

## Studies in Second Language Learning and Teaching

Department of English Studies, Faculty of Pedagogy and Fine Arts, Adam Mickiewicz University, Kalisz

SSLT 15 (2). 2025. 349-374. Published online: 30.06.2025

<https://doi.org/10.14746/sslit.48244>

<http://pressto.amu.edu.pl/index.php/sslit>

### *L2 Learning and academic self-concept: The role of dimensional comparisons*

Jens Möller ✉

University of Kiel, Germany

<https://orcid.org/0000-0003-1767-5859>

[jmoeller@ipl.uni-kiel.de](mailto:jmoeller@ipl.uni-kiel.de)

Katrin Arens

Leibniz Institute for Research and Information in Education, Frankfurt, Germany

<https://orcid.org/0000-0003-2494-4199>

[k.arenst@dipf.de](mailto:k.arenst@dipf.de)

Christoph Niepel

University of Luxembourg, Luxembourg

<https://orcid.org/0000-0001-6376-7901>

[christoph.niepel@uni.lu](mailto:christoph.niepel@uni.lu)

#### Abstract

An expanding literature has explored the impact of second language (L2) self-concept on language achievement and motivation. This review adopts a psychological lens to examine L2 self-concept, beginning with an outline of prominent theoretical frameworks: situated expectancy-value theory; Shavelson et al.'s (1976) hierarchical, multidimensional model of self-concept; and the integrated Marsh/Shavelson model (Marsh et al., 1988). Building on these foundations, we introduce Marsh's (1986) internal/external (I/E) frame of reference model, which posits that, within domains such as mathematics or verbal subjects, achievement and academic self-concept are positively correlated, whereas achievement in one domain relates negatively to self-concept in a different domain. Originally confined to mathematics and a single verbal subject in the first language (L1), the I/E model has been

extended to additional disciplines, including L2, through dimensional comparison theory (DCT; Möller & Marsh, 2013). Central to this paper is a synthesis of findings from a recent meta-analysis investigating I/E effects that incorporate measures of L2 achievement and self-concept. Results demonstrate that higher L2 achievement bolsters L2 self-concept while simultaneously diminishing self-concepts in math, physics, biology, and L1; conversely, accomplishments in those other fields exert negative influences on L2 self-concept. We conclude by discussing both theoretical insights and practical applications of self-concept research for language education generally, and L2 instruction specifically.

*Keywords:* academic self-concept; dimensional comparisons; social comparisons; L2 learning; review

## 1. Introduction

The self is conceived as individuals' perceptions of their traits and capabilities, forming essential elements of their identity. Drawing on James's (1890) distinction, self-concepts belong to the "me" aspect – serving as the target of appraisal by the "I." These self-concepts consist of subjective convictions regarding one's own attributes and have remained a focal point across disciplines such as psychology and education, including the study of language learning. Empirical work (Shavelson et al., 1976) has demonstrated that self-concept is inherently multidimensional, with people constructing distinct self-concepts for various life domains. Within the school context, academic self-concept reflects students' perceived proficiency and is reciprocally linked to achievement, subjective task values, and academic decision-making (Trautwein & Möller, 2016). Moreover, academic self-concept is differentiated by subject area: first language (L1) self-concept captures learners' self-assessed competence in their native tongue, which often coincides with the medium of instruction, while second language (L2) self-concept pertains specifically to their perceived ability in the first foreign language they study at school.

Academic self-concepts pertaining to languages are typically termed verbal self-concepts in psychological self-concept research; correspondingly, verbal achievement refers to achievement in various languages. Self-concepts in math and science subjects are considered as belonging to the math domain. Here we use the term L2 self-concept to describe achievement and self-concept related to learning a foreign language at school (see Lee & Bong, 2019). The subject-specific L2 self-concept is well established to be related to language-learning motivation and successful L2 learning. L2 self-concept has thus been recognized as being central to successful L2 learning, has been researched within empirical studies and has become a part of models of L2 acquisition (see, e.g., Dörnyei,

2005; Mercer, 2011). Relatedly, McCroskey and McCroskey (1988) state that perceived communicative competence is more important for communication behavior than students' actual competence.

Another influential framework within L2 self-concept research is Dörnyei's (2009) L2 motivational self system, which draws on Higgins's (1987) self-discrepancy theory. This model focuses on L2 learning motivation and how it is affected by gaps between actual self-concept and future dimensions of self-concept: the ought-to L2 self and the ideal L2 self. The ideal self denotes the set of language skills and attributes an individual aspires to attain, while the ought-to self embodies the internalized obligations, responsibilities, or expectations that one believes they must fulfil. Discrepancies between these actual and possible (i.e., ought-to and ideal) selves result in a feeling of tension that motivates people to close the gap (i.e., to improve L2 competencies).

Numerous studies have demonstrated that previous learning experiences, particularly L2 achievement, are positively linked with both actual and envisaged L2 self-concepts. Empirical findings consistently reveal strong, positive correlations between L2 performance and learners' perceptions of their L2 ability. The reciprocal effects model (Marsh & Craven, 2006; see Wu et al., 2021 for a recent meta-analysis) proposes that achievement and self-concept exert mutual, bidirectional influence. In doing so, it unites two earlier theoretical perspectives on causal directionality: the self-enhancement hypothesis and the skill-development hypothesis (Calsyn & Kenny, 1977). As hypothesized in the self-enhancement model, L2 self-concept predicts and explains L2 learning achievement (e.g., Möller et al., 2014; Wigfield et al., 2020). In their meta-analyses, Valentine et al. (2004), like Wu et al. (2021), reported positive effects of self-concept on future achievement, even after prior achievement was controlled for, confirming the influence of academic self-concept on subsequent achievement. This pattern partly emerges because learners with a stronger academic self-concept dedicate more time, effort, and persistence to tasks in that domain and are more likely to enroll in courses related to it (Wigfield & Eccles, 1992).

The skill-development perspective posits that gains in performance foster a stronger academic self-concept. This arises partly because students who achieve at higher levels receive more affirmative feedback on their accomplishments, which in turn cultivates a more favorable perception of their competence in that domain (Jansen et al., 2022; Sedikides & Gregg, 2008).

Although they are strongly related, academic self-concept and academic achievement are far from correlating perfectly. Self-concept, defined as a self-perception, reflects a subjective reality related to objective achievement and is not in perfect correspondence with test scores or grades. Therefore, the question arises as to which other variables, besides L2 achievement, subject-specific

self-concept depends on. Which additional outcomes are shaped by domain-specific self-concept, and on what grounds do we assert that academic self-concept operates at the subject level, thereby justifying a discrete L2 self-concept? Moreover, what underlying psychological mechanisms account for the diverse ways in which L2 self-concept presents itself across learners? In the following section we take an educational psychology research perspective to answer these questions. In doing so we present key models and theories from educational psychology.

## 2. Psychological models of domain-specific academic self-concept

In this section, we introduce Eccles and Wigfield's (2020) situated expectancy-value theory (SEVT) to illustrate how academic self-concept functions within the multifaceted domain of motivation and learning. We subsequently outline Shavelson et al.'s (1976) hierarchical, multidimensional model of self-concept, followed by Marsh and Shavelson's (Marsh et al., 1988) refinement and Marsh's (1986) internal/external (I/E) frame of reference model, which elucidate the interplay between verbal and mathematical self-concepts and the specific comparative processes underlying their development. Building on the I/E framework, we then explore dimensional comparison theory (DCT; Möller & Marsh, 2013). As a leading paradigm in academic motivation research, DCT has increasingly been applied to L2 learning, yielding compelling insights. Our objective is to furnish a comprehensive survey of the key educational-psychological theories and models that inform L2 acquisition research.

### 2.1. Academic self-concept in situated expectancy-value theory (SEVT)

Eccles et al. (1983) introduced one of the most influential motivational frameworks in educational psychology, which was later refined by Wigfield and Eccles (1992) and again by Eccles and Wigfield (2002), before being most recently expanded into situated expectancy-value theory (Eccles & Wigfield, 2020). SEVT integrates a range of socialization experiences, such as feedback from teachers, parents, and peers, and psychological variables, including learners' beliefs about their own competence and the importance they assign to learning activities, to explain how motivation arises and drives behavior in varied educational contexts. Within this framework, motivation is understood to comprise two interrelated components: expectancy and value.

The expectancy component addresses the question "Can I succeed at this task?" and encompasses both broad ability beliefs, that is, learners' general

judgments about their capability within an academic domain, and specific success expectations for upcoming tasks. Empirical research frequently uncovers strong positive correlations between these two facets, leading many scholars to treat them as a unified expectancy construct and to operationalize it through measures of academic self-concept (Eccles & Wigfield, 2002; Guo et al., 2015; Niepel et al., 2019). Conversely, the value component answers “Do I want to engage in this activity, and why?” and encompasses four subdimensions: intrinsic value (the enjoyment or interest derived from the activity), attainment value (the personal importance attached to doing well), utility value (the perceived usefulness of the activity for future goals), and cost (the anticipated negatives such as anxiety, effort required, or forgone alternatives) (Eccles & Wigfield, 2002).

SEVT further specifies psychological processes by which expectancy and value jointly influence learners’ performance and choices. Academic self-concept not only emerges from prior achievement but also mediates the link between earlier success and subsequent task values, thereby shaping decisions about course enrollment, effort allocation, and long-term educational trajectories (Gaspard et al., 2018; Goetz et al., 2008; Trautwein & Möller, 2016). Applied to second-language acquisition, SEVT predicts that learners with a strong L2 self-concept, that is, those who believe they possess the ability to master the foreign language, will become more motivated to study the language, are more likely to select L2-focused courses, and, ultimately, will attain higher levels of L2 proficiency.

Nonetheless, SEVT has yet to delineate fully the precise mechanisms through which learners form these expectancy and value perceptions. The following sections introduce complementary models that delve deeper into how academic self-concept, that is, the central expectancy construct, develops through both social and dimensional comparison processes.

## 2.2. The Shavelson et al. model of self-concept

Self-concept encompasses individuals’ beliefs about their own capabilities and limitations. An influential review by Shavelson et al. (1976) argued that self-concept is organized in a hierarchical, multidimensional structure. At its apex lies a global self-concept, which then branches into broad domains: academic, social, physical, and emotional. Beneath the academic domain, Shavelson and colleagues further subdivided it into distinct subject-specific self-concepts that correspond to individual school subjects. Hence, broader self-concepts were considered to encompass multiple specific ones. The hierarchical structure of academic self-concept remains contested, primarily because empirical studies have found only weak correlations between subject-specific self-concepts, especially

between verbal and mathematical domains, posing challenges to integrating them into a single overarching factor (Brunner et al., 2010; Marsh, 1987). Nonetheless, the multidimensional nature of academic self-concept is well supported as research consistently shows that students develop distinct self-concepts for individual school subjects (Arens et al., 2011).

### 2.3. The Marsh/Shavelson model of academic self-concept

To account for the apparent absence of a strict hierarchical structure in academic self-concept, Marsh et al. (1988) introduced a revised model, proposing the existence of two largely independent second-order factors: verbal self-concept and mathematical self-concept. The verbal self-concept encompasses students' perceived competencies in subjects such as L1, L2, history, and geography, whereas the mathematical self-concept comprises beliefs about abilities in areas like mathematics, physics, chemistry, and biology.

Subject-specific academic self-concepts can thus be positioned along a continuum ranging from a purely verbal to a purely mathematical pole. At the verbal end lies the L1 self-concept, shaped exclusively by the overarching verbal self-concept; conversely, the math self-concept anchors the mathematical end, fully defined by the higher-order math self-concept. Other subject-specific self-concepts fall somewhere along this continuum, depending on the degree to which they load more heavily onto either the verbal or mathematical higher-order factors. Consequently, self-concepts from dissimilar academic domains, such as L1 and mathematics, are situated at opposite ends, reflecting their basis in distinct higher-order self-concepts. In contrast, subjects with thematic or conceptual similarities cluster closer together, for example, chemistry and physics self-concepts, which are both shaped predominantly by the mathematical higher-order construct. Some subject self-concepts, such as biology, draw on both higher-order components and can therefore be located near the midpoint of the verbal-mathematical continuum (Arens et al., 2021).

### 2.4. The internal/external frame of reference (I/E) model

The weak correlation between students' math and verbal self-concepts prompted the development of the internal/external frame of reference model (I/E model) by Marsh (1986). This model focuses on the psychological mechanisms underlying the formation of subject-specific self-concepts and was initially applied to the domains of mathematics and L1. Within the model, the external frame of reference

functions as a comparative framework through which students evaluate their abilities in a specific subject by comparing themselves with the performance of their peers, typically classmates, in that same domain. This process, rooted in social comparison theory (Festinger, 1954; Gerber et al., 2018), involves judging one's competence based on interindividual standards. For example, students who outperform their classmates in L1 tend to develop a strong L1 self-concept, whereas students who perform below the class average in L1 are more likely to report a weaker L1 self-concept. Such social comparisons generally give rise to positive correlations between achievement and self-concept within the same academic domain.

In contrast, the internal frame of reference operates on intraindividual comparisons, wherein students assess their abilities in one subject relative to their perceived abilities in another. Psychologically, this entails dimensional comparisons, where the self is evaluated across domains (Möller & Köller, 2001; Möller & Marsh, 2013). For instance, a student who perceives their L1 performance as superior to their math performance is likely to form a more positive L1 self-concept. Conversely, when L1 achievement is perceived as weaker than math performance, a lower L1 self-concept is expected. These dimensional comparisons typically lead to negative cross-subject relationships between achievement and self-concept, a phenomenon referred to as contrast effects, such as the negative impact of math achievement on verbal self-concept, and vice versa. Figure 1 illustrates these relationships between achievement and self-concept in L1 and math.

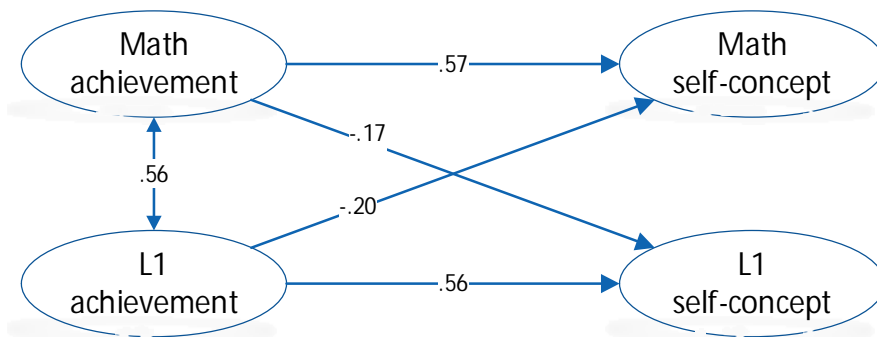


Figure 1 The classic I/E model: Results of a meta-analytic path-analysis on the relations between math and verbal achievement and math and verbal self-concept (data from Möller et al., 2020)

Taken together, the external and internal frames of reference produce a nuanced pattern of associations between achievement and self-concept both within individual domains and across them. Despite the often strong positive correlations observed between math and verbal achievement (e.g., in test scores or grades), the

contrastive nature of internal comparisons tends to produce a negative relationship between the self-concepts in these subjects. Interestingly, the opposing forces of social and dimensional comparisons frequently counteract one another, resulting in an overall near-zero correlation between students' math and verbal self-concepts, despite the underlying high positive correlation between their actual achievements in those domains.

## 2.5. Dimensional comparison theory and the generalized I/E model

In response to the extensive research conducted on the I/E model, DCT (Möller & Marsh, 2013) was explicitly conceived of to elucidate the applications and implications of dimensional comparisons. DCT has found application in various fields beyond K-12 education, particularly in clinical, health, and social psychology, in expanding our understanding of how dimensional comparisons affect people's minds (Möller, under review).

The generalized internal/external frame of reference model (GI/E model; Möller et al., 2016) holds particular relevance for research into L2 self-concept. This extended model builds upon the original I/E framework by incorporating a wider array of predictor and outcome variables, expanding its application beyond just math and verbal domains. Unlike the initial model, which was limited to one mathematical and one verbal subject, typically first language, the GI/E model encompasses a more diverse range of academic subjects, thus offering broader applicability (Arens et al., 2016; Jansen et al., 2015; Marsh et al., 2014, 2015; Möller et al., 2006). A key insight from the GI/E model is that the interaction between social and dimensional comparison processes does not invariably produce negative contrast effects, that is, inverse relationships between performance and self-concept across different subject areas. Instead, the model shows that these comparison mechanisms can also give rise to positive assimilation effects, whereby stronger performance in one domain can elevate students' self-concept in another, leading to a positive cross-subject link between achievement and self-concept.

The GI/E model draws on the structural principles of the Marsh/Shavelson model (Marsh et al., 1988; see previous section), which positions subject-specific self-concepts along a continuum ranging from verbal to mathematical domains. Dimensional comparisons are expected to generate contrast effects particularly when the compared subjects are conceptually distant or show little content overlap, such as math and foreign languages. In contrast, assimilation effects are more likely when the compared domains are closely related, either in content or cognitive demands, for instance, between L1 and L2, or between mathematics and physics. In such cases, performance in one subject may positively inform students' self-concept in the other due to their perceived similarity.



Empirical research has substantiated the theoretical assumptions of the Marsh/Shavelson model of academic self-concept and DCT, providing evidence for the occurrence of both contrast and assimilation effects. Studies consistently show negative relationships, indicating contrast effects between achievements and self-concepts in math and verbal subjects (Möller et al., 2009). This is attributable to the placement of mathematics and verbal subjects at opposing poles of the academic self-concept continuum, as conceptualized in the Marsh/Shavelson model (Marsh, 1990). Moreover, students often perceive mathematical and verbal competencies as relying on fundamentally different cognitive abilities, which can result in individuals excelling predominantly in one domain over the other. Conversely, empirical studies have identified positive correlations and assimilation effects between achievements and self-concepts in mathematics and physics (Arens et al., 2020; Jansen et al., 2015; Marsh et al., 2014, 2015; Möller et al., 2006). These two disciplines are typically categorized as math-related subjects and occupy adjacent positions on the academic self-concept spectrum. Additionally, academic success in physics is frequently seen as contingent upon proficiency in mathematics. The question of whether assimilation or contrast effects arise in the associations between achievement and self-concepts across different verbal domains, specifically L1 and L2, will be addressed in the following section.

### 3. L2 in research on the DCT

Empirical evidence indicates that L2 self-concept constitutes a distinct construct alongside L1 self-concept. For example, Arens et al. (2018), Möller et al. (2006), and Niepel et al. (2014) employed path analyses within the framework of the GI/E model, incorporating L2 as one of multiple academic domains (see below for further elaboration). Additionally, Mercer (2014) conducted a qualitative investigation into L2 self-concept development, drawing on the theoretical assumptions of the I/E model. Anna was interviewed on her self-concepts in English and French: “For Anna, the division of her FLL [foreign language learning] self into two halves is a visible indication of her relationship between two languages which she sees as totally separate and distinct” (Mercer, 2014, p. 60).

As outlined earlier, the original I/E model primarily emphasized verbal achievement and self-concept in students’ L1. In alignment with the GI/E model, contemporary research has expanded the verbal domain to encompass both L1 and L2. This broader perspective makes it plausible to expect a positive association between achievement and self-concept across different languages, indicating the presence of assimilation effects. Both L1 and L2 can be positioned on the verbal end of the academic self-concept continuum due to their shared linguistic

characteristics. Moreover, students may attribute success in language subjects to similar underlying verbal abilities. Established transfer effects in language acquisition further support this view, suggesting that proficiency in one language can facilitate the learning of another (Chen et al., 2010; Gebauer et al., 2013).

However, only a limited number of studies have demonstrated assimilation effects, namely positive cross-subject relations between achievement and self-concept, in the domain of multiple languages. Möller et al. (2006) were among the first to examine this, investigating German secondary school students with German as L1 and English as L2. Their findings indicated that higher achievement in English (German) was associated with a higher self-concept in German (English). Similarly, Marsh et al. (2014) found positive cross-paths between Dutch (L1) achievement and English (L2) self-concept in a large sample of over 15,000 Dutch secondary school students.

Nonetheless, the majority of findings regarding the relationship between language achievements and self-concepts have been either negative or statistically nonsignificant, suggesting contrast rather than assimilation effects. For instance, Xu et al. (2013), in a study involving secondary school students in Hong Kong, found no significant associations between Chinese (English) achievement and English (Chinese) self-concept. Marsh et al. (2001) even reported negative cross-subject paths between Chinese (English) achievement and English (Chinese) self-concept. Similarly, Marsh and Yeung (2001) found negative associations between Spanish achievement and a higher-order verbal self-concept encompassing English, history, and general verbal domains, as well as between general verbal achievement and Spanish self-concept. Additional support for contrast effects between languages comes from studies on German students learning English as an L2, which also report weak but negative associations between German (English) achievement and English (German) self-concept (Arens et al., 2020; Marsh et al., 2015; Niepel et al., 2014). Van der Westhuizen et al. (2023) found similar contrast effects between French and German in a Luxembourgish sample, while Stocker et al. (2021) reported significant negative cross-subject paths between English and Arabic.

Some studies have extended this research by including languages beyond L1 and L2. In Study 1 of Marsh et al. (2015), German secondary school students were assessed with German as L1, English as L2, and either French or Latin as a third language (L3). While the results indicated strong positive relations between achievement and self-concept within individual subjects, the cross-language associations, German, English, and L3, were either significantly negative or nonsignificant, suggesting contrast rather than assimilation effects. Arens et al. (2020) reported similar findings in their study of students with the same language configuration. Like Marsh et al. (2015), they found dimensional contrast

effects between German and English, and across all three languages. Specifically, L3 self-concepts (whether in French or Latin) were generally unrelated to L1 (German) achievement and negatively associated with L2 (English) achievement. These findings suggest that dimensional comparisons involving three languages influence the development of verbal self-concepts, again favoring contrast effects.

In sum, research conducted across diverse student populations in various national contexts (e.g., Germany, Hong Kong, United States) has consistently shown that dimensional comparisons between languages, particularly between L1 and L2, and extending to L3, are more likely to generate contrast than assimilation effects. These results challenge key assumptions of the Marsh/Shavelson model of academic self-concept and DCT, which predict that closely related subjects (e.g., those situated near each other on the verbal side of the math-verbal continuum) should exhibit assimilation effects, especially when success in those domains is thought to depend on overlapping cognitive abilities (Marsh, 1990; Marsh et al., 2014; Möller et al., 2015).

#### 4. Meta-analytical findings on self-concepts with a focus on L2 learning

Möller et al. (2020) conducted a comprehensive meta-analysis encompassing studies that examined the relationship between academic achievement and self-concept across two or more subjects. Their analysis synthesized empirical evidence regarding both social and dimensional comparison processes as they relate to achievement and academic self-concept formation, including in the domain of L2. Drawing on the framework of DCT, the authors formulated specific hypotheses concerning the influence of L2 achievement on various academic self-concepts:

1. Path coefficients from L2 achievement to corresponding L2 self-concept were expected to be positive, reflecting social comparison mechanisms.
2. Path coefficients from L2 achievement to non-corresponding self-concepts were hypothesized to be moderately negative, that is, indicative of contrast effects, when the target subject was dissimilar to L2 (e.g., math or subjects within the math/science domain), in line with dimensional comparison processes.
3. When the comparison subject was more similar to L2, such as another verbally oriented subject like L1, path coefficients from L2 achievement to non-corresponding self-concept were anticipated to be only slightly negative or near zero, reflecting weaker or absent contrast effects.

The meta-analysis included 46 studies derived from 23 publications (see Table 1), comprising a total sample of 114,145 students. Within this set, 21 studies examined the relationship between L2 and mathematics ( $N = 41,064$ ), 7 studies

included physics ( $N = 24,042$ ), and 4 focused on biology ( $N = 21,676$ ). Notably, 14 studies explored associations between L2 and L1 self-concepts ( $N = 27,363$ ), offering particularly relevant insights for verbal domain comparisons. In addition, six studies also considered students' subjective task values in the analysis.

Table 1 Summary of studies included in the meta-analysis

First author (year)	N Subjects	SC/STV	% fem	Grade	Region	Achievement
1 Schilling (2004)	1,632 Ma/Ph/Bi/Hi/L2/L1	SC	50	7-10	EU	School
2 Möller (2006)	1,440 Ma/Ph/L2/L1	SC	55	5	EU	School/Test
3 Sparfeldt (2006)	396/407 Ma/Ph/L2/L1	SC	57	9-10	EU	School
4 Neuenschwander (2007)	361/454/2,535 Ma/L1; Ma/L2	SC	52	6-7	EU/NA	School/Test
5 Rinn (2008)	181 Ma/L2	SC	43	7-10	NA	Test
6 Gniewosc (2010)	1,014/1,822 Ma/L1; Ma/L2	SC/STV	53	6	EU/NA	School
7 Faber (2012)	256 L2/L1	SC	56	9	EU	School
8 McInerney (2012)	8,354 Ma/L2	SC	44	7-9	As	Test
9 Parker (2013)	2,909/2,106 Ma/L2	SC	58	13	EU	Test
10 Xu (2013)	1,950 Ma/L2/L1	SC	53	7	As	School/Test
11 Marsh (2014)	15,356 Ma/L2/L1	SC	51	9	EU	School
12 Niepel (2014)	1,529/639/465 Ma/L1; Ma/L2/L1	SC	47	5-6	EU	School
13 Schurtz (2014)	1,390 Ma/L2	SC/STV	51	5-6	EU	School
14 Marsh (2015)	1,140 Ma/Bi/L2/L1	SC	54	7-10	EU	School
15 Arens (2016)	271 Ma/Ph/Hi/L2/L1	SC	55	7-10	EU	School
	873 Ma/Ph/Hi/L2	SC	59	10		
16 Götz (2016)	756/559/481 Ma/L2/L1	SC	52	9-11	EU	School
17 Helm (2016)	174/177/80/68/82/79 Ma/L1; Ma/Ph; L2/L1	SC	47	5-12	EU	School
18 Korhonen (2016)	1,152 Ma/L2	STV	50	9	EU	Test
19 Gogol (2017)	6,146/5500/866/1748 Ma/L2/L1/	SC/STV	50	9	EU	Test
20 Guo (2017)	18,047 Ph/Ch/Bi/L2	SC/STV	49	8	EU	Test
21 Löscher (2017)	850 Ma/L2	SC	48	7	EU	School/Test
22 Arens (2018)	1,648/1240/390 Ma/Ph/L2/L1	SC	46-64	10-12	EU	School
23 Gaspard (2018)	857 Ma/Ph/Bi/L2/L1	SC/STV	51	8	EU	School

Note. Ma = Mathematics; Ph = Physics; Ch = Chemistry; Bi = Biology; Sc = Science; PE = Physical education; Hi = History; L2 = Second language; L1 = First language; SC = Self-concept; STV = subjective task value; EU = Europe; As = Asia; NA = North America.

Möller et al. (2020) examined specific subject combinations involving L2, for which they had access to at least four datasets, such as math/L2, physics/L2, biology/L2, and L1/L2 (see Möller et al., 2020). In the following sections we present the meta-analytical findings related to L2 subjects and compare them with the corresponding results on relations between math and L1 as a reference point.

#### 4.1. Math/L1 as reference

The correlation between math and L1 achievements had a mean value of  $r = .56$ , signifying a robust effect size. The mean correlation for self-concepts in the corresponding subjects was positive but small ( $r = .08$ ). In their meta-analysis, Möller et al. (2020) reported a mean path coefficient of  $\beta = .56$  from math achievement to math self-concept, and  $\beta = .46$  from L1 achievement to L1 self-concept.

These findings provide robust evidence for strong positive relations consistent with social comparison processes. Importantly, in support of dimensional comparison theory, the cross-domain path coefficients representing dimensional comparison effects were significantly negative:  $\beta = -.17$  from math achievement to L1 self-concept, and  $\beta = -.20$  from L1 achievement to math self-concept. These results indicate that students tend to contrast their competencies across dissimilar subjects, particularly between math and L1, which are positioned on opposite ends of the academic self-concept continuum. Thus, these meta-analytical findings strongly corroborate the original I/E model.

#### 4.2. Math/L2

The resulting pattern for the math/L2 subject pair closely mirrored that of the reference combination math/L1. Although the correlation between math and L2 achievement was significantly lower ( $\Delta r = -.18$ ) than that observed between math and L1 ( $r = .56$ ), it remained significantly positive with a mean of  $r = .38$ . In contrast, the average correlation between self-concepts in math and L2 was nonsignificant ( $r = .04$ ). The link between L2 achievement and L2 self-concept ( $\beta = .58$ ) was notably stronger ( $\Delta\beta = .12$ ) than that between L1 achievement and L1 self-concept ( $\beta = .46$ ), suggesting that social comparison processes may exert a more pronounced influence on L2 self-concept than on L1. No further deviations from the original I/E model were detected for the math/L1 combination. Additionally, the dimensional comparison effects for math and L2 remained significantly negative ( $\beta = -.15$  for the effect of math achievement on L2 self-concept;  $\beta = -.17$  for the effect of L2 achievement on math self-concept).

Thus, Möller et al.'s (2020) meta-analysis revealed that, after controlling for L2 achievement, math achievement negatively predicted L2 self-concept and vice versa. That is, students who perform better in math tend to report a lower L2 self-concept, and students with stronger L2 achievement tend to evaluate their math self-concept more negatively. For example, among two students with equivalent L2 achievement, the one with higher math performance is likely to hold a lower L2 self-concept. These results, previously established in the context of math and L1, also hold true for math and L2, offering strong empirical support for the assumptions of DCT in the context of L2.

#### 4.3. Physics/L2

The subject combination of physics and L2 offered robust empirical support for the DCT assumptions. Although the correlation between physics and L2 achievement

was significantly lower than that observed for the reference pair math/L1, it remained positive, with a mean of  $r = .38$ . In contrast, the average correlation between physics and L2 self-concepts was not statistically significant ( $r = .08$ ). Crucially for DCT, the path coefficients representing dimensional comparison effects were significantly negative:  $\beta = -.12$  from physics achievement to L2 self-concept and  $\beta = -.13$  from L2 achievement to physics self-concept. These contrast effects closely mirrored those found for both the math/L1 and math/L2 combinations. That is, students who performed well in physics tended to report a lower L2 self-concept, and those who excelled in L2 tended to report a diminished physics self-concept, even after controlling for subject-specific achievement. These results reinforce the DCT assumption that dissimilar academic domains induce contrast effects between achievement in one subject and self-concept in another.

#### 4.4. Biology/L2

The results for biology and L2 were also consistent with the patterns observed for the reference pair math/L1. Möller et al. (2020) reported a significantly positive correlation between biology and L2 achievement, with a mean of  $r = .53$ , alongside a smaller but still positive correlation between self-concepts ( $r = .19$ ). As with other dissimilar subject pairings, the cross-path coefficients for dimensional comparison effects were negative:  $\beta = -.15$  from L2 achievement to biology self-concept, and  $\beta = -.08$  from biology achievement to L2 self-concept, the latter of which was not statistically significant. These results again support the notion that, even in verbally dissimilar but cognitively demanding domains such as biology, contrast effects emerge from achievement in one subject influencing self-concept in another.

#### 4.5. L2/L1

Of particular interest is the subject pair L2 and L1, two prototypically similar domains as defined by the Marsh/Shavelson model (Marsh et al., 1988). Despite their shared verbal nature, the observed achievement correlation between L1 and L2 was  $r = .49$ , slightly lower than the math/L1 reference but not significantly so. In contrast, the correlation between L1 and L2 self-concepts was significantly higher ( $r = .26$ ;  $\Delta r = .08$  compared to math/L1). However, the path coefficients representing dimensional comparisons between languages revealed significant contrast effects:  $\beta = -.09$  from L2 achievement to L1 self-concept, and  $\beta = -.13$  from L1 achievement to L2 self-concept. Notably, these values were significantly weaker than those found in the reference subject pair math/L1 ( $\Delta\beta = .08$  and  $\Delta\beta$

= .06, respectively). Figure 2 illustrates the interrelations between L1 and L2 achievement and self-concepts.

Thus, Möller et al.'s (2020) meta-analysis demonstrates that contrast effects persist even between two verbally aligned subjects. Achievement in L1 negatively predicted L2 self-concept and vice versa, after controlling for within-subject achievement. For instance, among two students with comparable L2 achievement levels, the student who performs better in L1 tends to report a lower L2 self-concept than their peer. These findings suggest that dimensional comparisons exert an influence even within closely related verbal domains, though the magnitude of contrast is somewhat attenuated relative to that observed for more dissimilar subject pairings.

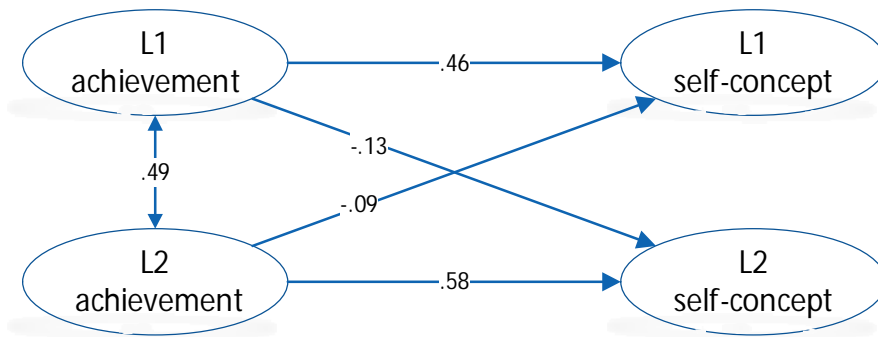


Figure 2 The I/E model with L1 and L2: Results of a meta-analytic path-analysis on the relations between L1 and L2 achievement and L1 and L2 self-concept (data from Möller et al., 2020)

## 5. Conclusion

Our goal was to describe the most important theories and models from educational psychology related to L2 self-concept. In this context, we described SEVT as a comprehensive model of the interconnections of achievement, motivation, and choice. In summary, we have outlined the I/E model and its extension, the GI/E model, within the DCT framework, emphasizing the role of dimensional comparison processes in the formation of L2 self-concepts. The empirical evidence reviewed strongly supports the notion that L2 self-concepts are not shaped in isolation but are systematically influenced by students' achievements in other academic domains. Specifically, consistent contrast effects were observed, indicating that higher achievement in subjects such as math, physics, and biology is associated with lower self-concepts in L2. These findings underscore the relevance of

dimensional comparisons in academic self-concept development and highlight the importance of considering subject interrelations when examining students' beliefs about their competencies, particularly in the domain of second language learning. Surprisingly, L2 achievements negatively affect L1 self-concepts and vice versa.

## 5.1. Theoretical implications

### 5.1.1. Implications for DCT

Our review supports extending the GI/E model to encompass multiple verbal subjects and underscores the critical role of dimensional comparison processes in shaping verbal self-concepts. The observed contrast effects between L1 and L2 challenge traditional assumptions of the DCT, which originally predicted assimilation effects between closely related subjects. These findings call for a reconsideration of the theoretical underpinnings of DCT, particularly regarding verbal domains. Future research should further investigate the mechanisms underlying these inconsistencies, including the role of perceived subject similarity and the influence of subject pairings on self-concept formation. Notably, studies examining achievement–self-concept relations across multiple languages within the GI/E framework (e.g., Arens et al., 2020; Marsh et al., 2015; Niepel et al., 2014) provide valuable insights into how dimensional comparisons may more frequently result in contrast effects rather than the anticipated assimilation effects. Only a limited number of studies, such as those by Marsh et al. (2014) and Möller et al. (2006), have documented assimilation effects between L1 and L2, further emphasizing the need to redefine DCT expectations in multilingual academic contexts.

### 5.1.2. Perceived subject similarity

Previous research indicates that perceived subject similarity and specific subject combinations play a moderating role in the cross-subject relations between achievement and self-concept (Helm et al., 2016; Wolff et al., 2020). The degree of contrast effects increases with the perceived dissimilarity of the subjects involved. Interestingly, Möller et al. (2020) demonstrated that the typical I/E model pattern, characterized by strong positive within-subject paths (reflecting social comparison) and significant negative cross-subject paths (indicating dimensional comparison), remains robust even when the subjects are perceived as relatively similar, such as L1 and L2. This suggests that perceived similarity alone may not be sufficient to generate assimilation effects, highlighting the complexity of



how students compare their academic performance across different language domains. No assimilation effects were observed, even within the verbal domain. Studies have shown that L1/L2 pairings are perceived as less similar than math/physics pairings but more similar than math/L1 pairings (Helm et al., 2016).

One possible explanation for these findings is that, despite both subjects involving language, the instruction of L1 in schools appears to differ substantially from the learning of L2. In L1 classes, students are already using the language of instruction, which most of them have already learned as their native language, and in which they are proficient. In contrast, L2 classes usually take a learner's perspective, and students have to learn the basics of a new language. Furthermore, the content and tasks of L1 and L2 classes differ significantly, which could lead students to perceive L1 and L2 as somewhat dissimilar subjects.

### 5.1.3. Subjective task values

Similarly to L2 self-concept, social and dimensional comparison effects likely influence L2 subjective task values. These effects are generally less pronounced for all subjects and are partially mediated by self-concept. Typically, academic self-concept has a higher correlation with achievement than subjective task values (Gaspard et al., 2019). Thus, academic self-concept is conceptually closer to achievement. However, detailed considerations for L2 subjective task values are limited due to the scarcity of empirical studies (Gaspard et al., 2018; Goetz et al., 2008) and the lack of meta-analyses. Recent research by Wan et al. (2021) has shown that contrast effects between different subjective task values increase with student age, impacting both verbal self-concept and verbal subjective task values.

This research aligns with recent developments linking DCT (Möller & Marsh, 2013) and SEVT (Wigfield et al., 2020). It helps explain the relationships observed between key constructs in SEVT, that is, expectancies (including academic self-concept) and values, and their relation to subject-specific achievements by detailing the underlying processes.

### 5.1.4. Further L2 research

Our review indicates that L2 has an independent role within verbal and non-verbal school subjects. Firstly, L2 achievement positively influences L2 self-concept and negatively impacts other verbal and non-verbal self-concepts. Thus, L2 achievement seems as important as achievement in other subjects in influencing several subject-specific self-concepts through social and dimensional comparisons.

Secondly, students have a distinct L2 self-concept, positively influenced by L2 achievements and negatively influenced by other verbal and non-verbal achievements. The positive relation between achievement and self-concept is particularly strong for L2, stronger than for L1, possibly because L2 self-concept is more school-based. Students might get information about their L1 competency not only at school, but also from family and peers. Information about their L2 competency is more restricted to school sources, including teacher feedback and school grades, which can easily be subject to social comparisons, leading to a closer connection between achievement and self-concept with L2 than L1.

A central question for L2 research could be how to deal with contrast effects on L2 self-concepts. Contrast effects on L2 self-concepts might be seen as a kind of bias. Imagine a student who performs very well in L1 but tends to underestimate his L2 ability. L2 research could explore whether certain teaching methodologies that point out commonalities and that demonstrate the interconnectedness of languages, could prevent contrast effects and foster a more positive and connected verbal self-concept. Curriculum designers should consider integrative and holistic approaches that celebrate multilingualism rather than segregating languages.

Concerning the contrast effects between verbal and non-verbal subjects, one could argue against premature specializations in particular subjects that are fostered by dimensional comparison effects. Using an L2 as the medium of instruction in non-verbal subjects may mitigate contrast effects between L2 achievement and self-concept in other subjects by strengthening the perceived connection between them. Wunberg et al. (2024) found that participation in a content and language integrated learning (CLIL) program led to an improved L2 self-concept without negatively affecting students' math self-concept. This suggests that integrating L2 learning with non-verbal subjects could promote positive self-concepts across multiple domains. Given that educators and parents often overlook the role of dimensional comparisons in shaping self-concepts, it may be beneficial to organize awareness campaigns or professional development workshops. Such initiatives could increase understanding of the complex relationships between achievement and self-concept across different academic subjects.

Furthermore, due to the limited number of studies involving more than two languages, additional research is necessary to investigate how L3 influences the interplay between L1 and L2, and how these three languages together shape academic self-concepts. We should also explore cultural and contextual factors when analyzing L2 learning. As the studies reviewed encompass various regions and cultural backgrounds, it would be intriguing to delve deeper into how cultural and societal valuations of languages play into these self-concepts. In addition, how relations develop between the different verbal self-concepts held by students with a migration background should be investigated. In Germany, for

instance, some students learn a home language not taught at school (e.g., Turkish), German as L2, and English as L3. The results of such subsamples are often not reported separately in existing studies.

Further research on L2 self-concept could also benefit from research on academic self-concept and DCT in general. Research has found some moderators that impact the strength of the achievement–self-concept relations assumed by the I/E model. As mentioned above, Wolff et al. (2020) demonstrated that moderators, such as perceived similarity and subject-specific beliefs about abilities, play a significant role in moderating dimensional comparison effects between L1 and math. This raises the question of whether similar moderators influence the relationships between various subject achievements and L2 self-concepts. Furthermore, while the original I/E model focuses on two comparison processes, that is, social and dimensional comparisons, recent research has expanded this framework to the 2I/E model, which incorporates temporal comparisons (comparing current achievements to past performance). Temporal comparisons should therefore be considered in L2 self-concept research as well. Initial longitudinal studies on the 2I/E model (Wolff et al., 2018; Study 2c) have revealed relatively small positive effects of improvements in L2 performance on L2 self-concept.

Finally, it should be investigated whether the findings on L2 depend on the nature and characteristics of the L2 language and also on the nature and characteristics of the L1 language. Given languages from different language families or using different alphabets (such as English, Chinese), such effects could be more negative than between more similar languages (English, German).

## 5.2. Practical implications

### 5.2.1. Facilitating L2 achievement and self-concept

L2 instruction should incorporate activities and assessments that not only improve L2 skills and achievement but also boost learners' confidence, including their academic self-concept of their L2 abilities. Following the reciprocal effects model (Marsh & Craven, 2006, Wu et al., 2021), both interact positively and thus share mutual relations. In our review of Möller et al.'s (2020) meta-analyses, we correspondingly found a significant positive correlation between L2 achievement and L2 self-concept. Positive feedback, scaffolded tasks, and opportunities for success can help develop better L2 achievements and ultimately, stronger L2 self-concepts.

### 5.2.2. Facilitating educators' understanding of self-concept development

Educators and parents might mistakenly assume that proficiency in one language naturally implies high ability beliefs in others. This assumption is reasonable, considering the strong correlations found between language achievements and the recognized transfer effects between languages. However, previous studies have shown that educators and parents often overlook dimensional comparisons when evaluating their students' or children's academic self-concepts (Dai, 2002; Helm et al., 2018). This oversight may lead to an underappreciation of the subject-specific nature of verbal self-concepts and the role that dimensional comparisons play in shaping them.

Educators should be aware that interventions designed to bolster achievement or self-concept in one verbal subject might not necessarily benefit another verbal subject. It is essential to nurture and promote each subject-specific verbal self-concept independently. Furthermore, these insights may assist teachers and parents in recognizing that a student excelling in two languages may still exhibit a high self-concept in one language and a relatively low self-concept in another. Given DCT implications for self-concept, educators might want to be cautious about comparing performance across different academic subjects. Comparing performance in L2 with that in another subject might negatively affect the self-concept of learners who excel in one subject but not the other.

In conclusion, the issue of academic self-concept, particularly in the context of L2 and multilingualism, offers a rich field of exploration. The unexpected findings of contrast effects between languages point to the complex interplay of factors influencing how students perceive their verbal capabilities. Educators, curriculum designers, and researchers need to consider these dynamics to promote positive academic outcomes and nurture a holistic and integrated verbal self-concept among students.

## References

- Arens, A. K., Becker, M., & Möller, J. (2018). The internal/external frame of reference (I/E) model: Extension to five school subjects and invariance across German secondary school ability tracks. *Learning and Individual Differences*, 67, 143-155. <https://doi.org/10.1016/j.lindif.2018.07.005>
- Arens, A. K., Helm, F., Wolff, F., & Möller, J. (2020). Social and dimensional comparisons in the formation of German students' verbal self-concepts. *The Journal of Experimental Education* 88(2), 245-264. <https://doi.org/10.1080/00220973.2019.1635069>.
- Arens, A. K., Jansen, M., Preckel, F., Schmidt, I., & Brunner, M. (2021). The structure of academic self-concept: A methodological review and empirical illustration of central models. *Review of Educational Research*, 91(1), 34-72. <https://doi.org/10.3102/0034654320972186>
- Arens, A. K., Möller, J., & Watermann, R. (2016). Extending the internal/external frame of reference model to social studies: Self-concept and achievement in history and politics. *Learning and Individual Differences*, 51, 91-99. <https://doi.org/10.1016/j.lindif.2016.08.044>
- Arens, A. K., Yeung, A. S., Craven, R. G., & Hasselhorn, M. (2011). The twofold multidimensionality of academic self-concept: Domain specificity and separation between competence and affect components. *Journal of Educational Psychology*, 103(4), 970-981. <https://doi.org/10.1037/a0025047>
- Brunner, M., Keller, U., Dierendonck, C., Reichert, M., Ugen, S., Fischbach, A., & Martin, R. (2010). The structure of academic self-concepts revisited: The nested Marsh/Shavelson model. *Journal of Educational Psychology*, 102(4), 964-981. <https://doi.org/10.1037/a0019644>
- Calsyn, R. J., & Kenny, D. A. (1977). Self-concept of ability and perceived evaluation of others: Cause or effect of academic achievement? *Journal of Educational Psychology*, 69(2), 136-145. <https://doi.org/10.1037/0022-0663.69.2.136>
- Chen, X., Xu, F., Nguyen, T.-K., Hong, G., & Wang, Y. (2010). Effects of cross-language transfer on first-language phonological awareness and literacy skills in Chinese children receiving English instruction. *Journal of Educational Psychology*, 102, 712-728. <https://doi.org/10.1037/a0018802>.
- Dai, D. Y. (2002). Incorporating parent perceptions: A replication and extension study of the internal-external frame of reference model of self-concept development. *Journal of Adolescent Research*, 17, 617-645. <https://doi.org/10.1177/074355802237467>
- Dörnyei, Z. (2005). *The psychology of the language learner: Individual differences in second language acquisition*. Lawrence Erlbaum.

- Dörnyei, Z. (2009) The L2 motivational self system. In Z. Dörnyei & E. Ushioda (Eds.), *Motivation, language identity and the L2 self* (pp. 9-42). Multilingual Matters.
- Eccles (Parsons), J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives* (pp. 75-146). W. H. Freeman.
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, 53(1), 109-132. <https://doi.org/10.1146/annurev.psych.53.100901.135153>
- Eccles, J. S. & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology*, 61, 101859. <https://doi.org/10.1016/j.cedpsych.2020.101859>
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7, 117-140. <https://doi.org/10.1177/001872675400700202>
- Gaspard, H., Wigfield, A., Jiang, Y., Nagengast, B., Trautwein, U., & Marsh, H. W. (2018). Dimensional comparisons: How academic track students' achievements are related to their expectancy and value beliefs across multiple domains. *Contemporary Educational Psychology*, 52, 1-14. <https://doi.org/10.1016/j.cedpsych.2017.10.003>
- Gaspard, H., Wille, E., Wormington, S. V., & Hulleman, C. S. (2019). How are upper secondary school students' expectancy-value profiles associated with achievement and university STEM major? A cross-domain comparison. *Contemporary Educational Psychology*, 58, 149-162. <https://doi.org/10.1016/j.cedpsych.2019.02.005>
- Gebauer, S. K., Zaunbauer, A. C., & Möller, J. (2013). Cross-language transfer in English immersion programs in Germany: Reading comprehension and reading fluency. *Contemporary Educational Psychology*, 38, 64-74. <https://doi.org/10.1016/j.cedpsych.2012.09.002>
- Gerber, J. P., Wheeler, L., & Suls, J. (2018) A social comparison theory meta-analysis 60+ years on. *Psychological Bulletin*, 144, 177-197. <https://doi.org/10.1037/bul0000127>
- Goetz, T., Frenzel, C. A., Hall, N. C., & Pekrun, R. (2008). Antecedents of academic emotions: Testing the internal/external frame of reference model for academic enjoyment. *Contemporary Educational Psychology*, 33, 9-33. <https://doi.org/10.1016/j.cedpsych.2006.12.002>
- Guo, J., Marsh, H. W., Parker, P. D., Morin, A. J. S., & Dicke, T. (2017). Extending expectancy-value theory predictions of achievement and aspirations in science: Dimensional comparison processes and expectancy-by-value interactions. *Learning and Instruction*, 49, 81-91. <https://doi.org/10.1016/j.learninstruc.2016.12.007>
- Guo, J., Parker, P. D., Marsh, H. W., & Morin, A. J. S. (2015). Achievement, motivation, and educational choices: A longitudinal study of expectancy and

- value using a multiplicative perspective. *Developmental Psychology*, 51(8), 1163-1176. <https://doi.org/10.1037/a0039440>
- Helm, F., Mueller-Kalthoff, H., Mukowski, R. & Möller, J. (2018). Teacher judgment accuracy regarding students' self-concepts: Affected by social and dimensional comparisons? *Learning and Instruction*, 55, 1-12. <https://doi.org/10.1016/j.learninstruc.2018.02.002>
- Helm, F., Müller-Kalthoff, H., Nagy, N., & Möller, J. (2016). Dimensional comparison theory: Perceived subject similarity impacts on students' self-concepts. *AERA Open*, 2, 1-9. <https://doi.org/10.1177/2332858416650624>
- Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review*, 94(3), 319-340. <https://doi.org/10.1037/0033-295X.94.3.319>
- James, W. (1890). *Principles of psychology*. Encyclopedia Britannica. <https://doi.org/10.1037/11059-000>
- Jansen, M., Schroeders, U., Lüdtke, O., & Marsh, H. W. (2015). Contrast and assimilation effects of dimensional comparisons in five subjects: An extension of the I/E model. *Journal of Educational Psychology*, 107, 1086-1101. <https://doi.org/10.1037/edu0000021>
- Jansen, T., Meyer, J., Wigfield, A., & Möller, J. (2022). Which student and instructional variables are most strongly related to academic motivation in K-12 education? A systematic review of meta-analyses. *Psychological Bulletin*, 148(1-2), 1-26. <https://doi.org/10.1037/bul0000354>
- Lee, M., & Bong, M. (2019). Relevance of goal theories to language learning research. *System*, 86, 102122. <https://doi.org/10.1016/j.system.2019.102122>
- Marsh, H. W. (1986). Verbal and math self-concepts: An internal/external frame of reference model. *American Educational Research Journal*, 23, 129-149. <https://doi.org/10.3102/00028312023001129>
- Marsh, H. W. (1987). The hierarchical structure of self-concept and the application of hierarchical confirmatory factor analysis. *Journal of Educational Measurement*, 24, 17-39. <https://doi.org/10.1111/j.1745-3984.1987.tb00259.x>
- Marsh, H. W. (1990). A multidimensional, hierarchical model of self-concept: Theoretical and empirical justification. *Educational Psychology Review*, 2, 77-172. <https://doi.org/10.3102/00028312023001129>
- Marsh, H. W., Byrne, B. M., & Shavelson, R. J. (1988). A multifaceted academic self-concept: Its hierarchical structure and its relation to academic achievement. *Journal of Educational Psychology*, 80(3), 366-380. <https://doi.org/10.1037/0022-0663.80.3.366>
- Marsh, H. W., & Craven, R. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science*, 1, 133-163.

- Marsh, H. W., Kong, C. K., & Hau, K. T. (2001). Extension of the internal/external frame of reference model of self-concept formation: Importance of native and nonnative languages for Chinese students. *Journal of Educational Psychology*, 93, 543-553.
- Marsh, H. W., Kuyper, H., Seaton, M., Parker, P. D., Morin, A. J. S., Möller, J., & Abduljabbar, A. S. (2014). Dimensional comparison theory: An extension of the internal/external frame of reference effect on academic self-concept formation. *Contemporary Educational Psychology*, 39, 326-341. <https://doi.org/10.1016/j.cedpsych.2014.08.003>
- Marsh, H. W., Lüdtke, O., Nagengast, B., Trautwein, U., Abduljabbar, A. S., Abdelfattah, F., & Jansen, M. (2015). Dimensional comparison theory: Paradoxical relations between self-beliefs and achievements in multiple domains. *Learning and Instruction*, 35, 16-32. <https://doi.org/10.1016/j.learninstruc.2014.08.005>
- Marsh, H. W., & Yeung, A. S. (2001). An extension of the internal/external frame of reference model: A response to Bong (1998). *Multivariate Behavioral Research*, 36, 389-420. <https://doi.org/10.1207/S15327906389-420>
- McCroskey, J. C. & McCroskey, L. (1988). Self-report as an approach to measuring communication competence. *Communication Research Reports*, 5, 108-113, <https://doi.org/10.1080/08824098809359810>
- Mercer, S. (2011). The self as a complex dynamic system. *Studies in Second Language Learning and Teaching*, 1(1), 57-82. <https://doi.org/10.14746/ssllt.2011.1.1.4>
- Mercer, S. (2014). Re-imagining the self as a network of relationships. In K. Csizér & M. Magid (Eds.), *The impact of self-concept on language learning* (pp. 51-69). Multilingual Matters.
- Möller, J. (under review). Ten years of dimensional comparison theory: On the development of a theory from educational psychology.
- Möller, J., Helm, F., Müller-Kalthoff, H., Nagy, N., & Marsh, H. W. (2015). Dimensional comparisons and their consequences for self-concept, motivation, and emotion. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., pp. 430-436). Elsevier.
- Möller, J., & Köller, O. (2001). Dimensional comparisons: An experimental approach to the internal/external frame of reference model. *Journal of Educational Psychology*, 93, 826-835. <https://doi.org/10.1037/0022-0663.93.4.826>
- Möller, J., & Marsh, H. W. (2013). Dimensional comparison theory. *Psychological Review*, 120, 544-560. <https://doi.org/10.1037/a0032459>
- Möller, J., Müller-Kalthoff, H., Helm, F., Nagy, N., & Marsh, H. W. (2016). The generalized internal/external frame of reference model: An extension to dimensional comparison theory. *Frontline Learning Research*, 4, 1-11. <https://doi.org/10.14786/flr.v4i2.169>



- Möller, J., Pohlmann, B., Köller, O., & Marsh, H. W. (2009). A meta-analytic path analysis of the internal/external frame of reference model of academic achievement and academic self-concept. *Review of Educational Research*, 79, 1129-1167. <https://doi.org/10.3102/0034654309337522>
- Möller, J., Streblov, L., Pohlmann, B., & Köller, O. (2006). An extension to the Internal/External frame of reference model to two verbal and numerical domains. *European Journal of Psychology of Education*, 21, 467-487. <https://doi.org/10.1007/BF03173515>
- Möller, J., Zimmermann, F., & Köller, O. (2014). The reciprocal internal/external frame of reference model using grades and test scores. *British Journal of Educational Psychology*, 84, 591-611. <https://doi.org/10.1111/bjep.12047>
- Möller, J., Zitzmann, S., Machts, N., Helm, F., & Wolff, F. (2020). A meta-analysis of relations between achievement and self-perception. *Review of Educational Research*, 90, 376-419. <https://doi.org/10.3102/0034654320919354>
- Niepel, C., Brunner, M., & Preckel, F. (2014). The longitudinal interplay of students' academic self-concepts and achievements within and across domains: Replicating and extending the reciprocal internal/external frame of reference model. *Journal of Educational Psychology*, 106(4), 1170-1191. <https://doi.org/10.1037/a0036307>
- Niepel, C., Stadler, M., & Greiff, S. (2019). Seeing is believing: Gender diversity in STEM is related to mathematics self-concept. *Journal of Educational Psychology*, 111(6), 1119-1130. <https://doi.org/10.1037/edu0000340>
- Sedikides, C., & Gregg, A. P. (2008). Self-enhancement: Food for thought. *Perspectives on Psychological Science*, 3(2), 102-116. <https://doi.org/10.1111/j.1745-6916.2008.00068.x>
- Shavelson, R. J., Hubner, J. J., & Stanton, G. C. (1976). Self-concept: Validation of construct interpretations. *Review of Educational Research*, 46, 407-444. <https://doi.org/10.2307/1170010>
- Stocker, J., Abu-Hilal, M., Hermena, E., AlJassmi, M., & Barbato, M. (2021). Internal/external frame of reference model and dimensional comparison theory: A novel exploration of their applicability among Arab high school students. *Educational Psychology* 41(4), 483-501. <https://doi.org/10.1080/01443410.2021.1887455>
- Trautwein, U., & Möller, J. (2016). Self-concept: Determinants and consequences of academic self-concept in school contexts. In A. A. Lipnevich, F. Preckel, & R. D. Roberts (Eds.), *Psychosocial skills and school systems in the 21st century: Theory, research, and practice* (pp. 187-214). Springer.
- Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: A meta-analytic review. *Educational Psychologist*, 39(2), 111-133. [https://doi.org/10.1207/s15326985ep3902\\_3](https://doi.org/10.1207/s15326985ep3902_3)

- Van der Westhuizen, L., Arens, K., Keller, U., Greiff, S., Fischbach, A., & Niepel, C. (2023) The formation of academic self-concept and interest in primary school: Examining the generalized internal/external frame of reference model with first- and third-grade children. *Contemporary Educational Psychology*, 73, 102-167. <https://doi.org/10.1016/j.cedpsych.2023.102167>
- Wan, S., Lauermann, F., Bailey, D. H., & Eccles, J. S. (2021). When do students begin to think that one has to be either a “math person” or a “language person?”: A meta-analytic review. *Psychological Bulletin*, 147(9), 867-889. <https://doi.org/10.1037/bul0000340>.
- Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review*, 12, 265-310. [https://doi.org/10.1016/0273-2297\(92\)90011-P](https://doi.org/10.1016/0273-2297(92)90011-P)
- Wigfield, A., Eccles, J. S., & Möller, J. (2020). How dimensional comparisons help to understand linkages between expectancies, values, performance, and choice. *Educational Psychology Review*, 32(3), 657-680. <https://doi.org/10.1007/s10648-020-09524-2>
- Wolff, F., Nagy, G., Retelsdorf, J., Helm, F., Köller, O., & Möller, J. (2018). The 2I/E model: Integrating temporal comparisons into the internal/external frame of reference model. *Journal of Educational Psychology*, 111, 1131-1161. <https://doi.org/10.1037/edu0000319>
- Wolff, F., Zitzmann, S., & Möller, J. (2020). Moderators of dimensional comparison effects: A comprehensive replication study putting prior findings on five moderators to the test and going beyond. *Journal of Educational Psychology*, 113(3), 621-640. <https://doi.org/10.1037/edu0000505>
- Wu, H., Guo, Y., Yang, Y., Zhao, L., & Guo, C. (2021). A meta-analysis of the longitudinal relationship between academic self-concept and academic achievement. *Educational Psychology Review*, 33(4), 1749-1778. <https://doi.org/10.1007/s10648-021-09600-1>
- Wunberg, M., Feddermann, M., Baumert, J., & Möller, J. (2024). CLIL Effects on Academic Self-Concepts: Positive effects in English but detrimental effects in math? *Learning & Instruction*, 92(4), 101923. <https://doi.org/10.1016/j.learninstruc.2024.101923>.
- Xu, M. K., Marsh, H. W., Hau, K.-T., Ho, I. T., Morin, A. J. S., & Abduljabbar, A. S. (2013). The internal/external frame of reference of academic self-concept: Extension to a foreign language and the role of language of instruction. *Journal of Educational Psychology*, 105, 489-503. <https://doi.org/10.1037/a0031333>