longitudinal studies of repeated measures before drawing a more definitive conclusion about the validity of its structure and the causal relationship that can be concluded.

Analysis of true intraindividual change

Steyer et al. (1997) presented a direct approach to model interindividual differences in intraindividual change: the *true intraindividual change* (TIC) models. According to this approach, the TIC scores (that is, the difference between two true score variables) between two measurement instances are the values of the latent variables. The model on which the present study is based supposes there are at least two observed variables measuring the same latent variable on at least two different occasions. Similarly, it is assumed that the measurement model (that is, the coefficients of the regressions of the observed values on the latent variables) is invariant between the two instances (*Multistate model with invariant parameters*, MSIP model).

The MSIP includes two versions (Steyer et al., 2000). In the state version, the measurement models of the six latent variables that measure 3x2 achievement goals are set as invariant over the two measurement times (T1 and T2) and are free to correlate with each other. The change version of the MSIP is the baseline. In this version, the indicators of each of the six latent variables in T2 are regressed over the latent variables corresponding to T1. Setting aggregate regression coefficients to be equal to the corresponding factorial loads means that the six latent factors in the 3x2 achievement goals in T2 give rise to the true intraindividual changes from T1 to T2. This model allows us to examine the TIC in the 3x2 achievement goals between T1 and T2. The aim of the present study is to examine the relationships between TIC in 3x2 achievement goals and TIC in other motivational variables.

The present study

Three premises related to the 3x2 achievement goals model support the use of TIC to better understand these processes: (a) for task-based goals, the mechanism to evaluate competence needs to have direct, immediate, continuous feedback during involvement in the task, which gives this form of regulation a very process-oriented quality of flow; (b) for self-based goals, the intrapersonal trajectory is used as a benchmark for evaluation and (c) for other-based goals, interpersonal comparison requires the ability to represent and compare two specific results spaced out over time at a cognitive level.

If the TIC in task-based goals and the self-based goals were inseparable, then a model other than the 3x2 model, such as the 2x2 model, could be supported. However, Elliot et al. (2011) presented several differences between the task-based and self-based goals regarding evaluation criteria and goal regulation mechanisms. So in this study, it is anticipated that TIC data would support the separation of these goals, and consequently, the expansion of the 3x2 achievement goals model. Based on this, and following the recommendations of Elliot et al. (2011), the first objective of the current study is to replicate previous findings about the 3x2 achievement goals framework in a longitudinal study, which establishes the TIC in these goal orientations. Consequently, it is expected that the hypothesized model, based on the baseline model, will provide a better fit to the data than alternative models.

The second objective of this study is to analyse the patterns of change in the 3x2 achievement goals between T1 and T2. Because this is the first study of changes in 3x2 achievement goal orientations with a multidimensional perspective, and because previous research does not present a clear picture of changes over time, it would be speculative to propose a specific hypothesis.

Finally, the third objective is to examine the relationships of TIC in the 3x2 achievement goal orientations with specific consequence variables such as friendship goals (approximation and avoidance), satisfaction with life, future intention to be physically active and different types of motivation. Once again, due to the innovative nature of the research and the fact that previous research does not shed light on the impact of changes in the 3x2 achievement goals on these variables, it would be too speculative to present a specific hypothesis.

Method

Research design

This is a longitudinal and quantitative research. The methodology included surveys using five questionnaires in two waves of measurement (repeated measures). A correlational study was carried out using true intraindividual change models.

Participants

The sample consisted of 334 students (178 men and 156 women) enrolled in three secondary education high schools in the north of Spain, aged between 11 and 15 years old (M = 13.12, SD = 1.05). They were three urban (one state-funded, one public, and one charter) high schools of a medium-high socioeconomic level. Physical education in Spain is a compulsory subject for all children and adolescents aged 6-16. Students take physical education every year (2 hours a week) both in Primary Education (six years) and in

Compulsory Secondary Education (four years). Basically, the instructional models used by teachers were direct instruction and cooperative learning. The Physical Education curriculum implemented was centred on the teaching of games and sports as well as fitness and health.

Procedure

Permission from the Ethics Commission for Research of the University was obtained. The schools were also contacted to obtain permission from principals and parents. One of the team's researchers administered the questionnaire to the participants on two occasions. She insisted that participation was voluntary and that all answers were kept confidential and they did not affect school grades. Questionnaires were completed during a regular online class (40 min) using Google Forms. Participants were also informed that the questionnaire was anonymous and that there were no correct or incorrect answers.

Measurements and instruments

Achievement goals. The 3x2 Achievement Goal Questionnaire in Physical Education (3x2 AGQ-PE; Méndez-Giménez, Cecchini & Fernández-Río, 2014) was used. The 3x2 AGQ-PE items are preceded by the phrase: "In my physical education lessons my goal is..." This questionnaire is composed of six types of goals: *task-approach* (e.g., "... to perform many exercises and tasks correctly"), *task-avoidance* (e.g., "... to avoid doing the tasks poorly"), *self-approach* (e.g., "... to perform the exercises better than I usually do"), *self-avoidance* (e.g., "… to avoid performing the exercises worse than I usually do"), *other-approach* (e.g., "… to outperform other students performing exercises and tasks"), and *other-avoidance* (e.g.,"… to avoid doing exercises and tasks worse than other students") (24 items). The values of Cronbach's alpha were .84, .76, .85, .81, .89, and .86, respectively.

Friendship goals. The Spanish version of the Friendship Goals Questionnaire in Physical Education from Garn and Sun (2009) was used, validated by Méndez-Giménez, Fernández-Río and Cecchini (2014). This scale is composed of a total of 8 items grouped into two factors (four items each): friendship-approach (e.g., "... deepening relationships with my friends") *and friendship-avoidance goals* (e.g., "... avoid disagreements and conflicts with my friends"). The values of Cronbach's alpha were .85 and .77, respectively.

Types of motivation. The Perceived Locus of Causality Questionnaire (PLOCQ, Goudas et al., 1994) was used; specifically, the version adapted and validated in Spanish by Moreno et al. (2009). The questionnaire is composed of five factors (four items for each factor): intrinsic motivation (e.g., "because physical education is fun"), regulation identified (e.g., "because it is important for me to do well in physical education"), introjected regulation (e.g., "because I would feel bad about myself if I did not"), external regulation (e.g., "because I will have problems if I do not"), and amotivation (e.g., "but I really don't know why"). The scale was preceded by "I take part in physical education classes...". Cronbach's alphas were .84, .84, .79, .76 and .78, respectively.

Satisfaction with life. The questionnaire from Diener et al. (1985) was used to measure a single factor composed of five items (e.g., "If I could live my life again, I would like everything to be the same). This instrument has been validated in Spanish by Cabañero et al. (2004). Cronbach's Alpha coefficient in the present study was .83.

Intention to be physically active (IPA). The Spanish version of the Intention to be physically active scale (IPA, Hein et al., 2004), was used, and validated by Moreno et al. (2007). It consists of five items for the evaluation of the students' intention to be physically active (e.g., "After graduation, I would like to take part in sports club training"). In the current study, Cronbach's alpha was .84. A 5-point Likert scale was used in all the scales.

Data analysis

The information obtained was analysed using SPSS 22.0 and EQS 6.2 programs as preliminary analysis showed a lack of multivariate normality. To assess the original model and to contrast it with the alternative models, confirmatory factor analysis (CFA) was requested. This analysis was based on the Satorra-Bentler chi-square (S-B χ^2) statistic and the robust standard estimates, which serve as a correction for χ^2 when the distribution assumptions are violated. Evaluation of the goodness-of-fit to the sample data was determined using the incremental fit index *CFI (Comparative Fit Index); the *RMSEA (Root Mean Square Error Approximation) and the RMSR (Root Mean Square Residual) were used as absolute fit indexes. The following values are suggested as indicative of a good fit: ≥ .95 for the * CFI, ≤ .05 for the *RMSEA, ≤ .08 for the SRMR. The 90% confidence interval provided by the *RMSEA was included to complete the analysis. In all the models, power was above .90.

Next, a true intraindividual change (TIC) was used in the framework of the structural equation model (SEM) to analyse the change in the scores of each participant in the 3x2 achievement goals (Steyer, 2005). The four indicators were parcelled by dimension to form two indicators per construct.

The second stage was to test a reference model, the baseline model. In this model, the hypothesis is formulated that the variables observed at T2 can predict their respective latent factors, both at T1 and at T2. To achieve this, each latent variable's indicators at T2 were regressed to the corresponding latent variables corresponding to T1. This new configuration transformed the latent factors at T2 into TIC scores over the time of the study, which allowed the proposed model to be tested.

Additional analysis was carried out to compare the adjustment of the hypothetical model with a series of alternative models based on the baseline model. Six alternative models were compared: (a) *a 2x2 model*, in which the other-based goals charged in their hypothetical latent factors, while the similarly valenced task-based and self-based goals loaded together into common latent factors; (b) *a Trichotomous model*, in which other-based goals charged together on their hypothetical latent factors, but task-based and self-

based goals charged together on a common latent factor; (c) *a Dichotomous model*, in which the other-based goals charged together in a common latent factor, and the task-based goals and the self-based goals charged together on another common latent factor; *(d) a TAp/TAv model* (task-approach/task-avoidance), in which all the items loaded in their hypothetical latent factors, except the task-approach and task-avoidance items, which loaded together on a common latent factor; (e) *a model SAp/SAv* (self-approach/self-avoidance), in which all the items charged in their hypothetical latent factors, with the exception of the items of self-approach and self-avoidance which loaded together on a common latent factor; (f) *a OAp/OAv model* (other-approach/other avoidance), in which all the items loaded in their hypothetical latent factors, with the exception of the other-approach and other avoidance items that loaded together in a common latent factor. The Akaike information criterion (AIC) was used to compare hypothesis model with the alternative models.

Synchronic correlations were made between latent variables and latent change for each group of independent factors. As explained below, factor loads were treated as invariant over time. Finally, nine independent SEM analyses were carried out taking the TIC in the 3x2 achievement goals as predictors of TIC in the outcome variables: intrinsic motivation, identified regulation, introjected regulation, external regulation, amotivation, friendship-approach, friendship-avoidance, intention to be physically active, and satisfaction with life.

Prior to performing these analyses, and in order to test the hypothesis that the measurement models are invariant over time, CFA analysis were performed on the state model (Steyer et al., 2000), including the variables indicated above in the 3x2 model. The results support factorial invariance. For example, comparing the model with constraints in which intrinsic motivation is included: (S-B χ^2 (266) = 297.92, p = .086, *CFI = .993, SRMR = .03, *RMSEA = .018 [90% CI = .000, .030]), with the same model in which there are no invariance restrictions (S-B χ^2 (259) = 286.26, p = .117, *CFI = .994, SRMR = .066, * RMSEA = .018 [90% IC = .000, .029]) the model adjustment did not improve significantly (ΔS-B χ^2 (7) = 11.66, n.s.). Similar results were found in the rest of the invariance analyses, which are not included due to space limitations.

Results

Descriptive analyses

The means and standard deviations for each type of achievement goal and the motivational consequences at times T1 and T2 are presented in Table 1. Task-approach goals and task-avoidance goals were the most highly scored by the students at each time. Self-approach goals and self-avoidance goals were scored less highly, and other-approach goals and other-avoidance goals received the lowest scores. These results replicate previous findings. In the other variables, friendship-avoidance goals scored higher than friendship-approach goals. Motivational regulations follow a valuation consistent with the theory, although identified motivation is scored more highly than intrinsic motivation.

Table 1. Means and standard deviations for the variables studied at T1 and T2

	T1		T2	
	M	*SD*	*M*	*SD*
Task-approach	4.19	.74	4.13	.71
Task-avoidance	4.17	.79	4.14	.77
Self-approach	4.08	.79	4.02	.76
Self-avoidance	3.92	.94	3.86	.84
Other-approach	3.10	1.17	3.07	1.12
Other-avoidance	3.49	1.09	3.36	1.02
Friendship-approach	3.74	1.01	3.73	.97
Friendship-avoidance	3.98	.93	3.90	.94
Satisfaction with life	3.86	.84	3.94	.80
Intention to be physically active	4.11	.91	4.03	.96
Intrinsic motivation	5.15	1.41	4.88	1.48
Identified regulation	5.29	1.41	5.05	1.45
Introjected regulation	4.17	1.52	4.13	1.50
External regulation	3.69	1.63	3.85	1.67
Amotivation	2.33	1.45	2.70	1.59

Bivariate correlations

Table 2 presents the bivariate correlations between all the study variables at T1 (below the diagonal) and T2 (above the diagonal). The highest correlations in achievement goals on both occasions are observed between the dimensions of other-approach and other-avoidance goals. Higher correlations at both times are also seen between task-approach and task-avoidance, and self-approach and self-avoidance goal dimensions. The highest correlations of achievement goals with the other variables in general appear between the task-approach and self-approach goals.

Comparison with alternative models

Table 3 shows the comparisons of the hypothetical model with the alternative models, based on the baseline model. The results indicated that the hypothetical model provided a better fit to the data than any of the alternative models.

Intraindividual changes in 3x2 achievement goals

Latent means and statistics on the differences are presented in Table 4. Latent means are calculated on the baseline models. They correspond to the average changes at the latent level, taking into account the measurement error. The *t-test* of paired samples showed that none of the changes were statistically significant in the 3x2 achievement goals. Nevertheless, there were significant differences in the changes of intrinsic motivation and identified regulation, which decreased, and in changes of amotivation, which increased.

Table 2. Bivariate correlations between the study variables at T1 (below the diagonal) and T2 (above)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. TAp	-	.65**	.73**	.55**	.33**	.33**	.33**	.35**	.27**	.51**	.51**	.57**	.29**	-.07	-.22**
2. TAv	.60**	-	.64**	.68**	.14**	.31**	.26**	.36**	.15**	.31**	.35**	.42**	.27**	.06	-.10
3. SAp	.66**	.56**	-	.63**	.26**	.22**	.35**	.29**	.27**	.43**	.53**	.58**	.32**	-.03	-.19**
4. SAv	.53**	.65**	.61**	.-	.24**	.37**	.14*	.21**	.15**	.35**	.34**	.37**	.18**	.01	-.11*
5. OAp	.22**	.08	.22**	.21**	-	.76**	.19**	.19**	.11	.33**	.30**	.30**	.29**	.13*	.10
6. OAv	.33**	.28**	.26**	.39**	.74**	.-	.17**	.27**	.07	.26**	.20**	.21**	.26**	.14*	.08
7. FAp	.39**	.30**	.39**	.18**	.10	.16**	-	.63**	.27**	.26**	.42**	.40**	.31**	.11	-.01
8. FAv	.41**	.44**	.44**	.30**	.19**	.29**	.63**	-	.30**	.15**	.24**	.27**	.30**	.15**	.01
9. SL	.29**	.24**	.30**	.21**	.09	.06	.16**	.14**	-	.19**	.22**	.20**	.07	-.10	-.16**
10. IPA	.49**	.31**	.36**	.29**	.37**	.33**	.19**	.19**	.18**	.-	.52**	.58**	.25**	-.14*	-.19**
11. IM	.54**	.41**	.46**	.36**	.23**	.28**	.37**	.36**	.19**	.52**	-	.86**	.45**	-.10	-.18**
12. IdR	.57**	.43**	.50**	.35**	.24**	.29**	.35**	.35**	.20**	.56**	.86**	-	.52**	-.06	-.22**
13. InR	.30**	.30**	.27**	.21**	.38**	.34**	.24**	.35**	.07	.37**	.50**	.55**	.-	.52**	.29**
14. ER	-.03	.00	-.00	.00	.14*	.14*	.03	.18**	-.01	-.01	-.02	.01	.45**	.-	.58**
15. A	-.23**	-.18**	-.17**	-.13*	.10	.01	-.11	-.05	-.07	-.10	-.32**	-.35**	.06	.46**	-

* $p < .05$; ** $p < .01$. TAp = Task-approach; TAv =Task-avoidance; SAp = Self-approach; SAv = Self-avoidance; OAp = Other-approach; OAv = Other-avoidance; FAp = Friendship-approach; FAv = Friendship- avoidance; SL = Satisfaction with life; IPA = Intention to be physically active; IM = Intrinsic motivation; IdR = Identified regulation; InR = Introjected regulation; ER = External regulation; A = Amotivation

Table 3. Comparison of the hypothetical model with alternative models

	S-Bχ^2	*df*	*CFI	*RMSEA 90% CI	SMRM	ΔS-Bχ^2	AIC
3x2	220.82	192	.992	.022(.000-.033)	.03	-	-163.17
2x2	398.65***	232	.954	.047(.039-.055)	.05	177.83	71.24
Trichotomus	558.40***	246	.914	.063(.056-.069)	.06	337,58	66.40
Dichotomous	660.82***	256	.888	.070(.063-.076)	.06	440.00	148.62
TAp/TAv	364.15***	214	.959	.047(.038-.055)	.04	143.33	-63.85
SAp/ SAv	399.58***	214	.950	.052(.049-.060)	.04	178.76	-28.42
OAp/OAv	393.76***	214	.950	.051(.043-.059)	.04	172.94	-.34.25

*** $p < .001$; TAp = Task-approach; TAv =Task-avoidance; SAp = Self-approach; SAv = Self-avoidance; OAp = Other-approach; OAv = Other-avoidance.

To analyse the intraindividual pattern of change in each participant and to verify whether the scores of some people increased over time, while others decreased, the Reliable Change Index was calculated. This index showed the following percentages of participants whose scores changed in the 3x2 achievement goal orientations: task-approach = 19.14%, task-avoidance = 12.65%, self-approach = 24.78%, self-avoidance = 28.39%, other-approach = 30.56%, and other-avoidance goals = 29.63% (Table 4).

Motivational consequences

The first SEM analysis tested the predictive value of the latent factors that measure TIC in the 3x2 achievement goals on TIC in intrinsic motivation. All combinations were tested. The only latent factor that predicted these changes was the task-approach goal (β = .32, $p < .001$, *CFI = .988, *RMSEA = .023). This same behaviour was observed in the *p*redictive model for identified regulation (β = .15, $p <$. 05, *CFI = .983, *RMSEA = .028), satisfaction with life (β = .37, $p < .001$; *CFI = .992, *RMSEA = .020), and friendship-approach (β = .32, $p < .001$; *CFI = .985, *RMSEA = .027). The predictive model of TIC for friendship-avoidance goals showed that task-avoidance TICs were the only predictor variable (β = .37, $p < .001$, *CFI = .985, *RMSEA = .026). In the introjected regulation TIC model (*CFI = .984, *RMSEA = .027) there were two predictor variables, task-approach (β = .15, $p <.05$), and other-approach goals (β = 22, $p < .01$). In the external regulation TIC model (*CFI = .986, *RMSEA = .025), other-approach goals (β = .16, $p < .05$). In the amotivation TIC model (*CFI = .985, *RMSEA = .027), self-approach goals (β = -.15, $p < .05$) and other-approach goals (β = .15, $p < .05$). Finally, in the intention to be physically active TIC model (*CFI = .986, *RMSEA = .025), task-approach (β = .40, $p < .001$) and other approach goals (β = .22, $p < .01$).

Table 4. Latent means and statistics in the true intraindividual change

	Latent means (change)	Score	
		% Increase	% Decrease
Task-approach	-.049	9.57	9.57
Task-avoidance	-.038	6.48	6.17
Self-approach	-.062	13.89	10.80
Self-avoidance	-.059	15.74	12.65
Other-approach	-.027	16.36	14.20
Other-avoidance	-.126	16.36	13.27
Friendship-approach	-.007	12.03	12.69
Friendship-avoidance	-.078	8.02	6.79
Satisfaction with life	.082	10.80	13.89
Intention to be physically active	-.086	9.57	6.79
Intrinsic motivation	-.293**	13.58	7.41
Identified regulation	-.233**	11.11	4.94
Introjected regulation	-.059	7.72	8.64
External regulation	.169	7.40	10.80
Amotivation	.385***	9.26	16.04

** $p < .01$; *** $p < .001$

Discussion

This study extends the usual procedure of considering students as a homogeneous group that can be interpreted to reveal the complexity of educational phenomenon. Consequently, it focuses on considering the individual characteristics of the students and the achievement goals they pursue in daily life, and how they are designed and customized to face the individual challenges and threats students are subjected to (Elliot & Sheldon, 1997). In order to answer questions like, 'Why do individuals differ in their patterns of change? What motivational and/or social consequences do these patterns of change have?' it is necessary to use models of change.

The change version of the MSIP is the baseline, in which TIC scores (that is, the difference between two variables of true score) between two measurement instances are the values of the latent variables. Students reported their achievement goals at T1 and six months later, at T2, using a measure of 3x2 achievement goals. The TIC baseline model for the 3x2 achievement goals showed that each of the goals of the hypothesis was reliably evaluated and that the hypothetical 3x2 model of TIC provided a good fit to the data. Indeed, it was shown that by adjusting the data to TIC, the 3x2 model fit better than the rest of the models tested. The empirical work on goal-based regulation indicates that mentally contrasting a future possibility with a present reality facilitates evaluation and strengthening.

The results of this study suggest that focusing on intraindividual changes in this contrasting process is particularly striking. When students evaluate their goals at T1, they imagine a desired future and immediately afterward, they reflect on the current situation that hinders the achievement of this desired future. If their goal is highly feasible, they firmly commit themselves to reaching it. When students re-evaluate the same goals at T2, they reimagine the desired future and reflect on the current situation after an experience in which they have been able to verify the achievements or failures of the goals pursued at T1 and the difficulty of the obstacles that they had tried to overcome. In fact, in the TIC model, adjustment rates are high. These results reflect the true measurement of the 3x2 achievement goals that requires awareness of changes over time.

To date, no study with these characteristics has been carried out. The results of this longitudinal study analysing TIC in the 3x2 achievement goals make a substantive contribution to achievement goal theory since they provide unequivocal support for the separation of task-based and self-based goal orientations, as well as the structures based on both approach and avoidance valences. However, as previous studies have shown (Cecchini et al., 2019; Méndez-Giménez et al., 2017; Méndez-Giménez, García-Romero & Cecchini, 2018), some factors have high correlations, especially the other-approach goals and the other-avoidance goals. These results could again call into question the extent to which these factors are different, but based on the arguments presented by different authors (Elliot et al., 2011) and their diverse relationships with other variables, it seems right to differentiate the two constructs. Task-approach goals and task-avoidance goals were the most highly scored by the students at each time. Self-approach goals and self-avoidance goals were scored less highly, and other-approach goals and other-avoidance goals received the lowest scores. These results replicate previous findings (Cecchini et al., 2019; Elliot et al., 2011).

The second objective of this study was to investigate the patterns of change in the 3x2 achievement goals between T1 and T2. The changes in the latent means of each of the six factors, calculated in the baseline models showed that none was statistically significant. Nevertheless, some intraindividual change patterns were found; the scores of some adolescents in the 3x2 goals increased over time, while the scores of others decreased. Greater changes were observed in other-based goals and the least in task-based goals. In both approach-goals and avoidance-goals there was an increase of intraindividual variability, higher in task-based goals, followed by self-based goals and other-based goals. These results seem to suggest a progression in goal stability, depending on how they are defined. Theories of motivation suggest that people prefer to commit to goals that are desirable and viable. According to the score given to the different achievement goals, the most appealing are task-based goals, while other-based goals are less appealing. In task-based goals, the control necessary to achieve success is, to a large extent, in the hands of the participant, depending on their commitment and personal ability. Whereas in other-based goals, success is contingent upon the ability to withstand comparison to others. The former goals are therefore more viable than the latter. When expectations of success are high, mental contrasting allows a firm commitment to goals. When expectations of success are low, mental contrasting produces weak or non-existent commitments to goals. Therefore, mental contrasting produces commitments to goals dependent on expectation. Taking into account the fact that in the present study personal experience is contrasted in relation to achievement of goals or satisfaction of expectations, their variability can

explain what happened. For example, the goal "to perform lesson activities correctly" (task-approach goals) is quite stable because for most students expectations of the result are high or dependent on their commitment. While the goal "to do better than other students in their accomplishment of tasks" (other-approach goals) is difficult for the majority of the students to achieve, so the expectation of success is low. These personal experiences, in which a person depends on others to achieve their own goals, make these goals more unstable over time.

This intraindividual variability in achievement goals must be directly related to intraindividual variability in other dependent variables. When we look at the consequences of the 3x2 achievement goal TICs in the nine variables TIC analysed, we see that task-approach goals were a positive predictor of intrinsic motivation, identified regulation, introjected regulation, satisfaction with life, friendship-approach goals and intention to be physically active in the future. This differential pattern reflects the more direct and immediate nature of competency assessment in task-approach goals, which is optimal for the phenomenological experience and the processing of relevant information from the competence. Task-based goals use the absolute demand of the task as a benchmark for evaluation (Elliot et al., 2011). In the educational field, the most direct and immediate task is the acquisition of different subject content in the form of learning or of the acquisition lasting behaviour by temporary practice, which is the same thing. It is this temporary nature, together with the immediacy of task-approach goals, which seems to explain the results to a large extent. In line with previously reported results (Cecchini et al., 2019; Méndez-Giménez et al., 2017), our data also suggest the need to prioritize task-approach goals over others.

Only task-avoidance goals predicted friendship-avoidance goals. Avoidance-based goals focus on failure, and regulation involves trying to avoid or prevent this negative outcome (Elliot et al., 2011). Using failure as the centre of regulation creates and perpetuates threat, anxiety, and vigilance since one is repeatedly reminded of the possibility of failure (Pekrun et al., 2009). The relationship between the variables measuring avoidance is consistent with theory since cognitive activity at the service of avoidance of failure is very rigid and restricted in scope. However, pursuing goals based on avoidance may be appropriate for some tasks that require the detection of errors. Future research can determine the effect of pursuing these types of goals in the social sphere.

The TIC in other-approach goals was a positive predictor of the TIC in introjected regulation, external regulation, amotivation, and intention to be physically active. The other-approach goals were positively associated with variables of positive valence (for example, intention to be physically active), and with variables of negative valence (e.g., external regulation and amotivation), consistent with Van Yperen's (2006) assumptions.

In this study, task-based goals were differentially related to self-based goals, and were overwhelmingly dominant. The self-approach goal TIC alone was a negative predictor of the amotivation TIC. In task-based goals, competence is defined as doing what the task requires well or badly, while self-based goals use the intraindividual trajectory as a benchmark for evaluation. One might think that due to the intrapersonal trajectory of self-approach goals, they would have a greater presence and explanatory power over the changes in other dependent variables; however, this is not what was found. One possible explanation is that task-based goals measure intraindividual changes in the perception of competence that the task itself requires. In other words, both task-approach, and self-approach goals promote similar processes in their regulation, but the former is more directly related to class tasks. Correctly performing tasks set for different school subjects is the most desirable goal because expectations of school success increase considerably. However simply improving does not guarantee that the requirements of a particular subject will be met at the end of the process. There might be improvement, but an exam or subject may still be failed (Elliot et al., 2011).

Finally, additional research is needed to explore possible links between task-avoidance and other-avoidance goals with relevant dependent variables of achievement, since these goal constructs had no predictive value in any of the variables in this study.

This research has significant implications for teaching. Schools and teachers should promote task-approach rather than self-approach or other-approach goals in their classes (Méndez-Giménez et al., 2017; Méndez-Giménez, García-Romero & Cecchini, 2018). Task-approach goals were more important to students and remained more stable over time during adolescence. They can be achieved by most students (as long as there is personal commitment), and have a positive impact on most of the variables analysed, more so than the other goal orientations.

A limitation of this study is the exclusive presence of students from a single secondary school subject, physical education. Another limitation is not having made a greater number of measurements (for example, T3). Future research should examine the TIC of the 3x2 achievement goal model in students in different academic years and subjects. We found a decrease in intrinsic motivation and identified regulation and an increase in demotivation over time. These results are consistent with those reported by Otis et al. (2005) in which there was a drop in self-determined school motivation as students got older. Longitudinal studies are needed to address this issue in the context of physical education.

Conclusions

This research reiterates the fact that task-approach goals are the most adaptive in terms of intraindividual change. Their presence and stability over time have been well documented during adolescence, a critical period in which the motivational fall is evident. The self-approach goals were only a negative predictor of amotivation, while the other-approach goals exhibited positive and negative effects on motivation. In summary, due to their demonstrated characteristics (stability, simplicity, adaptation), priority should be given to the establishment of task-approach goals in adolescents.

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