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The Evolving Relationship Between Reading Motivation and Achievement: A Longitudinal Study

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Abstract

This study examined the reciprocal relationship between reading engagement or motivation and reading achievement across primary and secondary grades in Chile. Using longitudinal SIMCE data from a cohort of 47,073 students assessed in Grade 4 (ages 9–10), Grade 8 (ages 13–14), and Grade 10 (ages 15–16), the study employed structural equation modeling to explore how reading comprehension and motivation influenced one another over time. Results revealed strong temporal stability in both constructs, with reading achievement showing robust continuity across all time points. From Grade 4 to Grade 8, reading achievement more strongly predicted later motivation than the reverse. In contrast, from Grade 8 to Grade 10, motivation became a stronger predictor of reading achievement. These findings suggest a shift in the directionality of influence, with motivation playing an increasingly important role in sustaining reading performance during secondary school. The results provide evidence on what to prioritize at different stages: in primary school, securing strong reading skills is essential for later engagement, while in secondary school, fostering motivation becomes key to maintaining achievement. In this way, the study offers guidance for schools and policymakers on how to design stage-specific strategies that support both skill development and long-term engagement with reading.

Keywords: reading achievement; reading motivation; structural equation modeling; longitudinal study; adolescence

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1. Introduction

Reading proficiency is widely recognized as a foundational skill that is fundamental to academic achievement, employability, civic participation, and individual well-being. However, reading performance does not develop in isolation: students' motivation to read can play a critical role in shaping reading habits and outcomes (De Naeghel et al., 2012; Miyamoto et al., 2019; Schaffner et al., 2013; Schaffner & Schiefele, 2016).

Decades of research have demonstrated a complex, reciprocal relationship between reading achievement and reading motivation (Becker et al., 2010; Chapman & Tunmer, 1995; Hebbecker et al., 2019; Miyamoto et al., 2019; Morgan & Fuchs, 2007). As explained by Self-Determination Theory (Ryan & Deci, 2000) and Expectancy-Value models (Eccles et al., 1983; Wigfield & Eccles, 2000), this reciprocal relationship suggests that students who feel competent as readers develop higher intrinsic motivation, which in turn promotes further reading engagement and achievement. Conversely, students who struggle with reading early on are at risk of decreased motivation and, consequently, continued underachievement (Morgan et al., 2008; Schiefele et al., 2016; Vaknin-Nusbaum et al., 2018).

1.1. Definition of Concepts

This study focuses on three concepts: reading achievement, reading motivation, and reading engagement. In the literature on literacy development, reading achievement is typically operationalized as a measurable outcome that reflects a student's ability to process and understand written text at different levels of complexity. While some studies refer more specifically to reading comprehension—the process by which a reader constructs meaning from text (Perfetti et al., 2005)—the broader construct of reading achievement is generally preferred when discussing longitudinal models and reciprocal relations (Hebbecker et al., 2019; Toste et al., 2020). This is because reading achievement often includes comprehension as its core dimension but also captures related skills such as vocabulary, fluency, and word recognition (RAND Reading Study Group & Snow, 2002).

In the context of large-scale educational assessments such as SIMCE (System for Measurement of Educational Quality, acronym in Spanish) in Chile, the term reading achievement is also commonly used to refer to test scores that primarily measure students' comprehension of narrative and expository texts. Therefore, for the purposes of this study, reading achievement is defined as students' demonstrated ability to understand, interpret, and critically engage with written texts, as measured by standardized reading assessments over time.

Reading motivation is defined as the drive to read resulting from beliefs, attitudes, and goals for reading: intrinsic motivation responds to internal purposes—i.e., pleasure or curiosity—and extrinsic motivation to external purposes—i.e., reward or recognition (Conradi et al., 2014). Rooted in Self-Determination Theory (SDT; Ryan & Deci, 2000), reading motivation describes the psychological drive behind an individual's engagement with reading. The focus of this study will be solely on intrinsic reading motivation, operationalized as the enjoyment of reading.

The third construct is reading engagement, which can be defined as the frequent and relatively stable habit of reading (Lee et al., 2021). Although reading motivation and reading engagement are close constructs, this study distinguishes between both while acknowledging their association (Unrau & Quirk, 2014). Reading motivation has been described like potential energy, encompassing the reasons that put students on the verge of reading; while reading engagement is like kinetic energy, representing the dedicated action of reading (Afflerbach & Harrison, 2017).

1.2. The Reciprocal Relationship Between Reading Motivation and Reading Achievement

Over the past three decades, researchers have repeatedly demonstrated that reading achievement and reading motivation are intertwined in a dynamic, reciprocal relationship that shapes students' academic growth from early schooling through adolescence (Coventry et al., 2023; Hebbecker et al., 2019; Miyamoto et al., 2019; Morgan & Fuchs, 2007; Schiefele et al., 2012; Toste et al., 2020; van Bergen et al., 2023).

One of the earliest empirical foundations for this relationship came from Gottfried (1990), who found that young children's motivation to read was strongly correlated with their reading skills, suggesting a close connection between the two even at the start of formal schooling. Chapman and Tunmer (1995, 1997) built on this work, showing that early reading skills and self-reported motivation were consistently correlated. Their findings laid the groundwork for viewing reading success as a driver of motivational beliefs and attitudes. Similarly, other studies found that children's early differences in reading skills could predict later differences in motivation, and vice versa, supporting a bidirectional framework (Lepola et al., 2000, 2005).

Building on this, longitudinal studies have clarified the mechanisms linking motivation and achievement. McElvany et al. (2008) found that intrinsic motivation in Grade 4 predicted reading literacy in Grade 6, but primarily through increased reading

behavior—suggesting that motivation contributes to achievement by fostering engagement. Becker et al. (2010) and Schaffner et al. (2013) confirmed this mediating role of reading amount, showing that motivated students read more, which in turn boosts comprehension. These findings align with broader learning models emphasizing behavioral engagement as the bridge between beliefs and academic outcomes (Guthrie et al., 2007).

At the same time, achievement also shapes motivation. Morgan and Fuchs (2007) synthesized longitudinal evidence showing that early reading success fosters positive self-concepts and attitudes toward reading, whereas early struggles often lead to declining motivation. This reinforces theoretical perspectives like Self-Determination Theory, which posits that feelings of competence are key to sustaining intrinsic motivation (Ryan & Deci, 2000).

Other longitudinal studies indicate that the relationship between reading motivation and achievement is reciprocal but not equally strong in both directions. Miyamoto et al. (2019) analyzed German students from Grade 5 to Grade 7 using a cross-lagged panel model. They found that reading competence predicted later intrinsic motivation ($\beta = 0.19$, $p < 0.01$), whereas motivation predicted later competence more weakly ($\beta = 0.13$, $p < 0.01$). Notably, these reciprocal effects were less evident for immigrant students, suggesting that sociocultural factors may condition the strength of the pathways. Hebbecker et al. (2019) expanded on this work with a multi-wave design that included intrinsic and extrinsic motivation. They observed strong stability of reading achievement across time ($\beta = 0.64$–0.76) and consistent paths from achievement to later intrinsic motivation. In contrast, the reverse pathway from intrinsic motivation to later achievement was statistically significant at only one interval, and extrinsic motivation showed no predictive value. At the aggregate level, Toste et al. (2020) synthesized findings from 132 studies and confirmed that achievement is the stronger predictor of later motivation ($r = 0.15$) compared to the reverse pathway ($r = 0.06$). Together, these studies support the view that the achievement-to-motivation pathway dominates during the school years.

Recent genetically informed and advanced longitudinal models provide further nuance. van Bergen et al. (2023) analyzed Finnish twins to test the causal ordering of literacy skills and enjoyment. Their models showed that literacy skills, which were highly stable and largely explained by genetic factors, predicted later enjoyment, while the reverse path was absent. This result provides stronger causal evidence for the primacy of achievement in shaping motivation. Coventry et al. (2023), however, introduced a developmental perspective using random-intercept cross-lagged panel models with Australian twins across Grades 3, 5, 7, and 9. Their results indicated that in primary school, reading achievement predicted subsequent enjoyment more strongly than the reverse. By secondary school, the direction reversed, with enjoyment predicting later achievement. They described this sequence as a "skill–leisure–skill" pattern, suggesting that competence initially builds motivation, but once basic skills are mastered, motivation becomes more critical for sustaining achievement.

Decades of empirical evidence converge on a clear conclusion: the relationship between reading motivation and reading achievement is indeed reciprocal but asymmetrical. Early reading success fuels future motivation more robustly than motivation predicts later achievement. Understanding how this dynamic unfolds in under-researched contexts, such as Chile, can help design targeted policies and interventions to break cycles of low literacy and disengagement.

1.3. Reading Achievement in the Chilean Context

Despite sustained policy efforts in recent decades, reading achievement remains one of the most persistent challenges in Chile's education system. National large-scale assessments indicate that 49% of tenth-grade students do not meet expected levels of reading proficiency (Agencia de Calidad de la Educación, 2025). Longitudinal data further underscore the

severity of this issue: in 2018, 29% of fourth-grade students performed at an insufficient level, a proportion that increased to 49% when the same cohort reached tenth grade in 2024 (Agencia de Calidad de la Educación, 2019, 2025).

This pattern suggests that the Chilean school system struggles not only to close initial reading gaps but also to prevent students who start with adequate comprehension skills from falling behind as they progress through higher grades. In parallel, evidence from the PIAAC (Programme for the International Assessment of Adult Competencies) shows that these gaps extend into adulthood: 53% of Chilean adults aged 16 to 65 are at the lowest levels of functional literacy, limiting their ability to access, process, and use written information in everyday life and work (Ministerio de Educación, 2024).

Despite these challenges, national longitudinal studies have shown that reading trajectories are not entirely fixed. For instance, analyses of Chilean SIMCE cohorts indicate that while most students (around 68%) maintain stable levels of reading performance over time, a small proportion (around 5%) succeed in reversing an early disadvantage and reach satisfactory levels of reading comprehension by the end of secondary education (Cubillos, 2021). Understanding the factors that explain these upward or downward trajectories remains an open question in Chilean educational research.

Given this context, there is a clear need for robust longitudinal evidence to better understand how reading motivation may influence the development of reading skills within the Chilean context. The present study addresses this gap by examining the reciprocal relationship between reading motivation and reading achievement across key educational stages, drawing on nationwide data.

1.4. This Study

Although substantial evidence supports the reciprocal relationship between reading achievement and reading motivation (Hebbecker et al., 2019; Miyamoto et al., 2019; Toste et al., 2020), much of this research has been conducted in North American and European contexts. As a result, there is limited understanding of how these dynamics operate in Latin American countries, where cultural, socioeconomic, and educational factors may shape students' reading trajectories in distinctive ways (Orellana et al., 2020). This gap limits the cross-cultural validity of current models explaining how students' skills and motivation influence each other over time.

The present study aims to address this gap by analyzing the longitudinal relationship between reading achievement and reading motivation in Chile, a country with persistent challenges in literacy achievement (Agencia de Calidad de la Educación, 2025). Drawing on nationwide SIMCE assessment data collected at three key points during students' schooling, this research offers one of the first large-scale examinations of how motivation and comprehension interact across multiple years in the Chilean context.

Specifically, this study is guided by the following research questions:

1. What is the nature of the bidirectional relationship between reading motivation and reading achievement among Chilean students across time?
2. Does the strength of the pathway from reading motivation to reading achievement differ from the strength of the reverse pathway (from reading achievement to motivation) across two distinct periods of schooling?

2. Materials and Methods

2.1. Data Sources

Panel data for this study was collected by the Chilean Agency for Educational Quality (Agencia de Calidad de la Educación). Researchers may request access to the databases through the platform: https://www.portaltransparencia.cl (accessed on 15 November

2023). Annually, the Agency administers the SIMCE, a series of standardized tests and questionnaires, over two consecutive days in late spring. All students in the selected cohorts (typically fourth, eighth, and tenth grade), regardless of school type, must take four tests. This study only includes results from the reading test. For the cohort included in this study, the only years in which student questionnaires included items on reading motivation or engagement were 2011 (Grade 4, two items on reading engagement), 2015 (Grade 8, eleven items on intrinsic motivation), and 2017 (Grade 10, eight items on intrinsic motivation for half of the students, while the other half received a different questionnaire). These were therefore the only years available for analyzing the reciprocal relationship between reading achievement and motivation.

2.2. Sample

The sample consists of the 47,073 Chilean students (52% female) for whom available variables were available for 2011 (4th grade), 2015 (8th grade) and 2017 (10th grade). The sample represents 25% of the 10th grade students in 2017 for whom valid reading scores were available (N = 185,460). Students in this sample were heterogeneous in terms of socioeconomic status (SES) and similar to the national distribution: 16% attended low SES schools, 33% attended medium-low SES schools, 26% attended medium SES schools, 14% attended medium-high SES schools, and 11% attended high SES schools.

2.3. Analysis

To estimate the bidirectional relationship between reading comprehension and motivation or engagement, a Structural Equation Modeling (SEM) approach was employed using maximum likelihood. Standardized scores from the SIMCE reading test were used as a reading achievement measure. Measures of motivation and engagement were constructed through principal component factor analysis, combining information from relevant questionnaire items for each grade level: 11 reading motivation items for 8th, 7 reading motivation items for 10th grade, and 2 reading engagement items for 4th grade. The resulting factors were standardized. To estimate the reciprocal relationship between reading comprehension and motivation, we included first- and second-order autoregressive terms, as well as cross-lagged effects. We also allowed for contemporaneous covariance in the error terms.

2.4. Measures

The reading motivation and engagement measures depended on the items available in the questionnaires for each year:

4th grade (2011): Students responded to one ordinal item regarding their frequency of reading for pleasure outside of school (0 = Never; 5 = Every day); and another ordinal item inquired about the number of books they had read for pleasure in the previous 6 months (0 = None; 6 = 6 or more).

8th grade (2015): Students rated their agreement with eleven items (e.g., “Reading is one of my favorite hobbies”, “I like to express my opinions about books I have read”) on a four-point Likert scale regarding their intrinsic reading motivation (1 = “Strongly disagree”, 4 = “Strongly agree”). These items were identical to those used in the Reading Enjoyment (JOYREAD) scale used in the 2009 PISA Student Questionnaire. Negative items were reverse coded (e.g., “I read only if I have to”, “For me, reading is a waste of time”). Scale reliability was estimated using the Stata 15 alpha command with all eleven items included, after reverse coding negatively worded items, yielding a high Cronbach’s alpha of 0.89.

10th grade (2017): Students rated their agreement with seven items (e.g., “Reading is one of my favorite hobbies”, “I like to express my opinions about books I have read”) on a

four-point Likert scale regarding their intrinsic reading motivation (1 = "Strongly disagree", 4 = "Strongly agree"). Six of these items were identical to those used in the Reading Enjoyment (JOYREAD) scale used in the 2009 PISA Student Questionnaire. Negative items were reverse coded (e.g., "I read only to get information that I need"). Scale reliability was estimated using the Stata alpha command with all seven items included, after reverse coding negatively worded items, yielding a high Cronbach's alpha of 0.91.

3. Results

Figure 1 and Table 1 show the estimated marginal effects of structural equations. Estimates of lesser interest were omitted for clarity. All estimators were significant at the 1% level. Since all variables are standardized, coefficients represent the effect of an increase of one standard deviation in the explanatory variable on the dependent variable. All estimated marginal effects have the expected signs. Results illustrate the strong stability of both reading achievement and motivation across time, as well as the shift in cross-domain effects—from achievement predicting later motivation in earlier grades to motivation predicting later achievement in later grades.

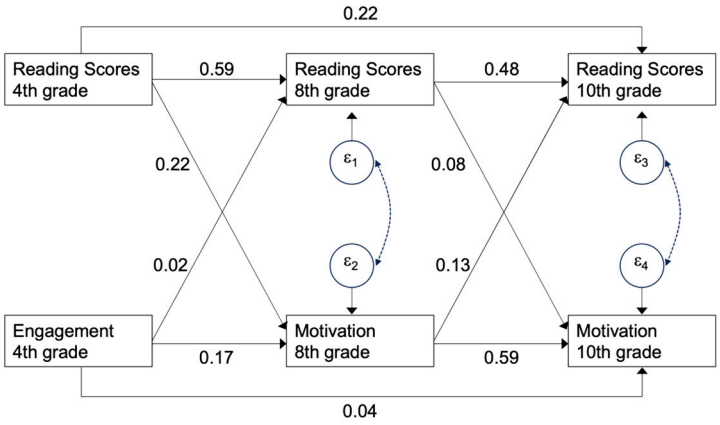

Figure 1. Structural Equation Model Results. Note. Solid lines represent estimated parameters. Dotted line represents covariance between errors.

3.1. Stability of Constructs over Time

Reading achievement demonstrated strong temporal stability. Reading scores in Grade 4 significantly predicted reading scores in Grade 8 (β = 0.59), which in turn predicted scores in Grade 10 (β = 0.48). In addition, a direct long-term path from Grade 4 reading scores to Grade 10 reading scores was observed (β = 0.22).

Reading motivation also showed notable continuity across time. Motivation in Grade 8 was significantly predicted by engagement in Grade 4 (β = 0.17), and motivation in Grade 10 was strongly predicted by motivation in Grade 8 (β = 0.59), revealing high motivational stability. A small but statistically significant direct path from 4th-grade engagement to 10th-grade motivation was also present (β = 0.04).

Table 1. Structural Equation Model Results.

Research Interest	Paths Examined	Stand. Estimates	Key Finding
Stability	Achievement 4 → Achievement 8	0.59 ***	Strong stability in both constructs
	Achievement 8 → Achievement 10	0.48 ***	
	Motivation 8 → Motivation 10	0.59 ***	
	Engagement 4 → Motivation 8	0.17 ***	

Table 1. *Cont.*

Research Interest	Paths Examined	Stand. Estimates	Key Finding
Achievement → Motivation	Achievement 4 → Motivation 8 Achievement 8 → Motivation 10	0.22 *** 0.08 ***	Achievement predicts later motivation, stronger earlier.
Motivation → Achievement	Engagement 4 → Achievement 8 Motivation 8 → Achievement 10	0.02 *** 0.13 ***	Motivation predicts later achievement, stronger later.
Long-Term Effects	Achievement 4 → Achievement 10 Engagement 4 → Motivation 10	0.22 *** 0.04 ***	Evidence of direct long-term effects.

Note. *** indicates significance at the 1%.

3.2. Effects of Reading Achievement on Later Motivation

Reading achievement exerted significant cross-domain effects on motivation. Grade 4 reading scores predicted Grade 8 motivation (β = 0.22), while Grade 8 reading scores had a smaller yet still significant effect on motivation in Grade 10 (β = 0.08). Additionally, reading scores in Grade 4 had a direct long-term effect on Grade 10 motivation (β = 0.13).

3.3. Effects of Motivation on Later Reading Achievement

Motivation and engagement also predicted later reading achievement, although effect sizes were smaller than those for stability paths. A small but statistically significant effect was observed from 4th-grade engagement to 8th-grade reading scores (β = 0.02), and Grade 8 motivation also significantly predicted Grade 10 reading scores (β = 0.13).

3.4. Comparative Patterns Across Time and Constructs

Comparing effect sizes across constructs and time points reveals several key patterns. Achievement stability was robust across all time points (β = 0.59 from Grade 4 to 8; β = 0.48 from Grade 8 to 10), with a lasting direct influence of Grade 4 achievement on Grade 10 scores (β = 0.22). These were the strongest paths in the model. Motivation stability from Grade 8 to 10 (β = 0.59) was nearly equivalent to that of achievement, emphasizing the long-term consistency of motivational dispositions.

Cross-domain effects from achievement to motivation were stronger in earlier years (β = 0.22 from Grade 4 to 8) than in later years (β = 0.08 from Grade 8 to 10). Cross-domain effects from motivation to achievement emerged more strongly in the later years (β = 0.13 from Grade 8 to 10), than in the first time periods (β = 0.02 from Grade 4 to 8).

Overall, reading achievement predicted motivation more strongly in earlier grades, while motivation's predictive power on achievement increased over time, suggesting a shift in directionality as students progress through school. These findings reveal a shifting relationship between achievement and motivation across time, with early achievement promoting motivation, and motivation playing a progressively greater role in maintaining academic performance during adolescence.

4. Discussion

The present study investigated the reciprocal relationship between reading comprehension, reading motivation, and reading engagement across critical developmental stages from elementary to secondary school in a large Chilean sample. The structural equation modeling (SEM) results reveal several key insights into the dynamics of these constructs.

4.1. Stability of Reading Comprehension

A prominent finding is the substantial stability of reading comprehension across grades. An increase of one standard deviation in 4th-grade reading scores had a considerable impact of 0.59 standard deviations on 8th-grade reading scores. This strong continuity remained high in the marginal effect of 8th-grade reading comprehension on 10th-grade comprehension (0.48 standard deviations). These results underscore that students who demonstrate strong reading skills at one grade level tend to maintain this proficiency in subsequent grades, which highlights the enduring nature of reading comprehension as a foundational academic skill. This pattern mirrors Hebbecker et al. (2019), who reported strong autoregressive stability in achievement across time, and supports the broader conclusion from Toste et al. (2020) that competence is consistently the most stable predictor of later outcomes.

4.2. Developmental Shifts in the Motivation-Comprehension Pathway

The findings illuminate a nuanced and developmentally dependent reciprocal relationship between reading motivation and reading comprehension. While the overall reciprocal relationship is confirmed, its directionality and strength appear to shift across different educational stages.

From 4th to 8th grade, the path from reading comprehension to reading motivation showed a larger marginal effect (0.22 standard deviations) than the path from 4th-grade engagement to 8th-grade reading scores (0.02 standard deviations). This suggests that in earlier stages of development, a student's demonstrated competence in reading (i.e., reading achievement) plays a more substantial role in fostering their motivation. This aligns with Self-Determination Theory, where feelings of competence are critical for the development of intrinsic motivation (Ryan & Deci, 2000).

Conversely, from 8th to 10th grade, a novel result emerged: the marginal effect of motivation on comprehension increased compared to the previous period. Specifically, the largest marginal effect on 10th-grade motivation came from 8th-grade motivation (0.59 standard deviations), while the effect of 8th-grade reading scores on 10th-grade motivation was much smaller (0.08 standard deviations). This indicates that as students mature, their intrinsic reading motivation may become a more significant driver of their reading comprehension. This developmental shift parallels the "skill–leisure–skill" pattern described by Coventry et al. (2023), who observed that achievement drives motivation in earlier grades, but motivation becomes a stronger predictor of achievement by secondary school.

The relatively smaller marginal effect of 4th-grade engagement on 8th-grade reading scores (0.02 standard deviations) compared to its impact on 8th-grade motivation (0.17 standard deviations) suggests that early engagement may primarily foster motivational growth, and this then indirectly contributes to later comprehension, potentially mediated by increased reading practice. However, because reading engagement consisted of a factor of only two items and it was not the same construct of reading motivation as that used in 8th and 10th grade, this interpretation should be considered with caution.

5. Conclusions

This study examined the reciprocal relationship between reading motivation and reading achievement across primary and secondary grades, guided by two research questions. RQ1 asked about the nature of the bidirectional association between motivation and achievement across time. The findings indicated that the relationship is reciprocal but varies in strength across developmental stages. In earlier grades, reading achievement more strongly predicted later motivation, suggesting that early comprehension skills are linked to subsequent engagement. By secondary school, however, motivation emerged as a

stronger predictor of achievement, reflecting the increasing importance of students' interest and attitudes in sustaining performance.

RQ2 asked whether the relative strength of these pathways differs across schooling levels. Results showed that the pathway from achievement to motivation was stronger from Grade 4 to Grade 8, whereas the pathway from motivation to achievement was more prominent from Grade 8 to Grade 10. This developmental pattern points to a gradual shift: in primary school, reading skills appear to provide a foundation for later engagement, while in secondary school, motivation plays a greater role in supporting achievement.

These findings suggest the value of approaches that are sensitive to students' developmental stage. In primary school, practices that build strong comprehension skills may create conditions that encourage later motivation. In secondary school, efforts that foster motivation may be especially helpful for maintaining achievement and should include successful elements from previous studies (e.g., McBreen & Savage, 2021; van der Sande et al., 2023).

This study contributes to the literature in several ways. It draws on a large longitudinal sample of nearly 50,000 students, providing estimates with strong statistical precision. It examines data collected at three time points across six years, offering a long-term view of reciprocal processes. It also extends research on the interaction between motivation and achievement to a new national setting, broadening the evidence base across education systems. Finally, it confirms a developmental shift in the relative strength of achievement and motivation pathways found in only one other study (Coventry et al., 2023), suggesting that the balance between skills and dispositions evolves with age. This finding warrants additional investigation in future studies and new contexts.

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Informed Consent Statement: Not applicable.

Data Availability Statement: The data that support the findings of this study were collected by the Chilean Agency for Educational Quality (Agencia de Calidad de la Educación). Researchers can request access to these databases through their public transparency platform, available at https://www.portaltransparencia.cl (accessed on 15 November 2023).

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

OECD	Organisation for Economic Co-operation and Development
PIACC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
SDT	Self-Determination Theory

SEM	Structural Equation Modeling
SES	Socioeconomic Status
SIMCE	Sistema de Medición de la Calidad de la Educación

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