Does Intrinsic Motivation Improve Academic Achievement, or Vice Versa? Providing Longitudinal Evidence for the Main Theories of Motivation Based on Primary Education Students' Age and Sex

¿La motivación intrínseca aumenta el rendimiento académico o viceversa? Aportando evidencias longitudinales a las principales teorías de la motivación basadas en la edad y el género del alumnado de educación primaria

Martin Sainz de la Maza[1]*, Lucia Campo*, Nahia Delgado** y José María Etxabe*
*Universidad del País Vasco/Euskal Herriko Unibertsitatea (España)
**Globernance (España)

Abstract

A significant number of teachers justify intrinsic motivation as a driver for the improvement of academic performance in primary school students. However, the main theories of motivation that exist today support the opposite idea. To date, the existing longitudinal studies on students at this stage are scarce, which makes it really difficult to verify whether this statement is true or whether it is an educational myth. For this reason, the objective of this study has been to verify whether intrinsic motivation leads to improvements in academic performance or vice versa, and whether this relationship is mediated by the student's age and gender. A total of 852 primary education students (M = 10.82; DT = .867) participated, and longitudinal data on their intrinsic motivation and academic performance was collected at the beginning (T1) and end (T2) of a 7-month period. The results revealed that, regardless of the student's sex and age, intrinsic motivation at T1 did not significantly predict academic performance at T2. However, academic performance at T1 did predict intrinsic motivation at T2, and this relationship was

1   **Correspondencia:** Martin Sainz de la Maza, martin.sainzdelamaza@ehu.eus, Facultad de Educación, Juan Ibáñez de Santo Domingo Kalea, 1, Vitoria-Gasteiz, CP: 01006

mediated by the student's age but not by their gender. These results are of special interest for teachers to eliminate possible educational myths and to observe how providing opportunities for success can be of special interest in improving students' intrinsic motivation.

Keywords: intrinsic motivation; academic achievement; primary education; moderation

Resumen

Un número significativo de profesorado justifica la motivación intrínseca como motor para mejorar el rendimiento académico del alumnado de Educación Primaria. No obstante, las principales teorías de la motivación existentes apoyan la idea contraria. A día de hoy, los estudios longitudinales existentes sobre alumnos/as de esta etapa son escasos, lo que hace realmente difícil comprobar si esta afirmación es cierta o se trata de un mito educativo. Por este motivo, el objetivo de este estudio ha sido comprobar si la motivación intrínseca conduce al rendimiento académico o viceversa, y si esta relación está moderada por la edad y el género del alumno. Participaron 852 estudiantes de educación primaria (M = 10,82; DT = .867), recogiéndose datos longitudinales sobre su motivación intrínseca y rendimiento académico antes (T1) y después de 7 meses de diferencia entre el inicio y el final del estudio (T2). Los resultados revelaron que, independientemente del género y la edad del estudiante, la motivación intrínseca en T1 no predijo significativamente el rendimiento académico en T2. Sin embargo, el rendimiento académico en T1 sí predecía la motivación intrínseca en T2, y esta relación estaba moderada por la edad del estudiante pero no por su género. Estos resultados son de especial interés para el profesorado a la hora de eliminar posibles mitos educativos y para observar cómo ofrecer oportunidades de éxito puede ser de especial interés para mejorar la motivación intrínseca del alumnado.

Palabras clave: motivación intrínseca; rendimiento académico; educación primaria; moderación.

Introduction

It is true that within the teaching community, there is a widely accepted myth that suggests that intrinsic motivation is a key factor in improving students' academic performance (Hidi & Renninger, 2006). This myth is based on the idea that when students are motivated by their genuine interest in a subject or topic, they are more likely to learn and perform better compared to those who lack intrinsic motivation and only study out of obligation.

However, it is important to note that the relationship between intrinsic motivation and academic performance can be complex and not always linear (Deci et al., 1999; Ryan and Deci, 2017; Vallerand, 1997). First, it's essential to consider that motivation is a highly variable factor, subject to social, emotional, and contextual changes (e.g., Acosta & Clavero, 2018; Lee & Stankov, 2018), even influenced by self-concept (McArthur et al., 2016), which has been shown to be significantly influenced by students' age and gender (e.g., Anderman & Anderman, 2020; Pongračić et al., 2021).

Second, and continuing with the malleability of motivation, one should rather inquire about the relationship between intrinsic motivation and self-efficacy over time. However, longitudinal studies regarding this relationship are scarce (e.g. Hornstra, et al. 2013; Liu & Hou, 2018; Zhang et. al., 2023). In them, it can be observed that not only intrinsic motivation is a determining factor in academic performance; extrinsic motivation is also significant (Pongračić et al., 2021), with the combination of these two modes of motivation being the true predictor (Liu & Hou, 2018). Moreover, in a recent study, it has been observed that self-efficacy is actually the most relevant variable for academic performance, rather than the types of motivation (Zhang et al., 2023).

Due to the scarcity of longitudinal studies regarding this relationship and the inherently variable nature of motivation, influenced by both internal and external factors in students, the following research has been conducted. Therefore, the aim of this study has been to investigate whether intrinsic motivation leads to academic performance or vice versa, and whether this relationship is moderated by the age and gender of the student.

Main motivation theories

Motivation is a determining variable in the teaching and learning process, having a significant impact on academic achievement (Ryan & Deci, 2017). Indeed, being a psychological construct with significant impact on achievement, various conceptualizations of motivation have been proposed over time. In fact, researchers have proposed five major theories: expectancy-value theory, attribution theory, social-cognitive theory, goal-orientation theory, and self-determination theory (Cook & Artino, 2016). These theories provide valuable insights into the different aspects of motivation, including expectations, values, attributions, social influences, goal orientations, and autonomy.

First, the expectancy-value theory is based on the idea that motivation develops when an individual's expectations of success are high, and this is accompanied by the idea of the perceived value or usefulness of the task to be performed (Eccles & Wigfield, 1995). Under this theory, the student is considered an active agent who determines their actions based on the value assigned to the goal and their expectations regarding that goal (Cook, et al. 2016). Second, attribution theory is based on the explanation we elaborate about the causes of the behaviors we engage in. Its use is intended to give meaning to our own positive and negative experiences and also to enable us to predict the future behaviors of others. Weiner's (1972; 1974) three-dimensional model includes locus of control (internal vs. external), stability (stable vs. unstable causes) and controllability (controllable vs. uncontrollable causes) as key concepts in predicting the degree of motivation of individuals. However, the causes attributed to events vary over time (Kusurkar et al., 2012), leading to continuous changes in students' motivation. Third, the social-cognitive theory determines that learning results from interactions between personal, behavioral and environmental factors; and in this line, feelings of self-efficacy are considered to be motivational enhancers (Schunk & Usher, 2012). The fact that motivation is highly influenced by such variable factors could suggest that the effect of motivation may diminish over time. Fourth, the theory of goal orientation indicates that students engage in activities for three different reasons: to master the

content (mastery goal), to do better than others (performance-approach goal), or to avoid failure (performance-avoidance goal).

Finally, self-determination theory is the framework that conceptualizes intrinsic motivation, which satisfies the needs for autonomy, competence, and relatedness (Deci & Ryan, 1987). Competence refers to the feeling of mastering a certain task; autonomy refers to the opportunity to control one's actions; and relatedness refers to a sense of affiliation with others to whom they would like to feel connected (Cook & Artino, 2016). As Deci et al. (1999) have largely defended, extrinsic rewards undermine intrinsic motivation in children. Despite these aspects leading to direct interest and enjoyment in what is being done, it is important to consider that currently the significance of this motivation is exaggerated without foundation. Moreover, it is also important to consider that certain external goals may enhance intrinsic motivation through a process of motivational synergy (Hennessey et al., 2015). Also, other authors consider that what matters is the content of the future goals and how they regulate behavior, so intrinsic future goals which are perceived as creating autonomous motivation/behavioral regulation are almost as adaptive as intrinsic motivation (Lens et al, 2009).

Thus, the counterpart of intrinsic motivation emerges as extrinsic motivation, which is defined as motivation driven by factors external to the task at hand (Boric, 2017). This can translate into performing the task solely for the sake of obtaining rewards or avoiding punishments. These two motivations, despite originating from completely opposite approaches, are positively related to each other (Pongracic, 2021). However, in practice, they are essentially independent (Abdelrahman, 2020). Therefore, they must be taken into account when addressing the work of teaching staff (Pongracic, 2021).

There is indeed a significant body of research that supports the notion that optimal learning occurs when students have intrinsic motivation and a genuine interest in the subject matter (Cerasoli et al., 2014; DePasque & Tricomi, 2015; Ryan & Deci, 2000). Additionally, it has been observed that intrinsic motivation is related to the acquisition of certain metacognitive skills (Abdelrahman, 2020). These studies highlight the importance of fostering intrinsic motivation and genuine interest in promoting effective learning and the development of metacognitive abilities. Similarly, extrinsic motivation has been shown to have a positive correlation with academic achievement (Abdelrahman, 2020), suggesting that performance, being a variable measured by students' grades in a subject or a set of subjects, and thus an external goal, could have a greater influence on what is studied as "academic achievement".

Motivation in Primary Education students

Motivation is an exceedingly variable factor that is subject to social, contextual (e.g. Lee & Stankov, 2018), emotional (e.g. Acosta & Clavero, 2018) and self-concept (e.g. McArthur, et al. 2016). Consequently, gender and age become significant socio-demographic variables in the study of motivation in educational sciences (e.g. Anderman & Anderman, 2020; Pongračić et al., 2021). These factors can play a crucial role in shaping students' motivational patterns and responses to various educational experiences, emphasizing the need to consider individual differences and unique contextual factors when investigating motivation in educational settings.

First, analyzing how gender affects motivation, the results of the research carried by Pongracic (2021) show statistically significantly higher motivation in girls (Baharudin and Zulkefly, 2009), which is directly related to higher success. The research of Anderman and Anderman (2020) showed a higher intrinsic motivation results in girls and a higher extrinsic motivation results in boys. Moreover, according to Badola's research (2013), boys and girls perceive the school climate differently, which affects motivation. The influence of climate perception on hope for success seems to be lower in girls, but climate perception has a lower influence on fear of failure in boys. These results suggest that girls' perception of climate makes the development of achievement motivation more difficult, which is consistent with previous findings by Nicaise et al. (2006) and Mutz and Burrmann (2014). It has also been concluded that the influence of perceived climate is greater when there are more children in a class (Manzano-Sánchez, 2021).

Second, as for the differences according to the age of the participants, the results are practically equal (Δmean = 0.01), from which it is concluded that the level of motivation does not increase with the years of schooling, but remains practically at the same level (Pongracic, 2021). Although previous research (Dubow et al., 2009) shows a decrease in achievement and motivation as a trend that develops over the years. It should be noted that in research of Castaño-Rubio et al. (2011) no differences were found in motivational orientation according to age; however, in the study by Cervelló and Santos-Rosa (2007), higher values were identified in motivation towards the ego as the pupils grew older, as they depend more on the influence of the environment such as parents or peers. However, it should be noted that primary school pupils are more motivated than secondary school pupils, so it can be considered that the younger the age, the higher the intrinsic motivation of pupils (Steinmayr et al. 2019).

In sum, while age may influence levels of intrinsic motivation and may also be mediated by gender, this relationship is complex and multifaceted. Understanding how intrinsic motivation changes across the life cycle and is affected by gender can help design more effective motivational interventions and strategies in educational settings to promote greater personal satisfaction and optimal performance at all ages. Future research should continue to delve deeper into this area to obtain a more complete and accurate picture of how age and gender affect intrinsic motivation.

Relationship between motivation and academic achievement

The association between motivation and academic achievement has been frequently tested (Herges et al., 2017; Wang et al., 2022), and founded in longitudinal and transcultural studies (Michaelides et al., 2019). Multiple authors defend that motivation in elementary school is a very important variable considered to have implications in the students' development and results, as well as future school success (Broussard & Garrison, 2004; Rahmani, 2011). Regarding the research about the causality between motivation and academic achievement, we can find diverse data. Even though many theories have always suggested that intrinsic motivation influences academic achievement (Taylor et al., 2014), Liu & Hou (2018) found that there is a reciprocal relationship between different types of extrinsic and intrinsic motivation and achievement. Also, Xiao and Sun (2021) defend the complexity of the motivational profiles of students to be considered for academic development.

Taking into account the different perspectives and dimensions to define motivation, nowadays multiple findings can be considered to specify which of them will be more related to academic achievement. Among them, self-concept turned out to be a motivational predictor variable of academic achievement (Steinmayr et al., 2019), which can be strongly influenced by age and gender. Hornstra et al. (2013) also found that self-efficacy was the dimension that was most related to achievement. In addition, those authors established that other motivational variables should be considered, such as task orientation, but this one may be more influenced by other external factors. For example, effective and constructive feedback from teachers plays a crucial role in this regard and helps self-esteem. Providing feedback that highlights students' achievements and offers guidance for improvement builds their confidence and desire to achieve higher academic goals. Furthermore, Abdelrahman's research (2020) results showed that self-esteem, goal orientation components (mastery, approach performance and avoidance performance) and academic achievement are correlated. Other external factors, such as social relationships and emotional support, play a significant role in motivation. A positive school environment, where students feel valued and supported, fosters their active participation and desire to learn. Indeed, meaningful social interactions with peers and teachers can foster a sense of belonging and cooperation, creating a motivating and enriching environment (Manzano-Sánchez, 2021). These factors, being variable depending on the context, can influence the lack of significance in the relationship between intrinsic motivation and academic performance.

Various findings highlight the impact of intrinsic and extrinsic motivation, separately, on academic achievement. Latest research about the differences between intrinsic and extrinsic motivation to influence academic achievement have found that both play a substantial role in academic achievement, but outline the importance of intrinsic motivation (Zhang et al. 2023). Related to this, other authors have founded that there is no significant gender difference in this relationship, at least in intrinsic motivation (Abdelralmah, 2020). Continuing with the possibility of a moderation effect of gender and age in the relationship between motivation and achievement, a meta-analysis of Quílez-Robres et al. (2021) concluded that there is no significant difference according to gender. They also found that motivation changes over time, according to chronological age, level of maturity, and, above all, in higher levels of primary school, where motivation can decrease. Therefore, chronological age itself is not always a moderating factor of motivation.

Method

Sample

A total of 852 elementary school students participated in the present study (Age = 10.82; SD = .867). Of the total 423 were male and 429 were female. Regarding the grade, 98 came from 4th grade of primary education, 240 came from 5th grade of primary education and 514 came from 6th grade of primary education. Of the total, 31 came from public schools, 705 came from subsidized-schools and 116 came from private schools. Initially, the sample consisted of 1059 students in the pre phase, but -this sample was subsequently reduced to 852 students in the post phase (mortality

rate of 19.5%). This sample was collected through probabilistic methods, by asking a total of 218 centers to participate, although only 17 of them finally agreed to participate (acceptance rate of 7.8%).

Instruments

Participants were initially asked for information regarding their personal characteristics, such as age and sex. This information was complemented with the collection of data associated with intrinsic motivation and academic performance of primary school students.

To measure intrinsic motivation, the learning goals dimension was used, within the *Academic Goals Questionnaire* of García et al. (1998). This dimension, consisting of a total of 8 items measured on a 5-point Likert scale, measures the degree of students' motivational orientation towards learning (e.g., "I study because I like to learn new things"). This dimension showed optimal internal consistency values for research of α = .868 (García et al., 1998).

Finally, to measure academic performance, the arithmetic mean was calculated between each student's grades in natural sciences, mathematics and Spanish language. The teacher of each classroom group provided this information.

Procedure and data analysis

Once the research problem was established and the variables to be studied were decided, a sample database was constructed to form an experimental group. All participating individuals were briefed on the study's objectives and their involvement. In a subsequent phase, a document was sent to the management team of each school, explaining the study's objectives. If they agreed, the teacher assigned to the study would manage the necessary tasks. These documents were collected as a commitment to the center's participation. Furthermore, it was decided to create a control group consisting of teachers from the same institution and others from nearby environments, but with similar socio-economic, familial, school size, professional teaching experience, and educational network characteristics as those of the experimental group schools. Data from over 200 schools were collected, and contacts were established with them via email and electronically. The process followed for both groups has been similar.

In the third phase, an explanatory document was once again sent to the management team, outlining the guidelines and objectives. After final acceptance, participating teachers were trained, and they were made aware of the data collection system for achieving the research outcomes. Both the experimental and control groups were provided with similar documents: informed consent from the responsibles to authorize the participation of the students, ensuring complete confidentiality, as well as relevant theoretical information to understand the research process and to obtain all the data related to the independent variables of the research.

In the fourth phase, a pilot test was conducted to assess the reliability and suitability of the methodology to be followed in the classrooms, and to clarify and ensure basic methodological issues. This trial was conducted with a group of students representing the target group to minimize ambiguities and procedural errors. In the fifth phase, the

pilot tests were analyzed to establish the groups of students who would definitely participate in the research.

In the sixth phase, the information was coded, and the involved teachers completed a brief ad-hoc questionnaire to understand the quantitative and qualitative characteristics of their classroom activities. This was done to determine motivation and academic outcomes, and to what extent they had used them.

Regarding the intervention, on one hand, the experimental group conducted the activities during two terms, equivalent to about seven months, from September 2018 to April 2019. The teachers who completed the study in this group (n = 14) were well-versed in the basic theoretical aspects of the conducted research, and their motivation for conducting the research was high.

Concerning the data analysis, means, standard deviations, correlations and reliability indices were calculated for intrinsic motivation and academic performance in both the pre (T1) and post (T2) phases.

Subsequently, to respond to the main objective of the study, a moderation analysis was performed with the macro *Process* in *SPSS Statistics 24*. The moderation analysis allows us to determine whether the strength of the relationship between an independent variable and a dependent variable varies as a function of a third variable. For this first moderation analysis, longitudinal data was used. Specifically, it was used as the independent variable was intrinsic motivation (T1), the dependent variable was academic performance (T2), and the moderating variables were students' age and sex. In this analysis, Beta values, standard error, p-values, lower and upper limits, as well as conditional effects were estimated. This process was repeated again with longitudinal data considering academic performance (T1) as independent variable, intrinsic motivation (T2) as dependent variable, and age and sex as moderating variables. Finally, the model was fulfilled with two more moderation analyses of transversal data, first with data of T1's intrinsic motivation and academic achievement; and second with data of T2's intrinsic motivation and academic achievement.

Results

At first, a descriptive analysis of the data was performed. This analysis was enriched by studying correlations and assessing the reliability values of the main dimensions.

Table 1

Statistics descriptives, correlations and reliability analyses.

	M	**DT**	**1**	**2**	**3**	**4**
INM(T1)	4.08	.678	(.859)	.495***	.240***	.231***
INM(T2)	4.08	.772		(.898)	.206***	.313***
AAC(T1)	3.96	.931			-	.579***
AAC(T2)	3.90	.977				-

*Note. INM, Intrinsic motivation; AAC, Academic Achievement; T1, Time 1; T2, Time 2; *** p < .001; ** p < .01; * p < .05. Internal consistency estimated by Cronbach's Alpha located in the main diagonal in brackets. AAC's internal consistency is not calculated, as it is a unique item.*

Next, in Table 2, a moderation analysis was performed considering intrinsic motivation (T1) as the independent variable, academic performance (T2) as the dependent variable, and age and gender as the moderator variables.
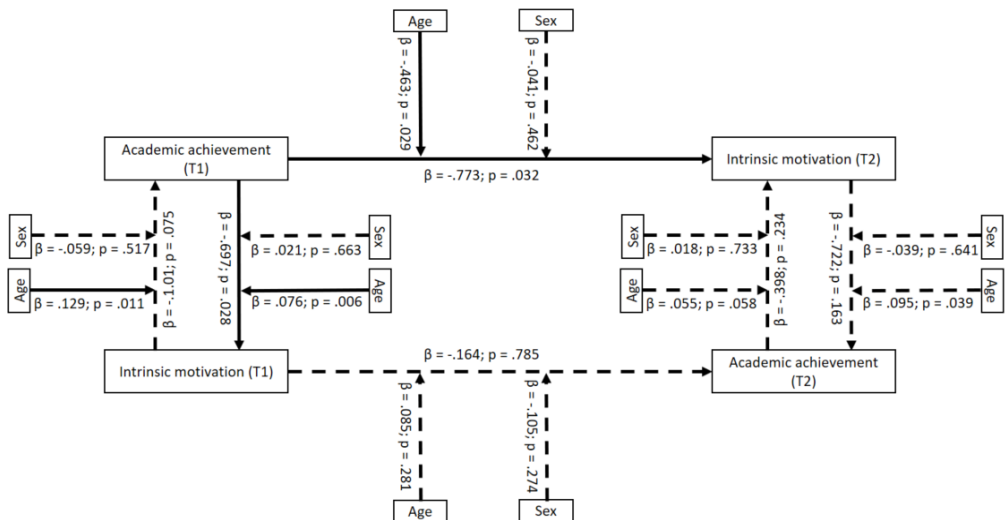
Table 2

Longitudinal relationship between intrinsic motivation (T1) and academic achievement (T2) when age and sex as moderators.

	β	*SE*	*p*	*LLCI*	*ULCI*	*Conditional Effects*
INM (T1)	-.164	.601	.785	-1.344	1.016	-
Age	-.326	.223	.144	-.763	.112	-
INM(T1)*Age	.058	.053	.281	-.047	.162	-
Sex	.568	.398	.153	-.212	1.348	-
INM(T1)*Sex	-.105	.096	.274	-.294	.083	

Note. INM(T1), Intrinsic Motivation in Time 1. SE, Standard error; LLCI, Lower limit for the confidence interval; ULCI, Upper limit for the confidence interval. Moderation analysis performed with 10,000 bootstrap samples. Conditional effects calculated by pick-a-point technique (-1SD, Mean, +1SD).

As can be seen in Figure 1, the relationship between intrinsic motivation (T1) and academic achievement (T2) was statistically non-significant (β = -.164; p = 785), regardless of the age (β = .058; p = 281) and sex (β = -.105; p = 274) of the primary school students.

Note. Dashed lines represent statistically non-significant relationships (p > .05).

Figure 1. Relationship between intrinsic motivation and academic achievement when age and sex as moderators for the different times T1 and T2.

Secondly, collected in Table 3, a moderation analysis was performed considering intrinsic motivation (T1) as the independent variable, academic performance (T2) as the dependent variable, and age and gender as the moderator variables.

Table 3

Longitudinal relationship between academic achievement (T1) and intrinsic motivation (T2) when age and sex as moderators.

	β	*SE*	*p*	*LLCI*	*ULCI*	*Conditional Effects*
AAC(T1)	-.773	.361	.032	-1.481	-.065	-
Age	-.463	.129	<.001	-.716	-.209	
*AAC(T1)*Age*	.090	.031	.004	.029	.152	9.96Y (β = .058; p = .169) 10.83Y (β = .143; p = .000) 11.69Y (β = .228; p = .000)
Sex	.281	.225	.214	-.162	.723	-
*ACA(T1)*Sex*	-.041	.055	.462	-.149	.068	-

Note. AAC(T1), Academic Achievement in Time 1. SE, Standard error; LLCI, Lower limit for the confidence interval; ULCI, Upper limit for the confidence interval; Y, Years. Moderation analysis performed with 10,000 bootstrap samples. Conditional effects calculated by pick-a-point technique (-1SD, Mean, +1SD).

As can be seen in Figure 1, academic performance (T1) statistically significantly predicted intrinsic motivation (T2) (β = -.773; p = .032). Furthermore, this relationship was moderated by age (β = -.463; p = .029), but not by sex (β = .041; p = .462). Specifically, in relation to age, in Figure 2, it can be seen from the conditional effects how academic performance (T1) statistically significantly predicted intrinsic motivation (T2) only in middle-aged (β = .143; p < .001) and older elementary school students (β = .228; p < .001), but not in young elementary school students (β = .058; p = .169).
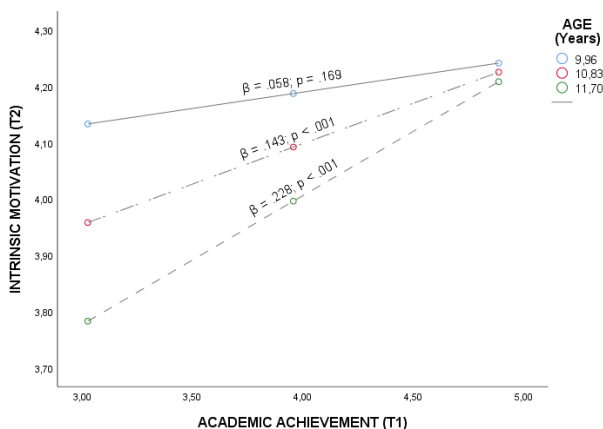

Figure 2. Relationship between academic achievement (T1) and intrinsic motivation (T2) when age as moderator.

Finally, and illustrated in Figure 1, when considering transversal data first of T1 and then of T2, it can be seen that just the relationship between academic achievement (T1) and intrinsic motivation (T1) was statistically significant (β = -.697; p = .028) and it was also moderated by the age (β = .076; p = .006).

Discussion

Based on our findings, there is no substantiated evidence to validate the notion that intrinsic motivation leads to improved academic performance among primary school students. These results contradict those suggesting that intrinsic motivation is a significant predictor of academic performance (e.g., Hornstra et al., 2013; Steirmayr et al., 2019). However, these studies, like others (e.g. Liu & Hou, 2018; Manzano-Sánchez, 2021), also shows that the relationship between intrinsic motivation and academic performance is more complex than it appears to be. Our results seem to emphasize the complexity of this relationship, and this will be further explored in this section.

Conversely, the results indicate that academic achievement might predict intrinsic motivation, particularly among the older primary school students, contradicting the prevailing belief held by educators. These results contradict the findings of Hornstra et al. (2013), which is a longitudinal study that examined the relationship between intrinsic motivation and academic achievement in primary school students, where a relationship between intrinsic motivation and academic performance was observed. Regarding this, Liu and Hou (2018) discovered that both intrinsic motivation and extrinsic motivation significantly predicted academic achievement, with the combination of these two perspectives of motivation being the most accurate predictor. Our findings align with this, indicating that academic performance might be a stronger predictor of intrinsic motivation than the opposite. Finally, it is worth mentioning studies that aimed to identify non-cognitive predictors of academic performance (Lee & Stankov, 2018; Manzano-Sánchez, 2021). Generally, these studies support the notion that non-cognitive factors are significant predictors of academic achievement. Our findings are consistent with the results of these previous studies, indicating that intrinsic motivation alone may not be a strong predictor of academic performance.

Furthermore, our research revealed that the connection between academic performance and intrinsic motivation was influenced by age but not by gender. These results are similar to those found by Herges et al. (2017), who found that age was a significant predictor of intrinsic motivation, with younger individuals showing higher levels of intrinsic motivation compared to older ones. When it comes to the influence of gender on this relationship, as seen in Rahmani's study (2011), it is generally girls who show higher levels of intrinsic motivation compared to boys, thereby influencing their academic performance. This contrasts with our results.

These findings have important implications both theoretical and practical. Regarding theoretical implications and future research, since motivation is a variable that changes over time, it is recommended to study the evolution of types of motivation over more extended periods than two years. Additionally, other variables that were not examined in this study, such as school and classroom climate, teacher-student relationships, and

self-concept, should be analyzed to understand how both internal and external factors moderate the relationship between motivations and academic performance.

Regarding the practical implications, for teachers and educators, the results suggest that providing opportunities for success may be more an effective way to improve students' intrinsic motivation. The key takeaway from this study would be to focus on creating a learning environment that provides opportunities for success and fosters a sense of competence and autonomy in students. This could involve setting achievable goals, providing feedback that emphasizes progress and improvement, and encouraging students to take ownership of their learning by allowing them to make choices and decisions about their work. By focusing on creating a supportive and empowering learning environment, teachers and educators could help promote intrinsic motivation and academic success in their students.

This study has several limitations to take into account when interpreting the results. One limitation is the sample size, which may limit the generalizability of the findings to other populations or contexts. Additionally, the study relied on self-reported measures of intrinsic motivation and academic performance, which may be subject to bias or measurement error. Another limitation of the study is that it did not examine the role of other potential moderators of the relationship between intrinsic motivation and academic performance, such as cultural background or socioeconomic status.

Despite these limitations, the study provides valuable insights into the complex and multifaceted relationship between intrinsic motivation and academic performance, and highlights the importance of considering individual differences and contextual factors when designing interventions and strategies to promote academic success.

References

Abdelrahma, R. M. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. *Heliyon*, *6*(9), e04192. https://doi.org/10.1016/j.heliyon.2020.e04192

Acosta, F. P., & Clavero, F. H. (2018). Relaciones entre rendimiento e inteligencia emocional en secundaria. *Tendencias Pedagógicas*, *31*, 165-186.

Anderman, E. M., & Anderman, L. H. (2020). *Classroom Motivation: Linking Research to Teacher Practice* (3rd ed.). Routledge. https://doi.org/10.4324/9781003013600

Badola, S. (2013). Effect of School's on Academic Achievement Motivation of Secondary level Students. *Educationia Confab*, *2*, 61–66.

Baharudin, R., & Zulkefly, N. S. (2009). Relationships with Father and Mother, Self-Esteem and Academic Achievement amongst College Students. *American Journal of Scientific Research*, *6*.

Borić, E. (2017). Teachers' job satisfaction, work motivation, and encouragement of competences among pupils. *Metodički ogledi: časopis za filozofiju odgoja*, *24*(2), 23-38.

Broussard, S. C., & Garrison, M. E. B. (2004). The Relationship Between Classroom Motivation and Academic Achievement in Elementary-School-Aged Chil-

dren. *Family and Consumer Sciences Research Journal, 33*, 106-120. https://doi.org/10.1177/1077727X04269573

Castaño-Rubio, I., Rodríguez Suárez, N., & Granero-Gallegos, A. (2011). Orientaciones de meta de los jóvenes escolares del colegio El Buen Pastor de Murcia. Espiral. *Cuadernos del Profesorado*, *4*(8), 13-21. http://dx.doi.org/10.25115/ecp.v4i8.921

Cerasoli, C. P., Nicklin, J. M., & Ford, M. T. (2014). Intrinsic motivation and extrinsic incentives jointly predict performance: a 40-year meta-analysis. *Psychological bulletin, 140*(4), 980-1008. https://doi.org/10.1037/a0035661

Cervelló, E. M., & Santos-Rosa, F. (2007). Motivación en las clases de Educación Física: un estudio de la perspectiva de las metas de logro en el contexto educativo. *Revista de Psicología del Deporte, 9*(12).

Cook, D. A. & Artino, A. R., J.R. (2016). Motivation to learn: an overview of contemporary theories. *Medical Eduction, 50*(10), 997-1014. https://doi.org/10.1111/medu.13074

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology, 53*(6), 1024-1037. https://doi.org/10.1037/0022-3514.53.6.1024

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*(6), 627-668.

DePasque, S., & Tricomi, E. (2015). Effects of intrinsic motivation on feedback processing during learning. *NeuroImage, 119*, 175-186. https://doi.org/10.1016/j.neuroimage.2015.06.046

Dubow, E., Boxer, P., & Huesmann, L. (2009). Long-term Effects of Parents' Education on Children's Educational and Occupational Success: Mediation by Family Interactions, Child Aggression, and Teenage Aspirations. Merrill-Palmer quarterly (Wayne State University Press), *55*, 224-249. https://doi.org/10.1353/mpq.0.0030

Eccles, J. S., & Wigfield, A. (1995). In the Mind of the Actor: The Structure of Adolescents' Achievement Task Values and Expectancy-Related Beliefs. *Personality and Social Psychology Bulletin, 21*(3), 215–225. https://doi.org/10.1177/0146167295213003

García, M. S., González-Pineda, J. A., Núñez, J. C., González-Pumariega, S., Álvarez, L., Roces, C., González, R., & Valle, A. (1998). El cuestionario de metas académicas (CMA): un instrumento para la evaluación de la orientación motivacional de los alumnos de Educación Secundaria. *Aula Abierta, 71*, 175-199.

Hennessey, B., Moran, S., Altringer, B., & Amabile, T. M. (2015). Extrinsic and intrinsic motivation. *Organizational Behavior, 11.* https://doi.org/10.1002/9781118785317.weom110098

Herges, R. M., Duffield, S., Martin, W., & Wageman, J. (2017). Motivation and Achievement of Middle School Mathematics Students. *The Mathematics Educator, 26*, 1, 83–106.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41*(2), 111-127. https://doi.org/10.1207/s15326985ep4102_4

Hornstra, L., van der Veen, I., Peetsma, T., & Volman, M. (2013). Developments in motivation and achievement during primary school: A longitudinal study on group-specific differences. *Learning and Individual Differences, 23*, 195-204. https://doi.org/10.1016/j.lindif.2012.09.004

Kusurkar, R. A., Croiset, G., Mann, K. V., Custers, E., & Ten Cate, O. (2012) Have motivation theories guided the development and reform of medical education curricula? *A review of the literature. Academic Medicine, 87*(6), 735-43. https://doi.org/10.1097/ACM.0b013e318253cc0e

Lee, J., & Stankov, L. (2018). Non-cognitive predictors of academic achievement: Evidence from TIMSS and PISA. *Learning and Individual Differences, 65*, 50-64. https://doi.org/10.1016/j.lindif.2018.05.009

Lens, W., Paixão, M. P., & Herrera, D. (2009). Instrumental Motivation is Extrinsic Motivation: So What??? *Psychologica, 50*, 21-40. https://doi.org/10.14195/1647-8606_50_2

Liu, Y., & Hou, S. (2018). Potential reciprocal relationship between motivation and achievement: A longitudinal study. *School Psychology International, 39*(1), 38–55. https://doi.org/10.1177/0143034317710574

Manzano-Sánchez, D. M. (2021). Differences between psychological aspects in Primary Education and Secondary Education. Motivation, Basic Psychological Needs, Responsibility, Classroom Climate, Prosocial and Antisocial behaviors and Violence | Diferencias entre aspectos psicológicos en Educación Primaria y Educación Secundaria. Motivación, Necesidades psicológicas básicas, Responsabilidad, Clima de aula, Conductas antisociales y Violencia. *Espiral. Cuadernos del profesorado, 14*(28). https://doi.org/10.25115/ecp.v14i28.4198

McArthur, A., Ellis, H. H., & Havard, B. (2016). Perceptions of Technology Integration and Creative Curricula in Child Education. *thannual*, 77.

Michaelides M. P., Gavin, G. T. L., Brown, T. L., Eklöf, H., & Papanastasiou, E. C. (2019). The Relationship of Motivation with Achievement in Mathematics. In IEAR (Ed.), *Motivational Profiles in TIMSS, 7*, 9-23. Springer, Cham. https://doi.org/10.1007/978-3-030-26183-2_2

Mutz, J.-P. D. M., & Burrmann, U. (2014). Sind Mädchen im koedukativen Sportunterricht systematisch benachteiligt? [Does coeducational Physical Education systematically discriminate against girls? New evidence on an old debate]. *Sportwissenschaft, 44*, 171– 181. https://doi.org/10.1007/s12662-014-0328-x

Nicaise, V., Cogérino, G., Bois, J., & Amorose, A. J. (2006). Students' perceptions of teacher feedback and physical competence in Physical Education classes: Gender effects. *Journal of Teaching in Physical Education, 25*, 36–57. https://doi.org/10.1123/jtpe.25.1.36

Pongračić, L., Hasanagić, D. L., & Komadina, L. T. (2021). Motivation Factors for Elementary School Students. *European Journal of Teaching and Education, 3*(1), 1-10. https://doi.org/10.33422/ejte.v3i1.646

Quílez-Robres, A., Moyano, N., & Cortés-Pascual (2021). Motivational, Emotional, and Social Factors Explain Academic Achievement in Children Aged 6–12 Years: A Meta-Analysis. *Education Sciences, 11*(9), 513. https://doi.org/10.3390/educsci11090513

Rahmani, P. (2011). The relationship between self-esteem, achievement goals and academic achievement among the primary school students. *Procedia - Social and Behavioral Sciences, 29*, 803-808. https://doi.org/10.1016/j.sbspro.2011.11.308

Ryan, R. M., & Deci, E. L. (2000). When rewards compete with nature: The undermining of intrinsic motivation and self-regulation. In Sansone, C. & Harackiewicz, J. (Eds). In, *Intrinsic and extrinsic motivation* (pp. 13-54). Academic Press.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications. http://ebookcentral.proquest.com/lib/purdue/detail.action?docID=4773318.

Schunk, D. H., & Usher, E. L. (2012). Social Cognitive Theory and Motivation. In R. M. Ryan (Ed.), *The Oxford Handbook of Human Motivation* (pp. 13-27). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195399820.013.0002

Steinmayr, R., Weidinger, A. F., Schwinger, M., & Spinath, B. (2019). The Importance of Students' Motivation for Their Academic Achievement – Replicating and Extending Previous Findings. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.01730

Taylor, G.; Jungert, T.; Mageau, G. A. ; Schattke, K.; Dedic, H.; Rosenfield, S. & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: the unique role of intrinsic motivation. *Contemporary Educational Psychology, 39*(4), 342-358. https://doi.org/10.1016/j.cedpsych.2014.08.002.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology, 29*, 271-360. https://doi.org/10.1016/S0065-2601(08)60019-2

Wang, C., Cho, H. J., Wiles, B., Moss, J. D., Bonem, E. M., Li, Q., Lu, Y., & Levesque-Bristol, C. (2022). Competence and autonomous motivation as motivational predictors of college students' mathematics achievement: from the perspective of self-determination theory. *International Journal of STEM Education, 9*, 41. https://doi.org/10.1186/s40594-022-00359-7

Weiner, B. (1972). Attribution theory, achievement motivation, and the educational process. *Review of educational research, 42*(2), 203-215. https://doi.org/10.2307/1170017

Weiner, B. (Ed.). (1974). *Achievement motivation and attribution theory*. General Learning Press.

Xiao F., & Sun, L. (2021). Students' Motivation and Affection Profiles and Their Relation to Mathematics Achievement, Persistence, and Behaviors. *Frontiers in Psychology, 11*. https://doi.org/10.3389/fpsyg.2020.533593

Zhang, Y., Yang, X., Sun, X., & Kaiser, G. (2023). The reciprocal relationship among Chinese senior secondary students' intrinsic and extrinsic motivation and cogni-

tive engagement in learning mathematics: a three-wave longitudinal study. *ZDM Mathematics Education, 55,* 399–412. https://doi.org/10.1007/s11858-022-01465-0