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Motivational Beliefs Specific to Business Studies Subfields: Interrelations, Antecedents, and Change in the Introductory Study Phase

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Motivational Beliefs Specific to Business Studies Subfields: Interrelations, Antecedents, and Change in the Introductory Study Phase

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Abstract

Self-concepts of ability (SCA) and intrinsic task values (ITV) are key determinants of students' choice of study program and dropout. Both constructs are multidimensional (i.e., specific to curricular learning content) and hierarchically structured (i.e., aggregate into one or more higher-order factors). The present study investigated German business studies students' ($N = 375$; age: $M(SD) = 21.8(5.51)$; 59% female) subfield-specific SCAs and ITVs. Longitudinal data collected at the transition into higher education (t1) and toward the end of the first semester (t2) gave insight into (changes in) interrelations and antecedents of subfield-specific SCAs and ITVs during the introductory study phase, when students likely had to review their hitherto anticipated motivational beliefs. Results from confirmatory factor analyses and structural equation modelling revealed that interrelations of SCAs and ITVs decrease over time. SCAs correlate increasingly strongly within a mathematical and a verbal domain compared to cross-domain correlations. Accordingly, mathematics, but not German SCA, from high school predicts all subfield-specific SCAs at t1, but only mathematical subfield SCAs at t2. However, the pattern of results for ITVs is less systematic. Curricular and practical implications of the subfield-specific formation of motivational beliefs at the transition into higher education are discussed.

Keywords: motivation; self-concept of ability; intrinsic task value; higher education; structural equation modeling

Creencias Motivacionales Específicas a Subcampos de Estudios de Empresa: Interrelaciones, Antecedentes y Cambio en la Fase Introductoria de un Estudio

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Resumen

Los auto conceptos de habilidad (ACA) y los valores intrínsecos a la actividad (VIA) son determinantes clave de la elección del alumnado de un programa de estudio y del abandono. Ambos constructos son multidimensionales (específicos al contenido de aprendizaje curricular) y están estructurados jerárquicamente agregados en uno o más factores de orden superior). Este estudio investigó los ACA específicos del subcampo y los VIA en alumnado de estudios de empresa alemanes ($N = 375$; edad: $M (DS) = 21.8 (5.51)$; 59% mujeres). Datos longitudinales recogidos en la transición a la educación superior (t1) y hacia el final del primer semestre (t2) arrojaron luz sobre los cambios en las interrelaciones y los antecedentes de los ACA específicos del subcampo y de los VIA durante la fase introductoria del estudio, cuando los estudiantes tenían que revisar sus creencias motivacionales anticipadas previas. Resultados de los análisis factoriales confirmatorios y modelos de ecuaciones estructurales revelaron que las interrelaciones de los ACA y los VIA disminuyeron a lo largo del tiempo. ACA correlacionaron más fuertemente con el dominio matemático y verbal comparado con correlaciones cros-dominio. De este modo, las matemáticas y no las ACA relativas al Alemán, del instituto predicen todos los ACA específicos del subcampo en t1 pero solo el ACA del subcampo matemático en t2. Sin embargo, el patrón de resultados para VIA es menos sistemático. Se discuten implicaciones curriculares y prácticas de la formación específica del subcampo de creencias motivacionales en la transición a la educación superior.

Palabras clave: motivación; autoconcepto de habilidad; valor intrínseco de la actividad; educación superior; modelo de educaciones estructurales.

Researchers and practitioners alike recognize motivational beliefs as determinants of students' choice of study program, engagement, persistence, and achievement in higher education (Bean & Eaton, 2000; Crosling, Thomas, & Heagney, 2008; Seidman, 2005; Trautwein & Bosse, 2017). Expectancy of success and subjective task value (Wigfield & Eccles, 2000) are key motivational beliefs predicting achievement and task choice, such as choosing a study program or dropping out of a study program (Bong, 2001; Eccles, Vida, & Barber, 2004; Heublein & Wolter, 2011; Malgwi, Howe, & Burnaby, 2005; Musu-Gillette, Wigfield, Harring, & Eccles, 2015; Tolciu & Sode, 2011; Shernoff & Hoogstra, 2001; T. R. Stinebrickner & Stinebrickner, 2009). Both expectancy of success—reflected by self-concepts of ability (Marsh, 1990a) or self-efficacy (Bandura, 1997; Eccles, 1983; Eccles & Wigfield, 1995)—and intrinsic task value, which is closely related to interest and intrinsic motivation (Eccles, 1983; 2005; Krapp, 1999; Ryan & Deci, 2000), are multidimensional constructs specific to curricular learning contents (e.g., subjects at school; Bong, 2001; Marsh, 1990a). Zooming out, subject-specific self-concepts and intrinsic task values accumulate to more abstract academic self-concepts and intrinsic task values (Chanal & Guay, 2015; Shavelson, Hubner, & Stanton, 1976; Vallerand & Ratelle, 2002).

In students' everyday life at university, lectures and seminars on different specialized subfields (Tempelaar, Gijsselaers, van der Loeff, & Nijhuis, 2007; Yeung, Chui, & Lau, 1999) constitute the overall field of study. However, higher education researchers often use fields of study as counterparts of school subjects (Bråten & Olaussen, 2005; Gorges, 2016; Gorges & Göke, 2015; Shernoff & Hoogstra, 2001; Brahm, Jenert, & Wagner, 2017) or focus on groups of fields of study (e.g., into math-intensive versus non-math-intensive; Musu-Gillette et al., 2015). Thus, previous research appears to neglect the subfield-related multidimensionality of motivational beliefs in higher education, that is, the idea that motivational beliefs are specific to subfields of study (i.e., subjects within a study program) in addition to fields of study.

Compared to high school, the range of subfields students may encounter in higher education is much broader and diverse, including novel and specialized academic learning content. The diversity of higher education subfields should be especially relevant during the transition into higher education. When high

school graduates leave the well-known high school curriculum to choose their study program, they need to think about their motivation regarding unknown learning content and make decisions based on vague motivational beliefs. In spite of—or maybe due to—the diversity in learning content, many studies within students’ transition into higher education focus on broader fields of study and work around the fact that students’ face novel academic learning contents (Nagy et al., 2008; Musu-Gillette et al., 2015; Shernoff & Hoogstra, 2001).

Against this backdrop, the present study seeks to extend our understanding of motivation at the transition into higher education in three ways. First, I focused on the multidimensionality of motivational beliefs specific to subfields of a field of study, namely business studies. Second, I used a longitudinal database that reveals how subfield-specific motivational beliefs and their interrelations change over the course of the introductory phase at university. Third, I investigated potential antecedents of subfield-specific motivational beliefs taken from students’ experience in high school—namely school subject-specific motivational beliefs—at the beginning and toward the end of the first semester. The study focused on self-concept of ability as an indicator of expectancy of success (Eccles & Wigfield, 1995) and intrinsic task value (i.e., a component of task value that is closely linked to students’ experience), which are subsumed under the term motivational beliefs.

The findings presented here offer a more fine-grained account of how first-year students form and change their subfield-specific motivational beliefs when they enter higher education. Understanding formation and change of motivational beliefs, in turn, may support counselors’ and higher education institutions’ efforts to help students make good choices and retain their motivation throughout their transition into higher education.

Students’ Subfield-Specific Self-Concepts of Ability and Intrinsic Task Values and Their Interrelations

Research from primary and secondary school has documented that self-concepts of ability and intrinsic task values are multidimensional and hierarchically structured (Bong, 2001; Chanal & Guay, 2015; Marsh, 1990a, 1990b; Shavelson et al., 1976; Vallerand & Ratelle, 2002). That is to say, students form motivational beliefs specific to a particular learning content within the curriculum (i.e., mathematics, biology, history) and aggregate them into higher-order (i.e., academic) motivational beliefs. Going beyond the high

school curriculum, motivational beliefs may be specific to specialized subsections of broader competence areas (e.g., self-concept regarding dance, dramatic art, visual art, and music are subordinate to an overall arts self-concept; [Vispoel, 1995](#)). Thus, students in higher education likely develop motivational beliefs, such as self-concepts of ability and intrinsic task value specific to subfields that are part of their study program ([Tempelaar et al., 2007](#); [Yeung et al., 1999](#)).

Regarding hierarchy, motivational beliefs may cluster into one or more higher-order factors depending on the coherence of the learning contents ([Marsh, 1990](#); [Yeung et al., 1999](#)). That is to say, students develop subject-specific self-concepts as well as superordinate domain-specific self-concepts. With respect to the broad range of diverse subjects in high school, Marsh ([1990a](#)) found two uncorrelated higher-order factors that cluster students' self-concepts of ability into a mathematical and a verbal domain. In the case of business studies, [Yeung et al. \(1999\)](#) argued that a specialized educational context, such as a commercial college covering a more homogenous range of subjects, promotes the formation of only one higher-order factor. By contrast, A. Y. Kolb and Kolb ([2005](#)) argued that business studies, in particular, is a diverse study program combining mathematics, economics, and behavioral science.

Diversity in subfields may, on the one hand, lead to well-differentiated subfield-specific motivational beliefs because each subfield is clearly distinguishable. On the other hand, however, groups of relatively similar subfields within a broad range of diverse subfields may foster the formation of more than one higher-order factor (e.g., mathematical and verbal motivational beliefs). Distinct higher-order factors, in turn, may lead to dimensional comparison effects, as outlined by Marsh ([1990b](#)). In dimensional comparisons, students develop their self-concepts of ability by evaluating their achievement in the respective domain and by comparing their achievement across domains, which typically shows negative effects. For example, a good grade in mathematics would increase a students' mathematical self-concept, but decrease his or her verbal self-concept.

Looking at existing empirical findings regarding subfield-specific motivational beliefs, results from [Yeung et al. \(1999\)](#) have supported the proposition of only one higher-order factor (but do not speak to a possible two-factor model). However, the correlational pattern suggests a distinction between mathematical and verbal subfields: Correlations were systematically

higher within the mathematical ($.28 < r < .41$) and verbal domain ($r = .38$), respectively, compared to cross-domain correlations ($r = .07$ and $.15$ for accounting; $r = .31$ and $.33$ for mathematics & statistics, and $r = .22$ and $.23$ for economics). These findings lend support to the assumption that students may distinguish a mathematical and verbal self-concept in commercial education.

Focusing on both self-concepts in terms of cognitive competence and value, Tempelaar et al. (2007, 2011) investigated subfield-specific motivational beliefs regarding five business studies subfields: Statistics, Finance & Accounting (both related to the mathematical domain), Marketing Management, Organizations & Human Resources Management (HRM; both related to the verbal domain), and Business Strategy (related to both the mathematical and the verbal domain). Confirmatory factor analyses demonstrated subfield-specificity for both cognitive competence and value (Tempelaar et al., 2007). Hence, students appear to distinguish clearly between subfield-specific motivational beliefs regarding these five subfields.

With respect to the underlying structure of subfield-specific motivational beliefs, Tempelaar et al. (2007) reported unanimously significant (all $p < .05$) small to moderate correlations between subfield-specific cognitive competence beliefs. Surprisingly, the correlation between cognitive competence regarding Finance & Accounting, and Statistics, which may both be considered mathematical subfields, was only $r = .10$, whereas correlations between cognitive competence regarding Marketing & Management, and Organization & HRM, two verbal subjects, were $r = .25$. Statistics cognitive competence correlated more strongly with cognitive competence regarding Business Strategy ($r = .25$), Marketing & Management ($r = .21$), and Organization & HRM ($r = .21$), whereas correlations between Finance & Accounting cognitive competence and both verbal cognitive competences were weaker ($r < .14$; and $r = .15$ with Business Strategy cognitive competence). Thus, cross-domain correlations were weaker compared to within-domain correlations for verbal subfields and Finance & Accounting.

Value correlations were unanimously significant (all $p < .05$), as well, but higher overall. The correlational pattern showed stronger correlations within the mathematical ($r = .44$) and verbal domain ($r = .41$), respectively, and weaker correlations across domains ($.14 < r < .27$). Business Strategy value correlated strongly with Marketing & Management value ($r = .47$) but less so ($.30 < r < .37$) with the rest of the subfield-specific cognitive competences.

The findings by Tempelaar et al. (2007) thus have suggested a distinction between mathematical and verbal motivational beliefs at least regarding task value.

Interpretation of these correlations should consider that the sample in Tempelaar et al.'s study (2007) were students from the first/second through fourth semester. Hence, participants predominantly had an extensive amount of experience with the study program. It is unclear whether first-year students' initial anticipation of subfield-specific beliefs would turn out to be as sophisticated as the ones reported by Tempelaar et al. (2007) and Yeung et al. (1999).

Antecedents of Students' Self-Concepts of Ability and Intrinsic Task Values

Researchers typically use subject-specific self-concepts and task values to predict subsequent educational task choice, such as choosing a college major (e.g., for science, Shernoff & Hoogstra, 2001; for math-intensive subjects, Musu-Gillette et al., 2015). Such studies may assume that study programs match school subjects at the university level. However, a broad range of study programs in higher education does not correspond to a school subject at secondary school (German Rectors' Conference, 2014; Schröder, 2015). Therefore, at the transition into higher education, students have to form motivational beliefs with respect to largely unknown learning content. It seems unlikely that students would do so out of thin air; but *how* do students form motivational beliefs in light of unknown learning content?

Tackling this question, Gorges & Kandler (2012) argued that students *anticipate* their motivational beliefs specific to a field of study that does not correspond to a well-known school subject. They suggested that such anticipated motivational beliefs may build on existing motivational beliefs derived from students' experience with high school subjects they perceive to be similar to the unknown learning content, a process they call *generalization*. In other words, first-year students are expected to use their school subject-specific motivational beliefs as a *best guess* (Gorges & Kandler, 2012, p. 611) for their field-of-study-specific motivational beliefs if they perceive both to be similar. So far, empirical findings support the generalization hypothesis. For example, physics-specific self-concept predicted self-concept specific to mechanical engineering (Gorges & Göke, 2015), and mathematics-specific

intrinsic task value predicted intrinsic task value specific to business studies (Gorges, 2016).

The idea of students generalizing their school subject-specific motivational beliefs to anticipate motivational beliefs specific to study programs implies that anticipated motivational beliefs may turn out to be wrong. Following this line of reasoning, students probably need to revise their motivational beliefs once they have gathered experience with the novel learning content (Gorges & Kandler, 2012). Accordingly, motivational beliefs in high school are increasingly stable (Denissen, Zarrett, & Eccles, 2007; Musu-Gillette et al., 2015; see Tempelaar et al., 2011 on the stability of motivational beliefs in higher education), whereas anticipated motivational beliefs in higher education probably need revising during the introductory phase of a study program, which leads to substantial variation in students' motivational beliefs during the introductory phase in higher education (Gorges, 2017). Revising may be rather frustrating for students, who assume that they have chosen the right study program based on their motivational beliefs. Thus, the need to revise one's initial motivational beliefs might explain why students often report lack of interest and lack of cognitive competence as major reasons for dropout (T. R. Stinebrickner & Stinebrickner, 2009; Heublein & Wolter, 2011), and why so many students drop out early (Barefoot, 2004; Holder, 2007; Tolciu & Sode, 2011).

As is the case with most studies, existing research investigating the hypothesized processes of generalization and revision in higher education contexts focused on broad (groups of) fields of study (Gorges, 2016, 2017; Gorges & Göke, 2015; Musu-Gillette et al., 2015), although fields of study reflect higher-order entities grouping a number of subfields rather than subjects. Nevertheless, at the transition into higher education, students' probably anticipate motivational beliefs specific to the field of study instead of forming motivational beliefs specific to hitherto unknown subfields. Hence, motivational beliefs specific to subfields likely develop in a top-down process (Marsh & Yeung, 1998), leading to similar motivational beliefs across all subfields. For example, research on anticipated motivational beliefs has suggested that most high school graduates associate business studies with mathematics and, consequently, use their mathematics-specific motivational beliefs—and not their verbal motivational beliefs—to anticipate their business studies-specific motivational beliefs (Gorges, 2016; Gorges & Göke, 2015). Thus, students initially appear to ignore the composition of business studies

from a diverse range of learning contents, which includes subfields from the verbal domain. However, interpretation of these findings should bear in mind that linking school subjects to fields of study neglects the multidimensionality of motivational beliefs in higher education. Results on the level of subfields may differ when students face a range of both mathematical and verbal subfields.

The Present Study

The present study seeks to extend our knowledge about students' potentially subfield-specific motivational beliefs, their interrelations, and antecedents thereof. Revising motivational beliefs carries the risk of frustration, self-worth threat, and, eventually, dropout. Therefore, further insight into subfield-specific motivational beliefs at the transition into higher education may be useful for building a supportive higher education environment, to help students to anticipate adequate expectancies of success and intrinsic task values for a study program, and to provide support for careful revisions of motivational beliefs.

The goal of this study was threefold. First, it investigated the correlational pattern of distinct subfield-specific self-concepts of ability and intrinsic task values. Second, it investigated potential changes of the correlational pattern between anticipated subfield-specific self-concepts of ability and intrinsic task values at the very beginning of the study program and experience-based self-concepts of ability and intrinsic task values toward the end of the first semester. Third, it tested the predictive validity of school-based motivational beliefs—namely mathematics-specific and German-specific self-concepts of ability and intrinsic task values—for students' anticipated subfield-specific motivational beliefs at both measurement points.

The study used longitudinal data from the German research project ValCom (“Value and Competences in Adulthood”) that offers insight into (changes of the) interrelations, and changes and antecedents of first-year students' motivational beliefs specific to four subfields of business studies, namely accounting, business arithmetic, human resources, and law. Assuming that first-year students initially develop self-concepts of ability and intrinsic task values regarding business studies as a whole *anticipated* subfield, specific motivational beliefs were expected to correlate strongly and unanimously. By contrast, correlations between *experience-based* motivational beliefs were expected to show a more differentiated pattern, with moderate to strong

correlations only within the mathematical and verbal domain, respectively, whereas correlations across domains were expected to be weak. Drawing on previous findings on the stability of field-of-study-specific motivational beliefs (Gorges, 2017), stability coefficients for subfield-specific motivational beliefs were expected to be moderate for the mathematical subfield (i.e., because of the link students perceive between business studies and mathematics; Gorges & Göke, 2015) and low for verbal subfields, which students should not expect in a business studies program.

In line with this reasoning, mathematics-specific motivational beliefs, but not German-specific motivational beliefs, were expected to predict *anticipated* subfield-specific motivational beliefs at the beginning of the study program. With time and experience, students should discover that business studies cover a broad range of diverse subject matters, some of which are rather similar to mathematics (e.g., business arithmetic, accounting), whereas others are not (e.g., human resources, law). Accordingly, German-specific motivational beliefs were expected to predict *experience-based* motivational beliefs specific to human resources and law (see Gorges, 2017, on the revision of motivational beliefs).

Method

Participants and Procedure

Participants were first-year students from six universities of applied sciences in Germany enrolled in study programs labeled *business studies* (in German “Betriebswirtschaft” or “Betriebswirtschaftslehre”). Online data collection took place during the weeks preceding the first semester up to the first weeks after the start of the study program (t1), and three to four months afterwards (i.e., toward the end of the first semester; t2). As is common in longitudinal research, participants’ data was linked across measurement points via a participant-generated personal code.

Overall, 408 students started the survey (response rate: 34%). All participants were informed about the purposes for which their data would be used and gave their consent. We excluded participants with missing data on all variables. The final sample contained $n_{t1} = 375$ students (age: $M (SD) = 21.8 (5.51)$; 59% female). Of these participants, 49.6% took part in wave two ($n_{t2} = 189$; $M (SD) = 21.41 (3.68)$; 66.5% female). Comparisons of those participants that were retained to those that dropped out indicated no

systematic difference between these groups, with the exception of self-concept of ability in business arithmetic, which was higher for those who dropped out of the study. Thus, attrition did not appear to bias the findings.

The survey first asked for students' sociodemographic characteristics followed by self-concept and task value measures regarding school subjects (among others mathematics and German), fields of study (among others business studies), four business studies subfields (business arithmetic, accounting, human resources, and law), and two subfields of the remaining fields of study, per survey page. Throughout the survey, participants were actively encouraged to anticipate their responses regardless of their personal experience with the learning content. Completion of the survey took approximately 20 minutes.

Measures

Self-concept of ability. All items were adapted from the literature (Dickhäuser, Schöne, Spinath, & Stiensmeier-Pelster, 2002) and used parallel wording to tap students' academic self-concepts for business studies and for the different subjects (e.g., "I consider my aptitude for business studies/mathematics/human resources/ ... to be high"). Items and mode of presentation were consistent at both measurement points. To have the same subject label across all participating universities, the major headings were consistent across all surveys, but examples were tailored to the specific curriculum. Students' self-concept was measured with respect to business arithmetic, law, accounting, and non-mathematical basic economics, which was human resources in all but one curricula. Items were presented in terms of a matrix where business studies shared a survey page with three more fields of study, and the four subjects were presented on the same survey page. Answers to all items were recorded using a four-point Likert-type scale (1 = *absolutely not true*, 2 = *rather not true*, 3 = *somewhat true*, 4 = *absolutely true*). Internal consistency was good for all subfields at both measurement points (see Table 1).

Intrinsic task value. All items were adapted from the literature (Steinmayr & Spinath, 2010) and used parallel wording to tap students' academic self-concepts for business studies and for the different subjects (e.g., "I have fun doing mathematics/human resources/ ..."). The mode of presentation was identical to the measurement of self-concept of ability. Internal consistency was good for all subfields at both measurement points (see Table 2).

Analyses

The analyses started with confirmatory factor analyses addressing the goodness of the hypothesized measurement models and bivariate correlations between self-concepts and intrinsic task values, respectively, regarding the four business studies subfields at each measurement point and over time. Correlations over time reflect stability coefficients (see [Gorges, 2017](#), on the stability of initial motivational beliefs in higher education). Regarding self-concept of ability and intrinsic task value, respectively, the model contained all constructs included in the subsequent structural equation models. Next, two structural models covering only t1 and t1 and t2 measures, respectively tested the predictive validity of t1 school subject-specific motivational beliefs for t1 and t2 subfield-specific motivational beliefs. Separate models were specified for self-concepts of ability and intrinsic task values (see [Fig.1](#) and [Fig. 2](#)).

The data was fitted to the specified models using the statistical software R ([R Core Team, 2015](#)) and the lavaan package ([Rosseel, 2012](#)). Robust maximum likelihood estimation and model-based handling of missing data made use of the full sample for model estimation regarding both measurement points. Model fit was evaluated based on the following fit indices: the comparative fit index (CFI, good $>.95$; acceptable $>.90$), the root mean square error of approximation (RMSEA; good $<.05$; acceptable $<.08$), and the standardized root mean residual (SRMR; acceptable $<.10$; good $<.05$; [Schermelleh-Engel, Moosbrugger, & Müller, 2003](#)).

Results

Measurement Models

Results from confirmatory factor analyses revealed at least acceptable model fit for the self-concept measurement model ($\chi^2(df) = 1444.509(695)$, $p < .01$, CFI = .917, RMSEA = .056, RMSEA 90%-CI: .052 – .060, SRMR = .047) and for the intrinsic task value measurement model ($\chi^2(df) = 1109.56(695)$, $p < .01$, CFI = .957, RMSEA = .042 RMSEA 90%-CI: .037 – .047, SRMR = .054). All factor loadings were significant ($p < .05$). Thus, the proposed measurement models were used in the following analyses.

Table 1

Internal Consistency, Descriptive Statistics, and Latent bivariate Correlations Across All Self-Concepts

	α	$M(SD)$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
t1 mathematics SCA (1)	.93	2.80 (.77)									
t1 German SCA (2)	.88	2.91 (.62)	0.081								
t1 business arithmetic SCA (3)	.90	2.64 (.69)	0.744*	0.012							
t1 accounting SCA (4)	.88	2.88 (.74)	0.341*	-0.054	0.448*						
t1 law SCA (5)	.91	2.73 (.67)	0.134*	-0.006	0.368*	0.604*					
t1 human resources SCA (6)	.92	2.92 (.71)	0.437*	0.043	0.556*	0.414*	0.401*				
t2 business arithmetic SCA (7)	.95	2.67 (.83)	0.668*	0.054	0.618*	0.207*	0.156*	0.351*			
t2 accounting SCA (8)	.93	2.71 (.77)	0.321*	-0.047	0.243*	0.608*	0.347*	0.207*	0.249*		
t2 law SCA (9)	.90	2.66 (.60)	-0.020	0.168	0.001	0.010	0.083	0.171	0.237*	0.175*	
t2 human resources SCA (10)	.88	2.97 (.56)	0.077	0.071	0.124	0.204*	0.150	0.219*	0.174	0.367*	0.465*

Note. SCA = self-concept of ability, * $p < .05$.

Descriptive Statistics and Correlational Patterns

Tables 1 and 2 show the mean, standard deviations, and latent factor correlations for all variables. Overall, self-concepts did not show a clear upward or downward trend over time, whereas all intrinsic task values decreased. As expected, correlations between mathematical versus verbal subfields of business studies decreased over time. The correlation between law and human resources self-concept slightly increased, whereas the correlation between business arithmetic and accounting self-concept substantially decreased. Stability coefficients were high for the mathematical subfields, but low for the verbal subfields. Mathematics and German self-concept were uncorrelated.

Table 2

Internal Consistency, Descriptive Statistics, and Latent Bivariate Correlations Across All Intrinsic Task Values

	α	$M(SD)$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
t1 mathematics ITV (1)	.94	2.83 (.77)									
t1 German ITV (2)	.84	2.72 (.65)	-0.022								
t1 business arithmetic ITV (3)	.94	2.85 (.70)	0.428*	0.003							
t1 accounting ITV (4)	.96	2.79 (.81)	0.271*	0.075	0.409*						
t1 law ITV (5)	.94	2.81 (.74)	0.019	0.211*	0.238*	0.598*					
t1 human resources ITV (6)	.93	3.24 (.60)	0.145*	0.022	0.486*	0.461*	0.461*				
t2 business arithmetic ITV (7)	.92	2.72 (.76)	0.664*	-0.080	0.250*	0.103	-0.090	-.004			
t2 accounting ITV (8)	.95	2.71(.83)	0.419*	-0.013	0.145	0.471*	0.175*	0.162*	0.313*		
t2 law ITV (9)	.93	2.77 (.71)	0.070	0.185	0.016	0.199*	0.356*	0.120	0.150*	0.083	
t2 human resources ITV (10)	.91	3.04 (.61)	0.033	0.042	0.192*	0.217*	0.148	0.214*	0.209*	0.157	0.371*

Note. ITV = intrinsic task value, * $p < .05$.

The overall correlational pattern for intrinsic task values was somewhat different compared to the pattern for self-concepts. Both within-domain correlations and cross-domain correlations decreased over time. However, within-domain correlations remained moderate and significant, whereas most cross-domain correlations at t2 were small, and only half of them were significant. Compared to self-concept correlations, stability coefficients were a little lower. Furthermore, the stability coefficients did not vary depending on the subfield being mathematical or verbal. Instead, accounting and law intrinsic task value showed high stability, whereas business arithmetic and human resources intrinsic task value showed moderate stability at best. Again, mathematics and German self-concept were uncorrelated.

Predicting Subfield-Specific Self-Concepts and Intrinsic Task Values

To investigate the predictive validity of mathematics- and German-specific motivational beliefs for subfield-specific motivational beliefs, two models were specified. The first model used t1 school subject-specific motivational beliefs to predict t1 subfield-specific motivational beliefs (i.e., anticipated motivational beliefs); the second model used t1 school subject-specific motivational beliefs to predict t2 subfield-specific motivational beliefs (i.e., experience-based motivational beliefs).

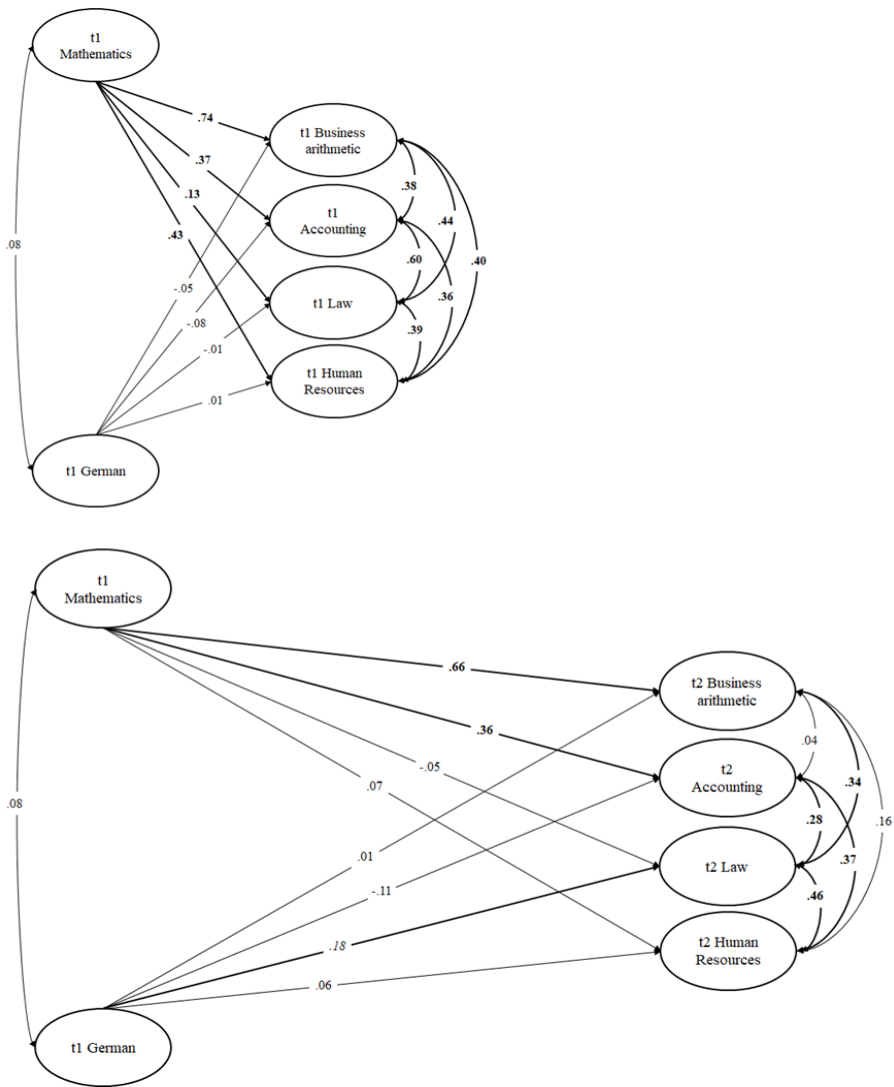


Figure 1. Results from structural equation models regarding self-concepts of ability.
Note. The figure shows standardized coefficients; significant paths/correlations and coefficients are printed in bold ($p < .05$), marginally significant coefficients ($p < .10$) are printed in italics; for further description, see text.

Model fit was acceptable for the first self-concept model ($\chi^2(df)=866.352(237)$, $p < .01$, CFI = .890, RMSEA = .096, RMSEA 90%-CI: .089–0.103, SRMR = .076) and slightly better for the second self-concept model ($\chi^2(df)=528.737(237)$, $p < .01$, CFI = .932, RMSEA = .061, RMSEA 90%-CI: .054 – .068, SRMR = .049). By contrast, both intrinsic task value models showed at least acceptable model fit (first model: $\chi^2(df)=493.220(237)$, $p < .01$, CFI = .961, RMSEA = .060, RMSEA 90%-CI: .053 – .067, SRMR = .056; second model: $\chi^2(df)=395.391(237)$, $p < .01$, CFI = .961, RMSEA = .047, RMSEA 90%-CI: .039 – .055, SRMR = .068).

As expected, mathematics self-concept of ability predicted all four anticipated subfield-specific self-concepts. Not surprisingly, its predictive validity was highest for business arithmetic self-concept and lowest for law self-concept (see [Figure 1](#)). German self-concept did not show a significant effect on any of the subfield-specific self-concepts. Predicting the same subfield-specific self-concepts three to four months later, however, showed a different pattern of results. More specifically, the predictive validity of mathematics self-concept for experience-based law and human resources self-concept decreased and was no longer significant. Effect sizes for German self-concept predicting law and accounting for self-concept increased markedly and revealed a trend toward significance for law self-concept ($\beta = -.18$; $p = .076$).



Figure 2. Results from structural equation models regarding intrinsic task values.

Note. The figure shows standardized coefficients; significant paths/correlations and coefficients are printed in bold ($p < .05$), marginally significant coefficients ($p < .10$) are printed in italics; for further description, see text.

Turning to intrinsic task value (see [Figure 2](#)), the pattern looked different. In particular, mathematics intrinsic task value predicted anticipated business arithmetic, accounting, and human resources intrinsic task values, but not law intrinsic task value. Law intrinsic task value, in turn, was predicted by German intrinsic task value. This pattern of results changed markedly when looking at experience-based intrinsic task value. Mathematics intrinsic task value continued to predict business arithmetic and accounting intrinsic task value, but none of the other paths reached significance. That is to say, German intrinsic task value lost its predictive validity over time.

Discussion

The present study investigated business studies students' subfield-specific motivational beliefs—that is, self-concepts and intrinsic task values—across students' first semester in higher education. Results show that students differentiate subfield-specific motivational beliefs during the transition into higher education, and even more so toward the end of the first semester. The correlational patterns suggest that students begin to distinguish subfields belonging to the mathematical versus verbal domain. Mathematical self-concepts are rather stable, whereas verbal self-concepts are highly unstable across the introductory study phase. These changes may be explained by uncertainties students face when they encounter novel academic learning content in higher education.

Investigating the predictive validity of mathematics- and German-specific motivational beliefs, two school subjects that students know well and differentially associate with business studies subfields, showed some changes over time as well. As expected, the predictive validity of mathematics-specific motivational beliefs decreased over time, whereas the predictive validity of German-specific motivational beliefs increased a little. Hence, these changes largely corresponded to the changes in the correlational pattern of subfield-specific motivational beliefs. Overall, results from the present study emphasize the need for students to anticipate motivational beliefs when entering higher education—likely by generalizing motivational beliefs from

well-known school subjects—and the hypothesized revision of motivational beliefs based on experience, which apparently affects the structure of self-concepts of ability and intrinsic task values.

Students' Motivational Beliefs at the Transition into Higher Education

A number of studies have addressed students' transition into higher education (Coertjens, Brahm, Trautwein, & Lindblom-Ylänne, 2017; Gale & Parker, 2014) and the role of school-based motivational beliefs for educational (e.g., Musu-Gillette et al., 2015; Shernoff & Hoogstra, 2001) and occupational decisions (e.g., Eccles et al., 2004; Mortimer, Zimmer-Gembeck, Holmes, & Shanahan, 2002). However, investigations that take the subfield-related multidimensionality of motivational beliefs and the diversity and novelty of academic learning content in higher education into account are rare. Hence, the present study provides a substantive extension of our understanding of students' motivational beliefs at the beginning of their career in higher education in two regards. First, the results emphasize the importance of investigations of motivational beliefs on the level of subfields, in addition to the level of fields of study. Changes in the correlational patterns of students' subfield-specific self-concepts of ability and intrinsic task values demonstrate that subfield-specific motivational beliefs may not be well-differentiated at the beginning, but certainly develop when students' experience with the subfields increases. This finding is especially important because self-concepts of ability and intrinsic task values are key factors for student retention and dropout (T. R. Stinebrickner & Stinebrickner, 2009; Heublein & Wolter, 2011).

Second, the present study offers insight into antecedents of anticipated motivational beliefs. As expected, stereotypes about which school subject is similar to a field of study affect students' anticipations of motivational beliefs (Gorges, 2016; Gorges & Göke, 2015). Such perceptions may lead students to use specific school-based motivational beliefs as predictors of their field-of-study-specific motivational beliefs, which may or may not turn out to be right. Thus, this study extends empirical findings on antecedents of field-of-study-specific motivational beliefs when students encounter novel learning contents on the level of subfields.

The Case of Business Studies

With respect to the field of study under investigation—business studies—the results confirm that common stereotypes (e.g., business studies contain a lot of mathematics) may lead first-year students to form inadequate motivational beliefs. More specifically, students' apparently use their mathematics-specific self-concept and intrinsic task value to anticipate their business studies-specific self-concept and intrinsic task value (Gorges, 2016; Gorges & Göke, 2015). As can be seen from the results, students use their mathematics-specific motivational beliefs to anticipate their business studies subfield-specific motivational beliefs as well. Thus, due to a lack of differentiation among business studies subfields, students seem to assume that mathematics competence and task value are important for every learning content in a business studies program. Such inadequate anticipations of motivational beliefs may lead to discontented and frustrated students.

Later in their first semester, students apparently discover that business studies subfields are quite diverse and seem to realize that competence and value related to German are just as important. In particular, the increase of the correlation between law and human resources self-concept suggests that students may develop a verbal self-concept factor to organize their subfield-specific self-concepts. By contrast, the correlation between business arithmetic and accounting self-concepts decreases, suggesting that students scrutinize their initial idea of many mathematical subjects in business studies as well. Overall, students appear to get to know their field of study better and develop self-concepts specific to each subfield, especially in the verbal ones, which they may not have expected. This, in turn, may lead to dropout.

In recent years, attempts have been made to integrate the diverse subfields within business studies by modifying the curriculum to increase students' employability in modern companies (Campbell et al., 2006). Critics of this development have argued that the traditional function-based curriculum allows students to quickly develop specialized competences, whereas pedagogical measures may foster teamwork and integrated competence across subfields (Campbell et al., 2006; Tempelaar et al., 2011). From a motivational perspective, students develop subject-specific motivational beliefs even in an integrated curriculum (Jansen, Schroeders, Lüdtke, & Pant, 2014). Thus, integrating different subfields to make distinctions less obvious will not necessarily lead to different processes of motivational development or to higher levels of motivation per se.

Practical Implications

With respect to higher education institutions' goals to attract and retain students that are successful in their study programs—and, in addition, students' goals to find the right study program—the present study draws attention to the significance of student counseling and provision of information prior to the decision to enroll. For example, it may help students to anticipate adequate business studies self-concepts and intrinsic task value if they know that business studies cover both mathematical and verbal content. For higher education teachers, it is important to know that students will develop motivational beliefs specific to every subfield they encounter at college or university. Therefore, every lecturer should foster motivation for his/her part of the curriculum; only then do more integration and cross-references add to students' motivation.

Comparison of the stability of motivational beliefs documented in this study to Tempelaar et al.'s (2011) results reveals that motivation becomes more stable rather quickly. Therefore, it is important to seize the opportunity to foster motivation at the beginning of a study program. Although students may be occupied with organizing their new life at university and blending in with the new environment, intrinsic task values may decline soon after students have entered higher education, which may lead to doubts regarding students' choice of study program. Given that all motivational beliefs are anticipated, some variation, including decreases, may not necessarily mean that students' have chosen the wrong study program. Programs that help students with adapting to the new social environment and prepare students who have to revise their motivational beliefs, which is a normal process, may prevent overly hasty reactions, such as early dropout. In addition, lectures should be aware of such motivational development and help students to retain or rebuild their motivation based on experience. Overall, these results emphasize that every lecture counts and may help students to gather information about their aptitude by providing feedback and promoting intrinsic task value (Hidi & Harackiewicz, 2000).

Limitations and Outlook

The present study draws on a longitudinal database. Students have been questioned at the beginning of their study program and toward the end of the first semester. This study design thus warrants causal conclusions with respect to the predictive validity of school subject-specific motivational beliefs for

motivational beliefs recorded at the second—but not the first—measurement point.

Due to similarities in structure and experience-based developmental processes, self-concepts of ability and intrinsic task value were treated as similar constructs throughout this study. However, in line with Gorges (2016), the pattern of results showed some inconsistencies across the analyses for self-concept and intrinsic task value. As an explanation, Gorges (2016) suggested that the concept of similarity underlying students' generalization may be different. More specifically, self-concepts generalize when students perceive a school subject as a foundation of a field of study, whereas intrinsic task value may generalize when students perceive the topics and the structure related to a school subject and a field of study to be similar. Against this background, students' may have realized that their mathematical competence is less important for being successful in law and human resources; hence, the predictive power of mathematical self-concept decreases. By contrast, they may have noticed that language (i.e., expressions and wordings) are important for success in a law courses, hence the predictive validity of their German self-concept for law increased. Regarding intrinsic task value, business arithmetic and accounting might include tasks similar to mathematics at school (e.g., mathematical exercises taken from everyday life). However, neither mathematics nor German tasks match the requirement of the learning contents of law and human resources, which might explain the extremely low stability of students' self-concepts of ability: They have to draw a picture of their own about their subfield-specific competence because their anticipated self-concepts drawing on mathematics turned out to be inadequate.

The present study focused on one specific field of study, namely business studies. This field of study was chosen based on its diverse contents and its absence in the regular school curricula in Germany, where this study was set. Replicating the study with respect to a field of study that students already know more about, for example, because it is a subject at school, may lead to different results. Such a study would nevertheless be desirable for broadening our understanding of motivational beliefs in higher education. Similarly, using a field of study with a smaller range of subfields may also lead to different results because it is more likely that students' field-of-study-specific motivational beliefs are in line with their subfield-specific beliefs. Finally, the present study focused on mathematics- and German-specific antecedents of subfield-specific motivational beliefs. Future research addressing

generalization and revision processes during the transition into higher education is needed to scrutinize the assumptions underlying the present study and to provide more details on how students' motivational beliefs develop in higher education.

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Student Interest and Engagement in Middle School Physical Education: Examining the Role of Needs Supportive Teaching

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Student Interest and Engagement in Middle School Physical Education: Examining the Role of Needs Supportive Teaching

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Abstract

This study examines the complexities of the social learning environment in middle school physical education. Specifically, we investigate the independent and interactive predictive effects of situational interest and needs supportive teaching on students' personal interest and class engagement. Middle school students ($N = 388$) in compulsory physical education courses completed questionnaires on situational interest, needs supportive teaching, personal interest, and behavioral and emotional engagement. Results from structural equation modeling tests revealed independent predictive effects of situational interest and needs supportive teaching on personal interest, and behavioral and emotional engagement. There was also an interactive effect between situational interest and needs supportive teaching on personal interest. This association was conditional on a minimum level of needs support in the social learning environment. To date, the conceptualization of situational interest has focused on student – activity interactions; however, our findings highlight the importance of social learning environment on student – activity interactions.

Keywords: interest, engagement, need support.

Interés y Compromiso del Alumnado en Educación Física en el Instituto: Examinando el Papel de la Enseñanza de Apoyo a las Necesidades

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Resumen

Este estudio examina las complejidades del entorno social de aprendizaje en la educación física en la escuela media. Específicamente, investigamos los efectos predictivos independientes e interactivos del interés situacional y de la enseñanza de apoyo a las necesidades sobre los intereses personales del alumnado y el compromiso en la clase. Estudiantes de escuela media ($N = 388$) en cursos de educación física obligatoria completaron cuestionarios sobre intereses situacionales, enseñanza de apoyo a las necesidades, interés personal y compromiso conductual y emocional. Resultados de tests de modelos de ecuaciones estructurales revelaron efectos predictivos independientes del interés situacional y la enseñanza de apoyo a necesidades sobre el interés personal, y el compromiso conductual y emocional. También hubo un efecto interactivo entre el interés situacional y la enseñanza de apoyo a las necesidades sobre el interés personal. Esta asociación fue condicional en un nivel mínimo de apoyo a las necesidades en el entorno social de aprendizaje. Hasta el momento, la conceptualización del interés situacional se ha focalizado en las interacciones estudiante-actividad; sin embargo, nuestros resultados subrayan la importancia del entorno social de aprendizaje sobre las interacciones estudiante-actividad.

Palabras clave: interés, compromiso, apoyo a las necesidades

Middle school is a critical juncture in understanding early adolescents' motivation toward establishing health lifestyle habits. Physical education (PE) provides early adolescents the opportunity to learning about healthy lifestyles in a structured, school-based learning environment. Unfortunately, early adolescence represents a time-period when students' attitudes toward PE start to decline (Mercier, Donovan, Gibbone, & Rozga, 2017). Students that lack motivation are unlikely to mobilize their personal resources toward the learning process, which undermines academic success (Skinner, Marchand, Furrer, & Kindermann, 2008) and impedes engagement in health behavior (Ntoumanis & Standage, 2009; Olson, Gaffney, Lee, & Starr, 2008). On the other hand, students who are interested and engaged in PE are more likely to achieve important outcomes such as knowledge development, motor skill proficiency, and physical activity participation (Chen & Ennis, 2009; Ennis, 2015).

In this study, we examine the complexities of middle school students' interest and engagement in PE. Recently, Chen and Wang (2017) challenged investigators to address the dearth of research on students' personal interest in PE. We attempt to answer this call by examining middle school PE students' beliefs about their social learning environment. Specifically, we explore students' personal interest and engagement regarding the interaction between situational interest toward routine activities in PE and perceptions of their teachers' motivational style. Situational interest is a powerful motivational factor in PE learning contexts (Chen & Darst, 2001). Despite strong theoretical links between interest development and social aspects of classrooms (Deci, 1992), research on situational interest in PE has focused on specific activities without addressing teachers' motivational style for delivering those activities. In the following paragraphs, we argue that situational interest and teacher motivational style need to be further investigated to enhance understanding about middle school students' personal interest and engagement in PE.

Interest Theory and Engagement

Interest is a critical element of motivation in the classroom because it predisposes students to engage and reengage in the learning process (Hidi & Renninger, 2006; Mitchell, 1993; Renninger & Hidi, 2016). Educational

researchers typically focus on two main types of interest, situational and personal (Hidi & Renninger, 2006). It is important to note, however, that cognitive activation, positive emotion, and personal meaning/value are core elements in both types of interest. Situational interest is a short-term type of interest focusing on the interaction between a student and her/his learning context. Specifically, situational interest is associated with personal attachment to the appealing contextual aspects of a learning task or content (Chen & Wang, 2017). Hidi and Renninger (2006) suggest that triggering situational interest occurs from external sources within the learning environment such as the instructional conditions, topic-focus, and social interactions with teachers and/or peers. On the other hand, personal interest is a person-centered psychological disposition toward a learning tasks or content, grounded in personal meaning, preference, and value (Hidi & Renninger, 2006). Personal interest develops over longer periods through repeated experiences with learning tasks and/or content.

Research on student interest in PE has concentrated on situational interest (Chen, Darst, & Pangrazi, 1999). Chen and his colleagues developed the situational interest framework in PE, which focuses on students' connection to activity characteristics that stimulate short-term interest. This is a highly productive research agenda because it provides vital information on how to structure PE tasks that activate student attention and positive emotional states. According to Chen and Wang (2017), situational interest may receive greater attention because external characteristics of the learning context are easier to manipulate than person-centered personal interest. However, the study of both situational interest and personal interest are necessary to obtain a comprehensive understanding of student interest (Chen & Wang, 2017; Garn, Cothran, & Jenkins, 2011; Hidi & Renninger, 2006; Renninger & Hidi, 2016). Situational interest has been linked to a variety of student outcomes in PE such as steps (Shen, Chen, Tolley, & Scrabis, 2003), engagement (Ding, Sun, & Chen, 2013), and physical activity (Huang & Gao, 2013). There is less evidence that links situational interest to knowledge gains in PE (Chen & Ennis, 2009; Shen, Chen, & Guan, 2007; Zhu et al., 2009). This may suggest the relationship between situational interest and knowledge gain is more complex and underscore the need to investigate intervening constructs including personal interest (Shen et al., 2007).

Garn et al. (2011) investigated middle school students' development of personal interest in a PE class over an 18-week period. In this qualitative

study, students reported the interconnection between interest development and learning in PE but noted a disconnect between the two. Specifically, students believed that interest was a key component of learning, but that learning rarely took place in their PE class. Thus, personal interest development was relegated to students who already had previous knowledge and high skill for a specific PE topic (e.g., basketball; soccer). This supports previous research that highlights intrinsic links between student interest and providing PE students with meaningful learning opportunities (Zhu et al., 2009).

Interest is a motivational resource that increases students' learning engagement (Hidi & Renninger, 2006; Renninger & Hidi, 2016). We conceptualize engagement as students' active participation in classroom activities, which reflects behavioral components such as attention and effort regulation and emotional components such as vitality and satisfaction (Skinner et al., 2008). Engagement provides the underpinnings of goal-directed behavior, cognition, and affect in academic settings and is an important catalyst for student learning, school adjustment, and psychological well-being (Skinner, Kindermann, & Furrer, 2009).

Situational Interest and Teacher Motivational Style in PE

Deci's (1992) theorizing on interest has provided a substantive foundation for the situational interest framework in PE (Chen et al., 1999). Deci (1992) persuasively discusses interest by addressing the interrelatedness of students, activities, and learning contexts. Situational interest research in PE partially captures Deci's conceptualization by emphasizing the interrelatedness between students and activities. Specifically, Chen et al. (1999) developed the Situational Interest Scale in PE (SIS-PE) consisting of person – activity dimensions such as attention demand, challenge, exploration intention, enjoyment, and novelty. Students report these cognitive and affective states toward a specific activity. There is also a total interest component on the SIS-PE that represents students' overall situational interest toward the activity.

According to Deci (1992), teachers' motivational style plays a vital role in developing and sustaining student interest. We operationalize teacher motivational style as student perceptions of needs supportive teaching (Reeve, 2006; Standage, Duda, & Ntoumanis 2005). Teachers are most effective at cultivating interest when they support students' feelings of autonomy, competence, and relatedness (Deci, 1992). Autonomy support focuses on how well teachers are able to produce a social learning environment that allows

students to experience agency in self-endorsed behaviors. Competence support focuses on how well teachers can produce a social learning environment that promotes achievement, meaningful learning, and skill development. Relatedness support focuses on how well can produce a social learning environment that facilitates positive interpersonal relationships. Deci and Ryan (2000) suggest that feelings of autonomy, competence, and relatedness are basic psychological needs that must be fulfilled for students to develop motivational resources. Thus, needs supportive teaching represents an optimal motivational style (Standage et al., 2005; Ryan & Deci, 2007). Student reports of their teachers' needs supportive teaching in PE facilitates a host of positive motivational constructs (Ntoumanis, 2001; Taylor & Ntoumanis, 2007).

To our knowledge, the potential interaction between situational interest and teacher motivational style in PE contexts is missing. Hidi and Renninger (2006) argue that situational interest may or may not lead to personal interest. They suggest that personal involvement and support from teachers are social aspects of a learning context that can strengthen the connection between situational interest and personal interest. Similarly, Schraw, Flowerday, and Lehman (2001) report that situational interest may be closely linked to teaching strategies such as providing students with choices or creating well-structured learning tasks, which align closely to autonomy support and competence support, respectively. Rotgans and Schmidt (2011) revealed an association between student perceptions of their teachers' social congruence, like relatedness support, and situational interest in university classrooms. Two studies in classroom contexts other than PE revealed that autonomy support predicted personal interest (Ciani, Ferguson, Bergin, & Hilpert, 2010; Tsai, Kunter, Ludtke, Truatswein, & Ryan, 2008).

This study addresses numerous gaps in the current student interest literature. First, situational interest researchers in PE have neglected to investigate the role of the social learning context that activities are situated in, specifically, students' perceptions of the motivational style of their teacher (Ciani et al., 2010; Deci, 1992; Tsai et al., 2008). We hypothesize that the level of needs supportive teaching that students perceive in their PE context strengthens the relationship between situational interest and personal interest (Hidi & Renninger, 2006). Studies on interest development outside of PE have focused solely on autonomy support as a motivational style of teaching, yet all three types of support (i.e., autonomy; competence; relatedness) are

necessary for optimal interest development (Deci, 1992). Similarly, studies outside of PE have not examined the multiplicative effects of situational interest and needs supportive teaching on personal interest or engagement (Ciani et al., 2010; Deci, 1992; Tsai et al., 2008). Hidi and Renninger (2006) theorize that the link between situational interest and personal interest may be conditional (i.e., moderated) by constructs related to personal involvement/support of teachers. Testing the independent effects of situational interest and teacher motivational style on personal interest does not reflect the complexities originally theorized by Hidi and Renninger (2006). Finally, personal interest in PE is an area of research that needs greater exploration because like situational interest, it is a powerful motivator that can facilitate important learning outcomes in PE (Chen & Ennis, 2009; Chen & Wang, 2017).

The Present Study

The purpose of this study is to investigate relationships between middle school students' reports of situational interest, teacher motivational style, personal interest, and multidimensional engagement in PE. The following hypotheses guided this study:

Hypothesis 1 (H1): Situational interest and needs supportive teaching will independently predict student reports of personal interest and multidimensional engagement.

Hypothesis 2 (H2): Needs supportive teaching will moderate the relationship between situational interest and personal interest.

Hypothesis 3 (H3): Needs supportive teaching will moderate the relationship between situational interest and multidimensional engagement.

Method

Participants and Context

Participants for this study were middle school students ($N = 388$) enrolled in PE classes from five schools in Southeastern region of United States. The participants mean age was 12.40 ($SD = 1.04$) and were predominantly female (64%). Most students reported their ethnicity as African American (46%) and Caucasian (33%). The grade-level distribution of the students was 40% sixth grade, 33% seventh grade, and 27% eighth grade. All five schools used a traditional, sports-based multi-activity curricular model where short units of

instruction focused on team sports dominated by large-sided games rather than skill development.

Measures

Situational interest. The Chen et al. (1999) Situational Interest Scale was used to measure students' situational interest. Specifically, we used the total situational interest subscale, which consists of four items such as "This activity is interesting." The stem of the scale asks students to write down the reference activity and answer each item in relation to his/her experience with the reference activity. In this study, students' warm-up was used as the reference activity. Although there was variation across classes, warm-up activities focused on a combination of walking/running/agility and traditional calisthenics (e.g., push-ups, jumping jacks, etc.) and were routine in nature (i.e., low interest). We assumed that the interaction between situational interest and teacher motivational style may be more prevalent in low interest activities compared to high interest activities. We also used the warm-up as a reference activity to keep the content focus similar across schools. Each item was answered on a 5-point scale ranging from (1) very untrue to (5) very true. The Situational Interest Scale has consistently demonstrated sound psychometric properties in secondary PE (Chen et al., 1999).

Needs supportive teaching. Student perceptions of needs supportive teaching in PE were measured using scales developed by Standage et al., (2005). Autonomy support was measured using 6-items. A sample item was, "During PE, the teacher provides me with choices and options". Competence support was measured by means of a 4-items. A sample item was, "During PE, my teacher helps me to improve." Relatedness support was measured with 5-items. A sample item was: "During PE, the teacher encourages me to work with others." Each item was answered on a 5-point scale ranging from (1) very untrue to (5) very true.

Personal interest. A personal interest scale developed by Trautwein, Ludtke, Marsh, Koller, and Baumert (2006) measured students' personal interest in PE. The scale consisted of 3-items; the first two items measured affective quality, while the third item tapped personal importance. The questionnaire was modified by replacing "mathematics" with "PE". The items were: "When I do PE, I sometimes get totally absorbed."; "Because PE is fun, I wouldn't want to give it up."; and "PE is important to me personally." Each

item was answered on a 5-point scale ranging from (1) strongly disagree to (5) strongly agree.

Engagement. Participants' behavioral and emotional engagement in PE was measured with an instrument developed by Skinner et al. (2008). Behavioral engagement was assessed using 5-items that captured students' attention, effort, and persistence in PE (e.g., "I pay attention in PE class."). Emotional engagement also included 5-items that assessed indicators of students' emotional participation during PE (e.g., "When I'm in PE class, I feel good."). Each item was measured on a 5-point scale ranging from (1) strongly disagree to (5) strongly agree. The instrument has been used in PE settings (Shen, McCaughtry, Martin, Fahlman, & Garn, 2012).

Procedure

Approval from the Institutional Review Board was acquired from the researchers' University before this study commenced. Parental consent and child assent forms were obtained from all the participants. The primary researcher thoroughly explained the nature of the study to the participants before administering the questionnaires. The primary researcher also clarified and responded to questions from the participants. On average, the students took ten minutes to respond to the questionnaires.

Data Analysis

Data were screened, and descriptive statistics were calculated for each construct. Internal consistency of each construct was tested with coefficient alpha estimates. Mplus 7.4 (Muthén & Muthén, 2015) with robust maximum likelihood (MLR) estimator was used for all structural equation modeling (SEM) analyses. The fixed-factor scaling approach was also used during all SEM analyses (Little, 2013). Small amounts of missing data were handled with full information maximum likelihood (Enders, 2010). We initially ran a fully exogenous model to evaluate latent correlations. This approach is superior to a bivariate correlation matrix because it parcels measurement error from the analysis, thus, estimates are generated from reliable variance only (Kline, 2015). SEM was used to test the main hypotheses of the study. First, we examined a model that situated situational interest and need support as exogenous or predicting constructs and personal interest, engagement, and disaffection as endogenous or outcomes. This baseline model provided information on overall fit (i.e., measurement model), structural relations (i.e.,

standardized betas), and effect size (i.e., R^2) without the interaction between situational interest and need support.

Next, we added the latent interaction between situational interest and need support to the baseline model using the latent moderated structural equations (LMS) approach (Klein & Moosbrugger, 2000). Modeling latent interactions with the LMS approach is a well-supported method of SEM moderation analysis (Little, Bovaird, & Widaman, 2009). One limitation of the LMS approach is that model fit statistics are not produced in Mplus (Muthén & Muthén, 2015). However, an adequate baseline measurement model fit provides justification to add the latent interaction. Furthermore, p -values for unstandardized beta coefficients and change (Δ) in R^2 values confirm or disconfirm the value of adding the interaction term. The Johnson-Neyman technique (Johnson & Neyman, 1936) with 95% confidence intervals (95% CIs) was used to probe statistical significance of latent interactions (Bauer & Curran, 2005). This plot represents the conditional relationship (i.e., unstandardized beta) between situational interest and outcomes for students who report diverse levels of need support. The Johnson-Neyman technique provides comprehensive information across all levels of the moderator unlike other techniques that only spotlight values one standard deviation above and below the mean (Spiller, Fitzsimons, Lynch, & McClelland, 2013). Regions of statistical significance for interactions were based on 95% CIs that did not straddle zero.

We used joint criteria to evaluate all SEM tests (Hu & Bentler, 1999). Specifically, the robust chi-square (χ^2) with degrees of freedom (df) and p -value, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the root-mean-square error of approximation (RMSEA) with 90% CI were used to evaluate model fit (Marsh, Hau, & Grayson, 2005). Marsh et al. (2005) suggests this combination absolute and relative fit index provides suitable information to judge quality of model fit. Values greater than .90 and .95 for the CFI and TLI indicate adequate and excellent fit to the data, whereas RMSEA values smaller than .08 or .06 support acceptable and excellent model fit (Hu & Bentler, 1999; Marsh et al., 2005). We also made SEM judgements based on parameter estimates such as standardized factor loadings and latent correlation estimates (Kline, 2015).

Results

Preliminary Analyses

Descriptive statistics, coefficient alpha estimates, and latent correlations are presented in [Table 1](#). Each factor had a mean score above the mid-point of its respective scale. Standard deviations ranged from low of .791 for behavioral engagement, to a high of 1.016 for situational interest. Coefficient alpha estimates ranged from a low of .766 for personal interest to a high of .927 for need support. Latent correlation estimates were positive with moderate-to-strong magnitudes ($p < .001$ for all pairs). The strongest latent correlations occurred between behavioral engagement and emotional engagement ($r = .794$) and between personal interest and emotional engagement ($r = .773$). The weakest latent correlations occurred between need support and behavioral engagement ($r = .490$).

Table 1
Descriptive Statistics, Coefficient Alpha Estimates, and Latent Correlations of Study Factors

Factor	SI	NS	PI	BE	EE
SI	1.000				
NS	.596	1.000			
PI	.537	.600	1.000		
BE	.506	.490	.576	1.000	
EE	.619	.562	.773	.794	1.000
M	3.584	3.597	3.387	3.943	3.738
SD	1.016	0.890	0.996	0.791	0.908
α	0.872	0.927	0.766	0.880	0.879

Note. SI = situational interest; NS = needs support; PI = personal Interest; BE = behavioral engagement; EE = emotional engagement; All latent correlations = $p < .001$; M = mean; SD = standard deviation; α = coefficient alpha.

Main Analyses

The baseline SEM produced a good fit of the data, robust $\chi^2 = 296.646$ based on 160 *df*, $p < .001$, CFI = .962, TLI = .955, RMSEA = .047 (90% CI = .039 – .055). It is important to note that this model was identified in a fully *a priori* manner in accordance with interest theory. All indicator uniqueness

was treated as orthogonal and we did not use statistical information such as modification indices to re-identify our model. SEM has come under scrutiny for dubious practices such as adding *posthoc* parameter estimates for the simple reason of improving model fit (Marsh, Morin, Parker, & Kaur, 2014). Standardized factor loadings from the measurement model are presented in Table 2. Indictors for all five latent constructs yielded strong factor loadings, which provided evidence that each latent factor accounted for substantial amounts of explained variance in its indicators (Kline, 2015). Taken together, robust support was evident for the baseline measurement model (Hu & Bentler, 1999; Marsh et al., 2005).

Table 2
Standardized Factor Loadings from Baseline SEM Measurement Model

SFL	SI	NS	PI	BE	EE
SI1	.673				
SI2	.774				
SI3	.860				
SI4	.871				
AS		.899			
CS		.895			
RS		.906			
PI1			.633		
PI2			.798		
PI3			.748		
BE1				.754	
BE2				.815	
BE3				.668	
BE4				.811	
BE5				.830	
EE1					.821
EE2					.823
EE3					.830
EE4					.781
EE5					.599

Note. SFL = standardized factor loading; SI = situational interest; AS = autonomy needs support; CS = competence need support; RS = relatedness need support; PI = personal interest; BE = behavioral engagement; EE = emotional engagement.

Results from the baseline structural model revealed consistent predictive relations between exogenous and endogenous factors. Both situational interest and need support produced statistically significant standardized beta coefficients ($p < .001$) on all three outcomes. Specifically, situational interest predicted personal interest ($\beta = .278$), behavioral engagement ($\beta = .332$), and emotional engagement ($\beta = .441$). A similar pattern of standardized beta coefficients occurred between need support and personal interest ($\beta = .434$), behavioral engagement ($\beta = .292$), and emotional engagement ($\beta = .299$). Finally, a substantial amount of variance was explained in personal interest ($R^2 = .410$), behavioral engagement ($R^2 = .311$), and emotional engagement ($R^2 = .441$). Taken together, results from the baseline model provided clear justification to test the latent interaction between situational interest and needs support (Klein & Moosbrugger, 2000).

A visual representation of final SEM with the addition of the interaction term and standardized beta coefficients can be found in Figure 1. The interaction effect between situational interest and need support on personal interest was statistically significant. However, this was not the case for behavioral engagement or emotional engagement. The main effects remained stable from the baseline model. An additional 3% of explained variance was accounted for by the interaction term ($R^2 = .443$).

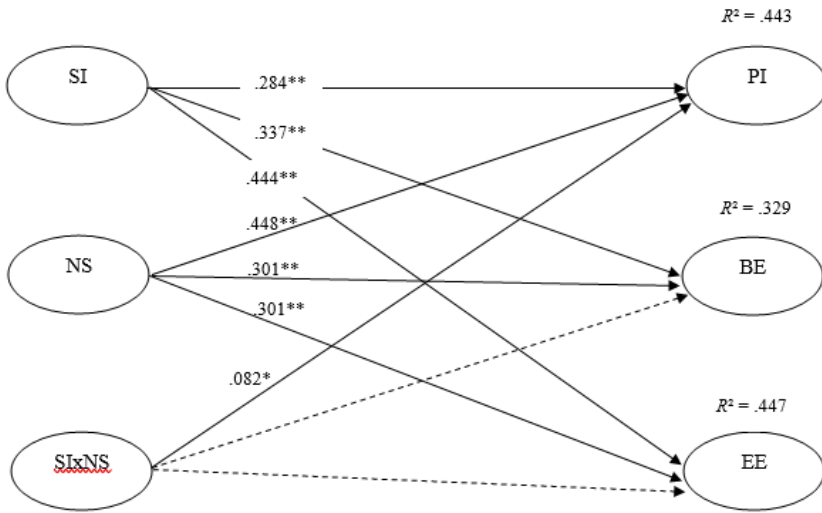


Figure 1. Standardized results of structural model testing the independent and interactive effects of situational interest (SI) and need supportive teaching (NS) on personal interest (PI), behavioral engagement (BE), and emotional engagement (EE). Dashed lines = non-significant paths.
 * = $p < .05$; ** = $p < .01$.

Figure 2 highlights findings from the Johnson-Neyman procedure, which provides clarity on the conditional relation between situational interest and personal interest. The relation between situational interest and personal interest was positive for students reporting need support, when SD scores were approximately $-.05$ or higher. In other words, there was not a statistically significant relationship between situational interest and personal interest for students who fell below the 30th percentile in their reports of needs support.

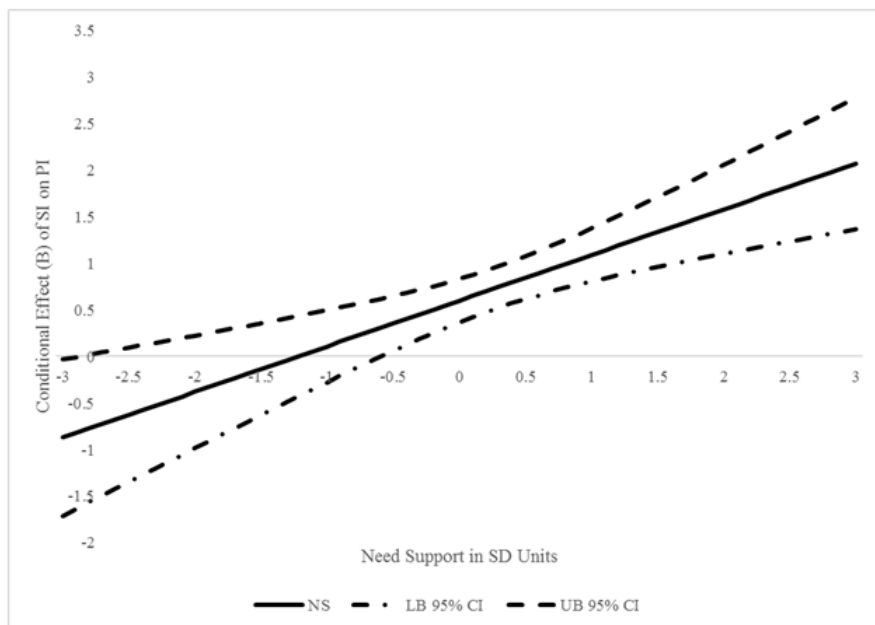


Figure 2. Unstandardized beta coefficients highlighting the conditional effects of situational interest (SI) on personal interest (PI) across variation of needs supportive teaching (NS). Confidence intervals (CI) that do not straddle zero = $p < .05$.

Discussion

Findings supported our first two hypotheses about relations between students' perceptions of situational interest, needs supportive teaching, personal interest, and class engagement. However, results did not support our third hypothesis; need supportive teaching did not moderate the relation between situational interest and engagement. Overall, these findings advance understanding about the complexities of student interest in PE, especially as it pertains to the social learning environment.

Results from the baseline measurement model testing H1 revealed a good fit of the data at both parameter and model levels, enhancing confidence in patterns established in the structural model (Hu & Bentler, 1999; Kline, 2015; Marsh et al., 2005). Situational interest and needs supportive teaching were

both associated with higher levels of students' personal interest, behavioral engagement, and emotional engagement in PE. While all associations were statistically significant, the links between situational interest and emotional engagement and between needs supportive teaching and personal interest produced the strongest magnitudes in the model. We hypothesize that the connection between situational interest and emotional engagement resulted from the affective component of situational interest (Chen et al., 1999; Hidi & Renninger, 2006). Specifically, positive feelings toward the warm-up activity likely energized students' participation and enhanced satisfaction (Skinner et al., 2008).

The shared variance between need supportive teaching and personal interest supports Deci's (1992) theorizing about the substantive relationship between student interest and the social learning environment. Previous studies outside of PE have underscored associations between teacher autonomy support and student interest (Ciani et al., 2010; Tsai et al., 2008). However, Deci (1992) stresses the importance of cultivating motivational resources including interest by supporting students' autonomy, competence, and relatedness simultaneously. The measurement of needs supportive teaching in this study met Deci's (1992) key assumption by including all three psychological needs, which may explain its strong connection with students' personal interest toward PE.

The small, positive relationship between situational and personal interest in the baseline model may have reflected the routine nature of the warm-up activity used as the situational interest reference activity. Chen and Darst (2001) provided clear evidence that cognitive demand represents an important element of task design when considering student interest. The warm-up activities of this study provided students with minimal cognitive demand. Thus, the relationship would likely be stronger if the situational interest reference activity called for greater levels of cognitive demand. However, the main contribution of this study was testing H2 and H3. We assumed that the strength between situational interest and personal interest (H2) and engagement (H3) would be more dependent on need supportive teaching during low-interest activities (Deci, 1992; Hidi & Renninger, 2006). Examination of effect sizes revealed the model explained substantial amounts of variance in emotional engagement (44%), personal interest (41%), and behavioral engagement (31%). Overall, support for H1 provided compelling

evidence to move forward with the moderation analysis (Klein & Moosbrugger, 2000; Little et al., 2009).

Findings revealed a significant situational interest by needs supportive teaching interaction on students' reports of personal interest, yielding support for H2 (see Figure 1). Readers should note, however, that the standardized beta coefficient and change in effect size were relatively small. Figure 2 casts light (Spiller et al., 2013) on the conditional relationship between situational interest and personal interest across all levels of student reports of needs supportive teaching (i.e., $-3\ SD$ to $+3\ SD$). Based on 95% confidence intervals, results demonstrated that the relationship between situational interest and personal interest was dependent on a minimum amount of need supportive teaching reported by students. This threshold was approximately one-half a SD below the mean. Interest researchers note that situational interest does not always lead to the development of personal interest (Chen & Wang, 2017; Hidi & Renninger, 2006). Our findings provide further clarification on how conditions in the social learning environment strengthen or weaken the relationship between situational interest and personal interest.

To date, research on situational interest in PE has focused on person-activity interactions (Chen & Darst, 2002; Chen & Wang, 2017; Zhu et al., 2009). Importantly, this study is one of the first to consider the social learning environment that the person-activity is situated. Specifically, student beliefs about their teachers' needs supportive behaviors changed the relationship between situational interest and personal interest. Personal meaning is central to both situational and personal interest (Hidi & Renninger, 2006). Teachers who support students' psychological needs of autonomy, competence, and relatedness routinely explain why activities are important and how they connect to life outside of PE (Ntoumanis & Standage, 2009). Thus, middle school teachers who use this need supportive teaching strategy may be especially effective at facilitating early adolescents' interest in PE. Based on our findings and previous theorizing (Deci, 1992; Renninger & Hidi, 2016), accounting for teachers provides meaningful information about student interest development and warrants further investigation.

Evidence was not supportive of H3, suggesting that needs supportive teaching did not moderate the relationship between situational interest and multi-dimensional engagement. Stated differently, the strength of associations between situational interest and both types of engagement were consistent across all levels of need supportive teaching. This may reflect the inherent

activating nature of situational interest (Chen et al., 1999; Deci, 1992; Hidi & Renninger, 2006; Renninger & Hidi, 2016). Taken within the context of these findings, situational interest appears to be a stable predictor of middle school students' engagement in PE whereas its relationship with personal interest is more dynamic, relying on other factors within the social learning environment.

Practical Implications

Findings from this study can translate to effective practice in middle school PE classrooms serving early adolescents. Our results highlight the importance of student, teacher, and activity in relation to optimizing early adolescents' personal interest, behavioral engagement, and emotional engagement. Learning activities must include interesting characteristics such as attention demand, exploration, or optimal challenge (Chen et al., 1999) and be delivered in a social learning environment that supports student autonomy, competence, and relatedness (Reeve, 2006; Ntoumanis, 2001; Ntoumanis & Standage, 2009). Autonomy supportive strategies include explaining the importance and value of each activity, providing meaningful choices, reducing pressure within an activity, and connecting in-class activities to life outside of PE. Competence supportive strategies include individualizing activities when possible, giving skill and effort-related encouragement, providing positive specific feedback, and accounting for diverse skill levels. Finally, relatedness support strategies include showing empathy toward students, listening, emphasizing personalized social interactions, and avoiding criticism and blame. Creating a social learning environment that considers student, teacher, and activity characteristics are more likely to promote student interest and engagement.

Limitations, Future Research, and Conclusions

This study is not without limitations. Data were only collected at one time-point, so temporal dynamics in construct relationships cannot be established from our findings. The use of more stringent longitudinal designs would allow researchers to establish temporal patterns and examine changes (i.e.

development) between aspects of the social learning environment and interest and engagement. This seems especially important when considering relations between situational and personal interest. The reference activity for situational interest consisted of warm-ups, which we considered low-interest based on the limited amount of cognitive demand associated with the activities (Chen & Darst, 2001). Therefore, it is unclear if our findings translate to high interest activities. Future researchers should explore the moderating role of needs supportive teaching with a diverse set of activities. The need supportive teaching measure was based on student self-reports; future researchers would benefit from investigating needs supportive teaching practices based on systematic teaching observations.

In conclusion, interest and engagement are constructs that can help researchers and practitioners alike understand achievement in PE because it underscores students who are attentive, enthusiastic, and active in the learning process. A major contribution of this study was examining the role of the social learning environment, which had been missing in the PE situational interest literature. Our findings highlight the inner-dynamics between situational interest, which focuses on activity characteristics, and needs supportive teaching, which focused on the social learning context in which activities occur. Taking a more comprehensive approach to investigating student interest appears to be one strategy that can advance understanding about how to cultivate this powerful motivational resource in PE.

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Teachers' perceptions about the etiology of intelligence and learning difficulties

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Teachers' Perceptions about the Etiology of Intelligence and Learning Difficulties

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Abstract

The etiology of intelligence and learning difficulties is interpreted and perceived in different ways within society. The present study aims to explore the perceptions of a sample of $n=501$ Brazilian teachers regarding genetic and environmental influences on intelligence and learning difficulties. Using numerical scales, it was observed that importance was ascribed by teachers to genetic and environmental influences across both the intelligence and learning difficulties domains. For intelligence, however, the evidence points to a greater belief in genetic influence. A multiple-choice items test revealed some differences on the perceptions of teachers according to gender, age, schooling, area of knowledge, income, years of experience, knowledge of genetics, and having studied genetics. Responses favouring genetic explanations were associated with certain demographic factors while the perception that only environment affects the various domains was not associated with any specific demographics.

Keywords: cognition; teachers' beliefs; biological determinism; genetics; behavioral genetics.

Percepciones del Profesorado acerca de la Etiología de la Inteligencia y las Dificultades de Aprendizaje

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Resumen

La etiología de la inteligencia y las dificultades de aprendizaje se interpretan y perciben de diferentes maneras dentro de la sociedad. El presente estudio tiene como objetivo explorar las percepciones de una muestra de $n=501$ docentes brasileños con respecto a las influencias genéticas y ambientales sobre la inteligencia y las dificultades de aprendizaje. Utilizando escalas numéricas, se observó que los profesores asignan importancia a las influencias genéticas y ambientales en los dominios de inteligencia y dificultades de aprendizaje. Para la inteligencia, sin embargo, la evidencia apunta a una mayor creencia en la influencia genética. Una prueba de ítems de opción múltiple reveló diferencias en las percepciones de los docentes según el sexo, la edad, la escolaridad, el área de conocimiento, los ingresos, los años de experiencia, el conocimiento de la genética y el estudio de la genética. Las respuestas que favorecen las explicaciones genéticas se asociaron con ciertos factores demográficos, mientras que la percepción de que solo el medio ambiente afecta los diversos dominios no se asoció con ninguna demografía específica.

Palabras clave: cognición; creencias del profesorado; determinismo biológico; genética; genética conductual.



The human cognitive system is involved in a range of neurological processes that characterize forms of acquisition, organization, use and expression of knowledge. The terms intelligence and learning, in their various cognitive mechanisms, are evidently related (Almeida, 1992), even parents and teachers of twins perceive the genetic and environmental influence on intelligence and learning difficulties in a very similar way (Walker & Plomin, 2005).

Although recent discourses have been considering the processes of learning and school outcomes as something beyond cognitive abilities (Abed, 2016), the educational system remains to privilege such abilities through standardized assessment. Human cognitive abilities have historically been attributed more to genetic factors than to environmental factors (Gould, 1996; Snyderman & Rothman, 1988), and these, in turn, were considered immutable by various social groups (Castera & Clement, 2014; Gould, 1996; Keller, 2005; Rattan, Savani, Naidu & Dweck, 2012; Thomas & Sarnecka, 2015; Willoughby et al., 2019)

The Brazilian teachers' conceptions about origin and evolution of life are more creationist than the teachers' conceptions in other Latin American countries, like Argentina and Uruguay, for example (Silva, Clément, Leão, Garros, & Carvalho, 2017). Such conception may be related to deterministic beliefs. Therefore, although we have some idea about teachers' perceptions of nature-nurture on educationally relevant traits in the United Kingdom and Europe (Walker & Plomin, 2005; Castera & Clement, 2014; Crosswaite & Asbury, 2018), it is likely that the perceptions of teacher in Brazil may differ to those found in Europe. Studies exploring the perceptions of teachers about genetic determinism have been conducted in many countries although primarily within the same study (Castera & Clement, 2014). In Brazil, studies have focused only on university students' perceptions about genetics (Carver, Castéra, Gericke, Evangelista, & El-Hani, 2017; Gericke; et al., 2017).

The first results about teachers' perceptions of behavioral genetics in Brazil were reported in a larger, multi-dimensional study perceptions about all behaviors were analyzed together (Antonelli-Ponti, Versuti, & Silva, 2018). The way teachers perceive their students may constitute beliefs, and these have the potential to influence teaching practice (Buehl & Beck, 2015). Furthermore, due to the complex historical and social debates and

discussions around the etiology of cognitive ability, particularly in relation to education, it is necessary the investigation the perceptions of Brazilian teachers about the genetic and environmental influence in relation to the cognition of their students.

Intelligence

Intelligence, measured by IQ tests, is considered the best predictive factor of school performance, overcoming other variables involved (Poropat, 2009) and demonstrating high relation with all school disciplines (Deary, Strand, Smith, & Fernandes, 2007).

The expression general cognitive ability (g) has been adopted in behavioral genetics studies, using a hierarchical model where 'g' is at the top, followed by specific cognitive abilities, which have 'g' in common, and the tests that can measure them, it's a latent concept (Plomin, DeFries, McClearn, & McGuffin, 2011). Studies evaluating the genetic and environmental influence on lifelong intelligence show that in childhood, intelligence has a greater environmental influence and is quite malleable during this period, and over the years, the genetic influence becomes larger and intelligence becomes more stable (Haworth, et al., 2011). About intelligence at the national level, experts agree that environment factors, like better health, better nutrition, include better education and school-systems, contribute to improve intelligence (Rindermann, et.al., 2016b). However, it is worth remembering that when discussing the genetic aspect of a trait, such as intelligence (or IQ) the role of the environment must still be considered, primarily through gene-environment correlation, in which the genetic characteristics influence, shape and choose the environment in three ways: passive, reactive and active (Plomin, DeFries, Knopik, & Neiderhiser, 2016)

This increase in heritability in intelligence can be understood through innovation and genetic amplification: “innovation refers to the possibility that increasing heritability results from novel genetic influences that were not present at previous time points” (Briley & Tucker-Drob, 2013, p.1705) and that can be triggered by changes outside the genes, such as physiological changes such as hormones at puberty, or environmental changes as a new school environment that lead to the activation of new genes. It is easy to understand this concept applied to childhood since in this phase the individual deals with constant novelties, thus recruiting or activating genes

that are appropriate for each situation (Briley & Tucker-Drob, 2013); “amplification refers to the possibility that early genetic influences on cognition become increasingly important with age” (Briley & Tucker-Drob, 2013, p.1705). An example would be the selection of environments according to the genetic predispositions, that is, the individual genetic preference for a given environment, which will keep active the genes that were initially activated for that task or activity, being these more expressed than those that are not stimulated. This is known as gene x environment interaction.

In early childhood, it is the predominant innovation, but it rapidly decreases, and amplification becomes responsible for increased heritability after eight years of age. It is important to note that genetic influence may become more or less important according to the relevance of the trait to the environmental context (Briley & Tucker-Drob, 2013). The relevant genes to environment in which the individual is inserted are activated in childhood and can remain active throughout life, increasing or decreasing its performance depending on the need to use these genes (Asbury & Plomin, 2013). Overall this means that although intelligence and IQ are highly heritable, we cannot ignore the complex interactions between genetics and the environment in which the child is living.

Learning difficulties

Difficulties, disturbances or learning disorders are difficulties in learning and using academic skills. Learning difficulties is an umbrella term for very wide range of disabilities, ranging from mild to severe and encompassing a whole range of different characteristics and expressions (American Psychiatric Association, 2013).

Behavioral genetics has found that both genetic and environmental factors influence learning difficulties (Erbeli, Hart, & Taylor, 2018; Swagerman et al., 2015) and it is suggested that these difficulties are within a spectrum of abilities. This bell curve of ability is present across all psychological traits. Individuals who present such difficulties are in the left end of the normal curve distribution (Plomin, et al., 2016), that is, they are not abnormal, only that they have low ability. Talent skills expressions, such as reading specialists, are influenced by the same genes that are responsible for normal reading expression and also reading difficulties, it means that the

same genes associated with difficulty reading tend to be associated with all reading comprehension, including normal readers and excellent readers (Plomin, Shakeshaft, McMillan, & Trzaskowski, 2014). This phenomenon has been termed "the abnormal is normal" (Asbury & Plomin, 2013; Plomin et al., 2016). The diagnoses go from qualitative dichotomous features like "is or is not" a good reader, "has or does not have" dyslexia, for quantitative distributions within the same normal curve (Plomin et al., 2016). "What we call common diseases such as learning disabilities are the quantitative extremes of continuous distributions of genetic risk" (Haworth & Plomin, 2010, p.786).

Genetic influence is certainly not the only determinant, but it plays an essential role (Swagerman et al., 2015). The environment, in turn, influences on several levels, from socioeconomic status (Erbeli et al., 2018) to emotional problems, which are related to learning difficulties (Santos & Graminha, 2006; Almeida, 1992) and beliefs related to the potential of achievement, which can be developed as tools to promote learning (Medeiros, Loureiro, Linhares, & Marturano, 2003). This comprehension must be transmitted to teachers, in teacher training courses on genetics of human behavior, as a way of collaborating in their understanding of their students and in their teaching practice (Crosswaite & Asbury, 2018).

Public perceptions about human cognition

Over time, research has been conducted to evaluate the perceptions of various groups of people on issues related to genetic influence and various aspects of human cognition (Castera & Clement, 2014; Crosswaite & Asbury, 2016; 2018; Gericke et al., 2017; Human Genetics Comission, 2001; Rindermann et al., 2016a; 2016b; Snyderman & Rothman, 1988; Thomas & Sarnecka, 2015; Walker & Plomin, 2005).

When exploring the perceptions of professionals from psychology and education – which is most relevant to this study - studies shows substantial acceptance of the importance of genetics, not discarding the environment, about the intelligence of the people (Rindermann et al., 2016a; 2016b; Snyderman & Rothman, 1988). Looking more broadly at the general public, studies have found the general public's perception about aspects of human genetics demonstrated a greater perception of the role of genes than of the environment influencing intelligence. However, studies have also

demonstrated opposition towards suggestions that genes play an important role in educational outcomes (Crosswaite & Asbury, 2016). On average, parents and teachers of UK twins reported that genes were at least as important as the environment to intelligence and learning difficulties, with some emphasis on genetics (Walker & Plomin, 2005). These findings were replicated in a later study, also in the UK context, that explored just teacher perceptions of the etiology of cognitive ability. In this sample of both primary and secondary teachers, it was found that most teachers placed equal emphasis on the role of genes and the environment (Crosswaite & Asbury, 2018).

A large study on intelligence aspects involving experts in the field, including teachers, revealed that most participants believe in the role of genes and the environment in the differences between individuals and estimate the heritability of intelligence between 57% and 60% (Snyderman & Rothman, 1988). The same research was recently conducted and generally demonstrated the maintenance of such perceptions (Rindermann, et al., 2016a; 2016b). A specific sample for teachers of twin 7-year-olds, considering a Likert scale, where number one represents genetic influence and number five, environmental influence, generated an average of 2.35 (Walker & Plomin, 2005); the teacher sample of the present study, with different analysis, in a previously reported result, generated an average of 2.57. In an inverted scale, participants at least 18 years old and located in the United States had averages from 3.32 to 3.37 (Willoughby et al., 2019). The exception to the pattern found so far is given in a sample of Brazilian university students, which generated an average of 2.61, also with an inverted scale, in which lower averages represent greater environmental influence for intelligence (Gericke et al., 2017).

In Brazil, a study exploring teacher beliefs about the about causes of learning difficulties, found that teachers attribute the root of these problems to hereditary, social and educational conditions, but considered the family environment as a predominant factor (Oliveira, Santos, Aspilicueta, & Cruz, 2012). Research on beliefs in genetic determinism in a sample of Brazilian university students (Gericke et al., 2017) found that the construct was divided into beliefs about biological traits and beliefs about social traits. Findings were similar to the study of Brazilian teachers' perceptions about the influence of genes and environment on human behaviors in the

educational environment (Antonelli-Ponti et al., 2018). Perceptions were divided into patterns related to social traits (personality and behavioral problems) and cognitive traits (intelligence and learning difficulties), furthermore, it was found that some teachers attribute equal weights to both factors, demonstrating an interactive perception (100% innate and 100% acquired) and not an additive perception (for example, 50% innate and 50% acquired) in relation to influences (Briley et al., 2018; Jacquard & Kahn, 2001).

The present study focuses specifically on teachers' perceptions about how genetics and the environment influence the cognitive traits of their students, represented here by the domains intelligence and learning difficulties. We were guided to answer these three research questions:

When comparing intelligence and learning difficulties, do teachers place a greater emphasis on nature or nurture for one over the other?

Is the perception of teachers more additive or interactive?

Is any group of teachers more (or less) deterministic?

Method

A descriptive, cross-sectional study was conducted from a convenience sample from October 2014 to October 2015. Participants included $n=501$ teachers from the public system (65%) and the private system (35%) from the state of São Paulo. The sample consisted predominantly of women (72.1%), which is in line with the Brazilian teaching population, with an average of 40 years (from 22 to 67 years). Teachers involved taught across a range of academic subjects and were classified into three main categories. The first referred to as 'human sciences' encompassed the subjects related to languages, history, social sciences; the second involved the 'biological' specializations; and the third category encompassed the 'exact' areas (physics, chemistry, mathematics).

The data collection took place after the researcher's contact with educational institutions of the state of São Paulo, mainly of municipalities in the northwest region. In all sessions, the teachers received the questionnaires on paper, and were asked to consent. The project was approved by the Committee of Ethics in Research in Human Beings of *Faculdade de*

Filosofia, Ciências e Letras de Ribeirão Preto - University of São Paulo, Brazil, under protocol nº 771.808.

The research instrument, which consists of Likert scales, was originally applied to parents and teachers in the United Kingdom (Walker & Plomin, 2005). Numerical scales from 0 (zero) to 10 (ten) for genes and for environment were added to the original questionnaire, in order to obtain another measure of perception beyond the 1 (one) to 5 (five) Likert scale. While the Likert scale measures which portion is assigned by teachers, for genes and the environment, the numerical scales have brought measures about what importance of genetics and the environment, separately, are assigned by the teacher for each behavior.

Considering the differences of language and culture, the process of adaptation of the questionnaire was carried out and its structure previously reported in Antonelli-Ponti et al (2018). In that previous paper the analyses were about a Likert scale averages and the group analysis was conducted considering all behaviours together. For the purpose of this paper only the items related to the teachers' perception about intelligence and learning difficulties will be analyzed focusing in numerical scales and group analysis for each domain.

Data analysis

Numerical scales (from 0 to 10) were presented on a scale of genetic influence and scale of environmental influence, which represents the weight that the teacher attributes to each of the factors in intelligence and learning difficulties. Descriptive statistics and t-test of paired samples were conducted with these scales' data by International Business Machines Statistical Package for the Social Sciences (IBM SPSS).

The Likert scale (from 1 to 5) was formed by items in the multiple choice format: 1 = Only genes; 2 = More genes than environment; 3 = Genes and environment in equal parts; 4 = More environment than genes; 5 = Only environment. This scale was used for comparison between different demographic groups of teachers (Gender, Age, Schooling, Area of Knowledge, Income, Years of experience, Knowledge in Genetics, Studying Genetics) on an exploratory and descriptive analysis of the categorical data, which was conducted by Statistical Analysis System (SAS), as used in (Antonelli-Ponti et al., 2018) for all behaviours together, and generated one

map of correspondence for intelligence and one map of correspondence for learning difficulties. The closer the variables are presented, the more frequent their joint occurrence.

Results

Teachers attribute the origin and development of their students' cognition more to genetic rather than environmental factors. There is a tendency to consider genetic and environmental factors in cognition. For intelligence, however, the evidence points to a greater belief in genetic influence.

Notably, none of the groups sampled expressed a belief in the role of environment being the exclusive explanatory factor explaining student differences in intelligence or learning difficulties. Also, no strong associations were found to characterize differences between sample groups in the correspondence maps. However, some proximity between groups and items are taken into account

Numerical scales

Most participants placed high importance to the role of genetics as well as the role of the environment across the two domains (Table 3). The highest mean was the one referring to the scale of genetic influence on intelligence (7.23) (Table 1).

A statistically significant difference was observed between the responses of the scale to genetics and the responses to environmental scale in the domain of intelligence ($t_{(498)} = 7.06$; $p < 0.05$) but not in learning difficulties.

The distance of perception between the weight of the genetic influence and the weight of the environmental influence (effect size) is very small for Learning Difficulties (0.05), and larger, approaching moderate, for Intelligence (0.39) (Table 1). Acceptance of the interaction of factors is greater the lower the observed distance.

Table 1
Mean, standard deviation and size effect of numerical scales from 0 to 10 on the weight of genetic and environmental influence on intelligence and learning difficulties (n=501)

Scale	Genetics		Environment		Size effect*
	Mean	SD	Mean	SD	
Intelligence	7.23	2.18	6.12	2.5	0.39
Learning difficulties	6.6	2.23	6.47	2.19	0.05

* Cohen's D= mean (genetics) - mean (environment) / $\sqrt{\text{mean of standard deviations}^2}$

Results regarding teachers who expressed a belief about the etiology of intelligence and/or learning difficulties are shown in [table 2](#). Results showed that only a small percentage of teachers expressed the belief that the two domains were down to either all environment or all genes.

Table 2
Percentages of simultaneous responses to extreme values on numerical scales from 0 to 10 on the influence of genetic and environmental influence on intelligence and learning difficulties.

Intelligence			Learning difficulties		
Genetics	Environment		Genetics	Environment	
10	10	4.2%	10	10	2.8%
10	0 (zero)	2.4%	10	0 (zero)	1%
0(zero)	10	0.6%	0 (zero)	10	0.4%

Table 3

Percentage of responses of the numerical scales from 0 to 10 on the influence of genetic and environmental influence on intelligence and learning difficulties (n=501).

Scale	Intelligence		Learning difficulties	
	Genetics	Environment	Genetics	Environment
0	0.6%	3.0%	0.4%	1.2%
1	0.6%	1.2%	0.8%	1.0%
2	1.2%	5.2%	2.4%	2.4%
3	2.4%	6.2%	4.8%	3.6%
4	4.6%	4.4%	6.6%	4.8%
5	18.0%	24.4%	22.8%	25.3%
6	7.0%	8.4%	8.8%	10.8%
7	11.6%	12.4%	13.6%	14.0%
8	20.8%	17.0%	16.4%	16.2%
9	16.2%	8.4%	11.6%	12.8%
10	16.8%	9.2%	11.2%	7.2%

Multiple choice items

The items which demonstrate perception of exclusive genetic influence (IGA1) or to some extent (IGA2, IGA3, IGA4) on Intelligence appear scattered on the map along with the sample groups. The item that demonstrates exclusive perception of the environment (IGA5) appears distant and unrelated to any of the teacher groups.

It is important to note that group who declare to have studied genetics during teacher training (EG1) as well as teachers who studied human

sciences (AC1) have strong association with the item that represents the balance between influences (IGA3). The male group (G2) has an association with the item 'more environment than genes' (IGA4), together with the exact sciences group (AC3), the older group (I4) and higher schooling group (E4). The teachers who declare that do not have knowledge in genetics (CG2) are associated with the item 'more genes than environment' (IGA2).

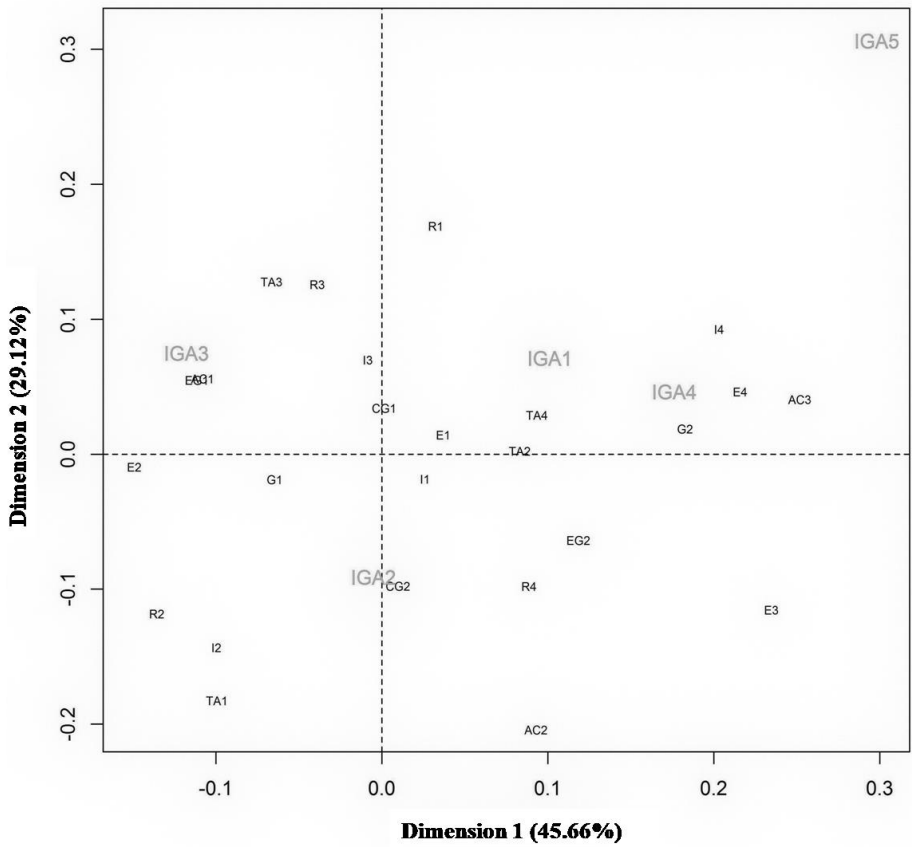


Figure 1. Correspondence Map of the multiple choice items on teachers' perception about genetic and environmental influence in Intelligence and the sample groups.

IGA1=only genes; IGA2=more genes than environment; IGA3=genes and environment in equal parts; IGA4=more environment than genes; IGA5=only environment. G1=Female; G2=Male; AC1=human sciences; AC2=biological sciences; AC3=exact sciences; EG1=studied genetics; EG2=did not study genetics; CG1=knows genetics; CG2=does not know genetics; E1=complete higher education; E2= complete higher education with specialization; E3=master's degree; E4=doctorate and postdoctoral training; R1, R2, R3 and R4=income ranges in increasing order; I1, I2, I3 and I4=age ranges in increasing order; TA1, TA2, TA3 and TA4=times of activity in increasing order.

On teachers' perception about Learning Difficulties, the items that demonstrate perception of exclusive genetic influence (IGA1) or to some extent (IGA2, IGA3, IGA4) appear on the map together with the sample groups. The item that demonstrates exclusive perception of the environment (IGA5) appears distant and unrelated to any of the teacher groups.

The other important cluster here is of the 'only genes' (IGA1), 'more genes than environment' (IGA2) and 'genes and environment in equal parts' (IGA3). This cluster is separated from 'more environment than genes' (IGA4). This cluster is associated most notably the lower schooling groups (E1, E2), the female group (G1) and the human sciences group (AC1). The complementary groups to these: greater education (E3, E4), male (G2) and of the biological sciences (AC2) and exact sciences (AC3), has no association with any item.

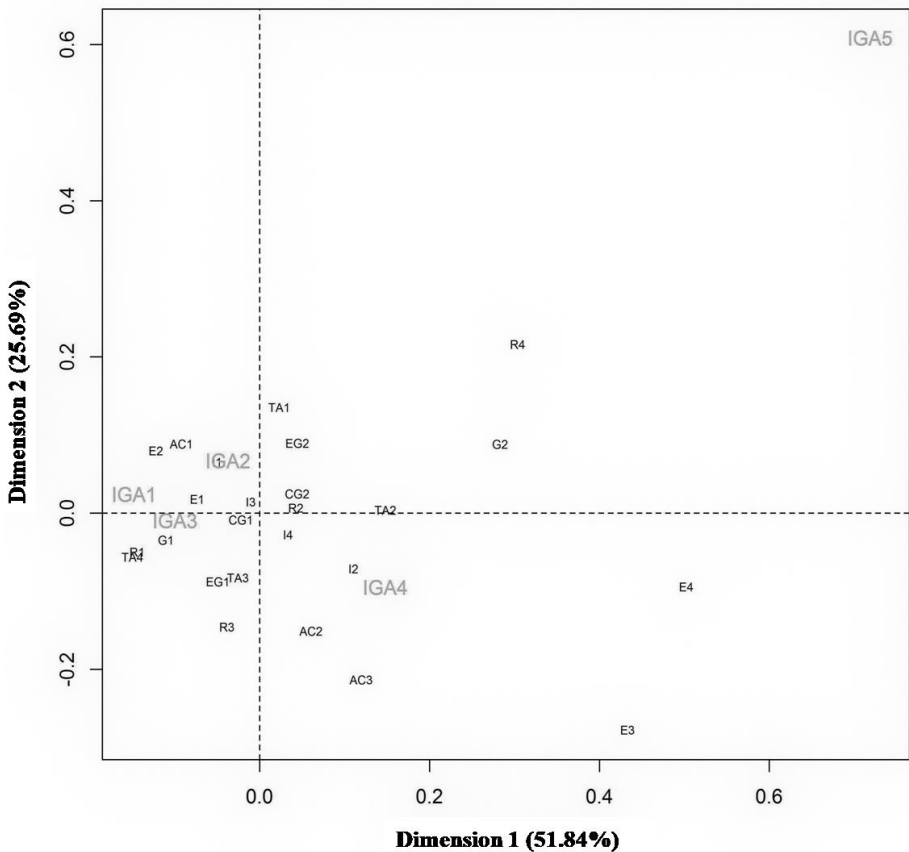


Figure 2. Correspondence map of the multiple choice item son teachers' perception about genetic and environmental influence in Learning Difficulties and the sample groups. IGA1=only genes; IGA2=more genes than environment; IGA3=genes and environment in equal parts; IGA4=more environment than genes; IGA5=only environment. G1=Female; G2=Male; AC1=human sciences; AC2=biological sciences; AC3=exact sciences; EG1=studied genetics; EG2=did not study genetics; CG1=knows genetics; CG2=does not know genetics; E1=complete higher education; E2= complete higher education with specialization; E3=master's degree; E4=doctorate and postdoctoral training; R1, R2, R3 and R4=income ranges in

increasing order; I1, I2, I3 and I4=age ranges in increasing order; TA1, TA2, TA3 and TA4=times of activity in increasing order.

Discussion

This study analyzed the perception of Brazilian teachers regarding the genetic and environmental influence on the cognitive ability of their students. The novelties are the analysis of the perception of the sample groups regarding intelligence and learning difficulties, which had not been done previously (Antonelli-Ponti, et al, 2018), and the analysis of the scales from 0 (zero) to 10 that evaluate the perception regarding the weight that the teachers attribute to the each factor (genetics and environment). The latter brings important results on genetic determinism and additive or interactive perception in this sample.

Most of the participants attributed high values both to the weight of the genetic influence and to the influence of the environmental influence in the two domains (Table 3). The extreme perceptions (zero for genetics and 10 for environment or 10 for genetics and zero for environment) were higher in intelligence than in learning difficulties (Table 2). However, the percentage was higher for responses 10 for genetics and zero for environment, demonstrating evidences about belief in genetic determinism, especially for intelligence. The interactive answers (10 for genetics and 10 environment, simultaneously) was also higher in intelligence than in learning difficulties (Table 2). At the same time as there are beliefs in genetic determinism, radically considering only genes, there is also an interactive perception that attributes maximum value to both factors. Interactive perception does not impose a degree of importance between the factors, considering that the traits are "100% innate and 100% acquired" (Jacquard & Kahn, 2001, p. 167).

Perceptions that only environment influences the cognitive abilities did not associated with no one sample group. The next sections will discuss the results separately, beginning the perception about intelligence, followed by the perception about the learning difficulties.

Teachers' perception about Intelligence

The numerical scales' results show greater acceptance of the genetic influence on intelligence. The concentration of responses above five is higher on genetic scale than on environment scale, and the difference between scales is statistically significant.

About the multiple choice questions, the item "environment only" (IGA5) is far from the sample groups; the items that contain genetic influence and all the groups of teachers appear sparse, with no concentration between them (Figure 1). This scenario shows that the population evaluated has a rather diversify perception. People who consider intelligence a fixed attribute had a greater tendency to believe that intelligence is innate and that the brain has little plasticity, while people who consider malleable intelligence have tended to believe that intelligence can suffer interference from the environment and that the brain can change throughout life (Thomas & Sarnecka, 2015). In the cited study, as in the current result, the perceptions were distributed in a *continuum*, not only in two extreme points, demonstrating that the interaction between organism and environment is considered in various degrees.

Age groups are scattered without a clear pattern of visualization or important association, however, the younger range (I1) appears without an association, but the older age group (I4) is associated with "more environment than genes" (IGA4) (Figure 1). Perceptions by age strata were inverted if we compare with an earlier study (Human Genetics Commission, 2001), which younger people considered the role of the environment and older people emphasized the role of genes in intelligence.

The highest level of schooling (E4) is associated with item IGA4 (more environment than genes). The E1 group is not strongly associated with any of the items but appears between IGA2 (more genes than environment) and IGA1 (genes only). Considering the more inactive items IGA1 and IGA2 when compared to items IGA3 (genes and environment in equal parts) and IGA4 (Figure 1), we found similarity with the study of Cástera and Clément (2014) which found that the higher the number of years in the graduation, the smaller was the level of genetic determinism of the evaluated teachers. Another group that understood the interaction between genes and environment is educated mothers with schooling and with more than one child (Willoughby et al., 2019). Still comparing the present study with the

aforementioned study, knowledge in biology did not influence beliefs in innatism (Castéra & Clément, 2014). Here, we note that the three major areas of knowledge are associated with items that consider the two factors, the human area (AC1) is associated with IGA3 - and quite associated with having studied genetics in its formation (EG1), which we suppose be related to the genetic epistemology of Jean Piaget; the biological area (AC2) is closer, but not associated, to IGA2; and the exact area (AC3) shows an association with IGA4. Regardless of the area, we agree that investment in years of study and continuing teacher training and education may reduce the belief in genetic determinism among teachers.

Mother with more children may be able to observe the difference between them, the similarities with parents and the influences of shared and non-shared environments (Willoughby et al., 2019). It could be expected that teachers of students at different ages would perceive influences on intelligence differently, according to the stage of cognitive development. It can be argued, however, that the probability of teachers with lower levels of education (E1) acting at initial levels of education with children and adolescents is higher, and teachers with higher levels of education (E4) are more likely to act at advanced levels of education, with adult learners. In this case, the E4 group (as well as the older group I4) associated in AC with IGA4 reveals the perception of common sense, which suggests that the environment exerts more influence as experiences accumulate throughout life (Asbury & Plomin, 2013). However, studies show that genetic influence, which is lower in childhood, increases in adolescence and young adulthood (Haworth et al., 2011) and continues over time until cognitive capacity is considered “is almost as heritable as height” (Asbury & Plomin, 2013, p. 6). On the other hand, the most important environmental influence is the non-shared, which remains important and relatively stable during life and that shared environmental influence is greater in childhood and decreases throughout development (Haworth et al., 2011).

The result of this research, a lot of perception of influence of the two factors including a portion of interactive perception, is optimistic. Non-deterministic teachers can value personalized contact and personal experiences in childhood through the promotion of diversified environmental stimuli of great importance, since the susceptibility to such interventions may activate genes for intelligence in the phenomenon of

genetic innovation (Briley & Tucker-Drob, 2013). The varied possibility of choices in childhood will provide the selection of the environment appropriate to the genetic predisposition of each individual, since the genetic influence prevails or equals to the environmental one during a time (Asbury & Plomin, 2013). In subsequent stages of individual development and school maturation, insertion into the chosen environment will lead to the phenomenon of genetic amplification, and consequent genetic decline regarding unselected environments (Briley & Tucker-Drob, 2013). Considering the relationship between intelligence and academic performance (Deary et al., 2007) as well as gene-environment correlations (Plomin et al., 2016), directed strategies are necessary for students to perform to the fullest of their abilities and the breadth of their predispositions.

Teachers' perception about Learning Difficulties

The majority of the participants attributed values equal to or greater than five to the weight of genetic influence as well as the environmental influence (Table 3). The dispersion between the two scales is very small (Table 1), and there are not statistically significant differences between them. This, plus an amount of interactive responses (10 for genes and 10 for environment), shows acceptance about the interaction of the two factors, and an interactive perception (Briley et al., 2018; Jacquard & Kahn, 2001), contrary to the additive perception, similar to studies with twins which need to quantify heritability and environment (Erbeli et al., 2018).

In this domain, dichotomous responses to scales appear less than intelligence responses, but maintain the pattern: more teachers assigned maximum value (10) for genetics and none (zero) for environment in a deterministic perception that the diagnosis is irreversible; and fewer teachers assigned the maximum value (10) for environment and none (zero) for genetics attributing that the family, neighborhood or/and school environment are determinants of such difficulties.

In a Brazilian teacher sample, was ascribed the family environment as a predominant factor for learning difficulties (Oliveira, Santos, Aspilicueta, & Cruz, 2012). Although it is reported as a family environment, if we consider the passive and reactive gene-environment correlation (Plomin et al., 2016) such perceptions seem to implicitly accept the genetic influence in this

domain. The [Figure 2](#) show (IGA1), "more genes than environment" (IGA2), "genes and environment in equal parts" (IGA3) and "more environment than genes" (IGA4). The item "environment only" (IGA5) appears quite far away, revealing the acceptance of genetic influence by the teachers.

Castéra and Clément (2014) found that the fewer years of schooling of the teachers, resulted in a more innate viewpoint. It can be seen that E1 and E2 (full superior and specialization) are associated with items that may be considered more innatists (IGA1 and IGA2), while E3 and E4 (masters and doctoral / postdoctoral, respectively) appear on the less innate side of the map less ([Figure 2](#)). Gericke et al (2017) did not find differences between the participants with greater and less knowledge in genetics in relation to the beliefs in genetic determinism. The approximations observed in the groups that declared that they had not studied aspects of genetics (EG2) and did not have knowledge in genetics (CG2) were among themselves and with the perception of greater genetic influence (IGA2). The group who declares that would have studied genetics during teacher training (EG1) is not associated with any category of response but is closer to IGA3 (genes and environment in equal parts). The group who declares to have knowledge in genetics (CG1) is positioned between IGA2 and IGA3 ([Figure 2](#)).

The genetic influence referred by behavioral genetics does not label extreme positions of the curve as abnormal (Asbury & Plomin, 2013; Plomin et al., 2016). This hypothesis, allied with the balanced and interactive perception of teachers founded here, is encouraging because it excludes the possibility of categorized diagnosis, which may lead parents and teachers not to offer incentives for children to overcome their limitations (Asbury & Plomin, 2013). Genetic formation on teachers' courses may assist in the extinction of deterministic beliefs and consequently diagnoses that label individuals based on the perception about the etiology of their learning difficulty.

Limitations and future research

Although we have a significant sample, it is not representative, which is a weakness of the study. In addition, the division by demographic characteristics generates smaller groups. By getting larger sample other comparative analyzes among groups could be performed.

The research instrument in present study assesses the explicit teachers' perceptions; an instrument that measures the same perceptions in an implicit way may bring new results. Furthermore, would be useful include an instrument for assess teachers' practices in order to understand if the perceptions and beliefs affect the way how teachers deal with and invest in their students.

There is evidence that beliefs related to people's potential for intelligence can be shaped by culture (Rattan et al., 2012) and by political views (Willoughby et al., 2019). Personal or family experiences of diseases or genetic tests can collaborate in the formation of perceptions, characterizing belief in genetic determinism (Senior et al., 1999). Beliefs in genetics determinism can be the origin of determinist beliefs in families with a child diagnosed with learning difficulties, leading to accommodate behaviors both in family and school. The experiences and observations can be used in a positive way. In the lack of particular experiences, it is known that learning can occur through observation (Mendes & Seidl-de-Moura, 2016), which should be considered in future studies using, for example, overcoming stories (Bernard, Dercon, Orkin & Taffesse, 2014). The promotion of knowledge about the interaction between genes and the environment, going beyond of examples of Mendelian genetics, may be relevant in the ongoing training of teachers (Crosswaite & Asbury, 2018), and may also serve as an incentive to the creation of new ways of acting.

Conclusion

This study found that overall teachers placed emphasis on the role of both genetics and environment in explaining differences for both intelligence and learning difficulties. It was found that emphasis on the role of genetics was particularly pronounced for intelligence. Perceptions changed little based on various demographic factors suggesting that across the teaching population views were homogenous.

These findings mean although there are deterministic perceptions about cognition as well as additive perceptions, separating the influence of factors and placing a greater weight on some of them, a new form of perception is emerging: the interactive perception about cognition, considering the interdependence between genes and the environment.

We believe that the characteristics of the groups are not highly evident because we are experiencing a time of change perception on this issue and, in this sense, promoting more information about behavioral genetics has the potential to generate greater understanding about influences and to decrease deterministic beliefs.

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Psychological Impact of Work-Integrated Learning Programmes in Malaysia: The Moderating Role of Self-Esteem on Relation between Self-Efficacy and Self-Confidence

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Psychological Impact of Work-Integrated Learning Programmes in Malaysia: The Moderating Role of Self-Esteem on Relation between Self-Efficacy and Self-Confidence

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Abstract

This study further extends a theoretical model of psychological empowerment by investigating the relationships between self-efficacy, self-confidence and self-esteem. A sample of by 383 of Malaysian undergraduates participating in Work Integrated Learning (WIL) programmes across five public universities is used to test the model employing partial-least squares based structural equation modelling. The results have demonstrated that self-efficacy and self-esteem have a positive and significant relationship with self-confidence. This study also confirms the moderating effect of self-esteem on the relationship between self-efficacy and self-confidence. Furthermore, the findings of this study provide insight about psychological attributes of undergraduates participated in WIL programmes. These findings have implications for WIL stakeholders, which are highlighted in the paper.

Keywords: work-integrated learning; psychological attributes; psychological empowerment; higher education; Malaysia.

Impacto Psicológico de Programas de Integración del Trabajo en Malasia: El Rol Moderador de la Autoestima en la Relación entre la Autoeficacia y la Autoconfianza

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Resumen

Este estudio extiende un modelo teórico de empoderamiento psicológico por medio de investigar las relaciones entre la autoeficacia, la autoconfianza y la autoestima. Una muestra de 383 estudiantes de grado de Malasia participantes en Programas de Aprendizaje de Trabajo Integrado (WIL) en cinco universidades públicas se usa para examinar el modelo usando modelización de ecuaciones estructurales basadas en mínimos cuadrados parciales. Los resultados demuestran que la autoeficacia y la autoestima tienen una relación positiva y significativa con la autoconfianza. Este estudio también confirma el papel moderador de la autoestima sobre la relación entre la autoeficacia y la autoconfianza. Además, los resultados arrojan luz sobre los atributos psicológicos de los estudiantes que participaron en estos programas. Los resultados tienen implicaciones para los usuarios de WIL, que se subrayan en el artículo.

Palabras clave: aprendizaje de trabajo integrado; atributos psicológicos; empoderamiento psicológico; educación superior; Malasia.

Work-Integrated Learning (WIL) is a programme implemented by institutions of higher learning for undergraduates. WIL has widely been considered as being instrumental in providing new undergraduates with skills to find employability and function effectively in work place (Jackson, 2015). Educational theorists have suggested that WIL programmes are superior teaching tools compared to traditional learning tools (Ibrahim & Jaafar, 2017). Despite the progressive development of WIL programmes, studies investigating the benefits of WIL have mainly focused on the economic as well as monetary benefits obtained by various stakeholders rather than the gains to specific undergraduates' learning outcomes or the on examining psychological attributes of the undergraduates (Drysdale et al., 2016; Potgieter, 2012). Recently, Jackson and Wilton (2016) called for WIL programmes to focus on undergraduates' psychological career resources or career meta-competencies.

In the context of WIL programmes, research is fragmented in investigating the relationship between psychological attributes including self-efficacy, self-esteem, and self-confidence of undergraduates after participating in WIL programmes. A previous study revealed that undergraduates who have participated in WIL programmes were found to have higher levels of perceived self-confidence, self-esteem, and self-efficacy compared to undergraduates who had not participated in WIL programmes (Drysdale et al., 2012). Another study undertaken in China, examined the mediating and moderating effects of global self-esteem on the relationship between social support and subjective well-being of undergraduate Chinese students (Kong et al., 2013). Review of literature reveals that no comprehensive study has examined the moderating effect of self-esteem on the psychological attributes of self-efficacy and self-confidence of undergraduates participating in WIL programme. Thus, the aim of the current study is to fill this gap. This study proposes to investigate the relationship of an undergraduate's psychological attributes after participating in WIL programmes, which address self-efficacy, self-esteem, and self-confidence, as well as to examine the moderating effect of self-esteem.

Literature Review and Hypothesis Development

The theoretical underpinning of this study is the concept of psychological empowerment in the context of WIL programmes. In general, psychological empowerment can be conceptualized as intrinsic motivation based on cognition including meaning, impact, self-determination, and competency (Spreitzer, 1995). Past research concludes that the form of psychological empowerment depends on the context and population being studied (Rappaport, 1984). WIL programmes provide an avenue for undergraduate psychological empowerment. A recent study has demonstrated this and concluded that intrinsic task motivation is manifested in a set of cognitions that include competence, impact, meaning, and self-determination, reflects an undergraduate's orientation to his or her work role (Drewery et al., 2016).

Psychological factors such as self-confidence, self-efficacy and self-esteem are important contributors to the psychological empowerment of the undergraduate students. This will lead to a higher rate of employability of these students. Previous studies revealed a positive and significant association between the employees' psychological empowerment and the attitudes and behaviours relating to their jobs (Islam et al., 2016). Another study also confirmed that psychological empowerment factors including meaning, impact, self-determination, and competency have a significant positive relationship with an organization's learning (Safari et al., 2011). However, these have been in organizational learning context. A recent study undertaken in Canada examines the perceptions of co-op students' towards work-term quality in order to predict their perceived work-term quality (Drewery et al., 2016). However, extant literature appears to have overlooked the potential comparative context of the undergraduate's psychological attributes in developing countries.

Self-Confidence

The concept of self-confidence has been widely discussed in psychology and applied research. Kukulu et al., (2013) define self-confidence as the ability of an individual to recognise his or her own ability, love towards himself/herself or an awareness of his or her own emotions. Carson et al., (2001) describe self-confidence as feelings of well-being because of deepening positive emotions. Self-confidence is reported as an integral psychological construct that affects a student's academic performance

(Craven et al., 1991). Possessing self-confidence means there is an expectation that a person will achieve a goal in a certain situation. Kukululu et al. (2013) suggest the role of educational or teaching methods, such as WIL programmes, can influence the development of an undergraduate's self-confidence.

Previous studies demonstrated that undergraduates who successfully participated in a comprehensive WIL programme have increased self-confidence (Balta et al., 2012; Purdie et al., 2013; Spowart, 2011; Zegwaard & McCurdy, 2014). Further, it has also been found that self-efficacy and self-esteem influence self-confidence (Dickerson & Taylor, 2000). Yet, the relationship between the above-mentioned psychological attributes has received little attention.

Self-Efficacy

Bandura (1977) defined self-efficacy as an individual's conviction in his/her ability to regulate one's motivation, thought process, and environment to achieve certain outcomes. Since then, many studies have recognized self-efficacy as a motivational outcome. Carpenter (2011), suggested that having self-confidence in an individual's ability in completion of a difficult task will increase his/her likelihood of engaging such a behaviour in future. Likewise, lack of self-efficacy can reduce an individual's inclination to a behaviour or action when faced with challenging or complex circumstances (Hebert et al., 2014).

There is an increasing body of research that indicates that measures of academic self-efficacy are predictive of student academic achievement (Zajacova et al., 2005; Mazlum et al., 2015). High self-efficacy beliefs are also associated with the use of learning strategies (DiBenedetto & Zimmerman, 2010). Moreover, self-efficacy is related to high academic performance and the use of self-regulatory strategies (Bembenutty, 2011). Self-efficacy also has been found to be an important predictor of an undergraduate's self-perceived employability and employment outcomes (Kanfer et al., 2001; Velde & Berg, 2003).

Previous research has identified that WIL programmes enhance an undergraduate's level of self-efficacy (e.g. Bates et al. 2014; Edwards; 2014; Freudenberg et. al., 2011). Furthermore, other studies have also found that real life experiences gained through WIL programmes such as service

learning programmes, increased the undergraduates' motivation to participate in research activities, as it elevates their perception of practice implications of their research (Harder, 2010; Deck et al., 2016). Raelin et al., (2011) examined the effect of WIL programmes such as cooperative education based on three dimensions of self-efficacy change and concluded WIL programmes significantly influence self-efficacy.

As for the relationship between self-efficacy and self-confidence, Dickerson and Taylor (2000) revealed that task specific self-efficacy influences an individual's self-confidence. This find support in other studies, which, demonstrated that self-efficacy has a positive relationship with the self-confidence (Raelin et al., 2011). This leads us to the Hypothesis 1: Self-efficacy of undergraduates who have participated in WIL programmes is positively related to self-confidence

Self-Esteem

Rosenberg (1965) defined self-esteem as an individual's positive or negative attitudes about themselves. High self-esteem would mean that an individual has a feeling of being good enough, while low self-esteem refers to a feeling of not being good enough. In order to have a high self-esteem, individuals attempt to have a control and mastery of their socio-cultural environment (Coetzee & Bergh, 2009). Previous studies reveal that individuals having low self-esteem are more likely to perform poorly and achieve less than those with high self-esteem (Brockner & Guare, 1983; Kerka, 1998). They are not confident that they will succeed in whatever task that they undertake (Baumeister, 1997).

Several studies have been conducted to examine the effect of self-esteem on students' self-confidence. Previous studies have concluded that students with low self-esteem could elevate themselves by participating in work-based learning (Brockner & Guare, 1983; Fugate et al., 2004). Potgieter (2012) suggested that career meta-competencies such as self-esteem do influence undergraduate employability attributes significantly. Therefore, higher education institutions and employers should emphasize the importance of an undergraduate's self-esteem development in a WIL programme in order to improve his or her employability attributes.

Past studies have also examined the relationship between self-esteem and self –confidence and concluded with interesting relationships. Self-esteem

and self-confidence were found to be interrelated concepts but mutually dependent (Feltz, 2007). This implies that certain people, who may not have high self-confidence in a given task, might value themselves highly. In contrast, some might consider themselves as highly competent at a given task but may not have similar feelings of self-esteem. In contrast, another study revealed that individuals with high levels of self-confidence have high levels of self-esteem (Kukulu et al., 2013). Further including the construct of self-efficacy, Dickerson & Taylor (2000) demonstrated that self-esteem along with self-efficacy, are strong predictors of individual self-confidence. They also suggested that there is a strong relationship between self-esteem and self-efficacy.

It should be noted that there is no unanimity as to the relationships between self-esteem and self-confidence in extant studies. Therefore, in addition to examining the direct relationship between self-esteem and self-confidence, the present study also proposes that self-esteem will moderate the relationship between self-efficacy and self-confidence. The reasoning for such a proposition is grounded by closely examining relevant extant literature. Past studies have reported a moderating effect of the self-esteem construct on psychological variables and the psychological stress or well-being of university undergraduates (Kong et al., 2013; Moradi & Subich, 2004). Another study concluded that self-esteem is an important psychological resource, which acts as a buffer against a stressful environment (Cast & Burke, 2002). A study undertaken in Turkey revealed that there was a significant positive relationship between self-esteem and academic achievement of Turkish undergraduates (Duru & Balkis, 2017). Kong et al. (2013) examined the moderation effect of self-esteem between social support and life satisfaction. As such, the logical sequence suggests that self-esteem may have an influence on the on the relationship between self-efficacy and self-confidence. Therefore, are proposed Hypothesis 2: Self-esteem of undergraduates who had participated in WIL programmes is positively related to self-confidence, and Hypothesis 3: The relationship between self-efficacy and self-confidence of undergraduates who had participated in WIL programmes becomes stronger when the level of self-esteem is high”.

Method

This study employs a purposive sampling technique as it targets a specific group of respondents, which is undergraduate participants in WIL programmes. This study focuses on the psychological attributes of the sample.

Empirical Research Setting

An assortment of WIL programmes have been used by educators in more than thirty countries all over the world (Nagy & Smith, 2016). However, research on the use of WIL programmes in Malaysia is scanty. A recent study undertaken in Malaysia examines employers perception of undergraduates competence after their WIL programme, but this is confined to their employability skills (Jaaffar et al., 2016). This study is timely as the government of Malaysia has acknowledged the importance of providing a high-quality workforce which is responsive to local, as well as global forces, particularly since trading among nations of the world has become increasingly liberalised (Daud et al., 2011). Rigorous research on WIL programmes will help to have a better understanding of the effect of self-esteem on the psychological attributes of self-efficacy and self-confidence of undergraduates participating in WIL programmes. Thus, it is worthwhile exploring if there are such differences between the behaviour of undergraduate students in different countries such as Malaysia.

Survey Instrument

A structured questionnaire was developed based on a thorough review of literature. Multi-item measurement scales were used to operationalise the dependant and independent variables. The self-confidence construct consists of seven items adopted from Shrauger's (1995) Personal Evaluation Inventory (PEI) scale. The self-efficacy construct consists of eight items adopted from Chen's et al. (2001) General Self-efficacy Scale and Freudenberg, et al., (2010). The self-esteem construct consists of five items adopted from Rosenberg's (1965) Self-Esteem Inventory scale (Garcia et al., 2019). All these items are detailed in Table 1. All items were measured on a the five-point Likert scale with 1 representing "strongly disagree" and 5 representing "strongly agree". The questionnaire in English was used aimed

to capture the perception of the undergraduate respondent's psychological attributes after completing WIL programmes. A section to capture the demographic profile of the respondents was also included.

Data Collection

The study utilized a cross-sectional approach. Respondents were undergraduates studying for business management degrees at five Malaysian public universities and who had undergone various WIL programmes, including: 1) internship/placement/practicum, 2) industrial attachment, 3) research assistantships (paid/unpaid), 4) teaching assistantships, 5) job shadowing, 6) volunteering (community service) and 7) study abroad. Data was obtained through a purposive sampling method using a drop and collect approach. The surveys were only distributed to the undergraduates who had undergone WIL programmes with the cooperation of each business faculty's internship coordinator. This study used drop-off/pick-up survey technique where 500 questionnaires were distributed to internship coordinators of five Malaysian Public universities (Jackson-Smith et al., 2016). The survey was conducted at one point in time over a period of two months. Overall 389 responses were received, of these six responses were dropped from further analyses, as they were not fully completed. This left us with 383 usable responses indicating 76.7 percent response rate.

Descriptive Statistics

The descriptive statistic in Table 1 shows that, 89 respondents were male (23.2 percent) and 294 were female (76.8 percent). Three hundred seventy (96.6%) of respondents had undergone an internship/placement/practicum, 26 (6.8%) industry attachment, 8 (2.1%) had undergone research assistantships (paid/unpaid), 12 (3.15%) had undergone teaching assistantships, 4 (1%) had undergone job shadowing, 61 (15.9 %) had undergone volunteering (community service) and 7 (1.8%) had undergone 'study abroad'. The result also indicated that 105 (27.4%) of respondents have WIL experience in more than one programme. The percentage of male and female students in this study reflects the current scenario in public universities in Malaysia, where, generally speaking, the percentage for female students is higher than male students consistent with statistics released by the Ministry of Higher Education (2013). The choice of WIL

activities used in this study is consistent with the definition of WIL proposed by Martin et al. (2012).

Table 1

Descriptive Statistics

Description	Frequency (N=383)	Percentage
Gender		
Male	89	23.2
Female	294	76.8
Training Programmes Involved		
Internship/Placement/Practicum	370	96.6
Industry Attachment	26	6.8
Research Assistantship (paid/unpaid)	8	2.1
Teaching Assistantship	12	3.1
Job Shadowing	4	1.0
Volunteering (community service)	61	15.9
Study abroad	7	1.8

Data Analysis Technique

The research hypotheses were tested using the Partial Least Square (PLS) method and used the software application SmartPLS software (Ringle et al., 2005). This study used PLS because of its flexible restriction with regard to the in respect to the distribution and population of the study. PLS also has potential to provide a more reliable and accurate computation of moderating effects since it takes into account errors which has the capability to reduce the possible relationship and thereby improve theory validation (Henseler & Fassott, 2010). Following procedures suggested by Anderson & Gerbing (1988), a two-stage analytical procedure was employed. This included a) testing the validity and reliability of the measurement model and b) testing the hypothesized relationship of the structural model. Finally, a bootstrapping method (5000 re-samples) was performed to test the significance of the path coefficients and the loading of the variables (Hair et al., 2014).

Results

Measurement model results

To confirm the reliability of items, a confirmatory factor analysis (CFA) was first undertaken. The convergent validity and discriminant validity were also established. Three items from the construct of self-efficacy and two items from self-esteem were deleted as the loadings did not meet the critical threshold limit of 0.50 (Anderson & Gerbing, 1988; Bagozzi and Yi, 1988). The internal consistency reliability was also achieved using composite reliability as the values were more than the required cut-off value of 0.70 (Chin, 1998; Hair et al., 2012) (Table 2). The average variance extracted (AVE) met the minimum criteria of 0.5, confirming convergent validity (Fornell & Larcker, 1981). The scale items, loadings, composite reliability and AVE are provided in Table 2.

Table 2

Scales, loadings, composite reliability and average variance extracted

Constructs	Label	Loadings	C. R	AVE
Self-Confidence				
I have control over my own life	CON1	0.7490	0.867	0.567
I am easy to like.	CON2	0.7385		
I never feel down for very long.	CON3	0.6860		
I am not embarrassed to let people know my opinions.	CON4	0.8091		
If a task is difficult, that makes me even more determined.	CON5	0.7763		
I feel emotionally mature.	CON6	DEL		
I like myself even when others do not.	CON7	DEL		
Self-Efficacy				
My belief that I will achieve most of the career goals that I have been able to set for myself.	EFF1	DEL	0.880	0.514
My certainty that I will accomplish difficult tasks when faced with them.	EFF2	0.7270		
My general belief that I can obtain outcomes that are important to me	EFF3	0.5733		

My belief that I can succeed at almost any endeavour to which I set my mind.	EFF4	0.6119		
My ability to overcome successfully many challenges.	EFF5	0.7622		
My confidence that I can perform effectively on many different tasks.	EFF6	0.7846		
My ability to do most tasks very well compared to other people.	EFF7	0.7721		
My ability to perform quite well even when things are tough.	EFF8	0.7577		
Self-Esteem				
I am happy with who I am.	EST1	DEL	0.775	0.535
I am sure I will be able to reach my goals.	EST2	DEL		
I have many things to be proud of.	EST3	0.7106		
I feel that I am a success.	EST4	0.7016		
If I meet a copy of myself, I would enjoy talking to this person.	EST5	0.7789		

The discriminant validity, as shown in Table 3, is also established because the square root of the AVE was higher than the inter-correlation of each of the study's constructs in relation to other constructs of the research model and also higher than the construct correlation (Chin, 2010). Therefore, it is safely assumed that the measurement model in this study meets the internal consistency reliability, convergent and discriminant validity.

Table 3

Discriminant validity

Variables	Self-Confidence	Self-Efficacy	Self-Esteem
Self-Confidence	0.7530		
Self-Efficacy	0.4100	0.7169	
Self-Esteem	0.4871	0.3591	0.7314

Structural Model Results (PLS Path with moderator)

To assess the results of structural model using PLS-SEM, the procedure outlined by Hair, Hult, Ringle, and Sarstedt (2013) were employed. These procedures call for assessing the four key criteria in the structural model. These include assessments of: a) the significance of the path coefficients, b) the coefficient determination (R^2), c) the size effect (f^2), and finally d) the predictive relevance (Q^2). Following these procedures, results for the assessment of the significance of path coefficients are presented in Figure 1, and Table 4. The structural model in Fig. 1 presents a path model with two direct effects (EFF->CON) and EST-> CON), and one indirect (moderating) effect (EFF*EST-> CON).

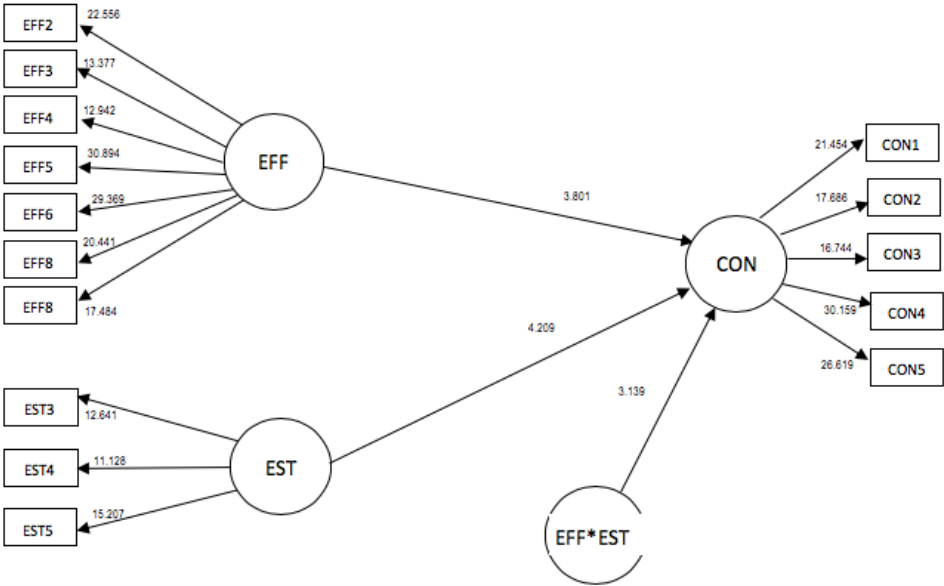


Figure 1. Structural model

This study examined the moderating role of self-esteem on the relationship between self-efficacy and self-confidence. Table 4 presents the summary results of findings. The results indicated there is a positive relationship between self-efficacy with self-confidence ($\beta=1.4556$; $t=3.8013$; $p=0.00$). The results also revealed that a positive relationship exists between self-esteem and self-confidence ($\beta=1.4331$; $t=4.2095$; $p=0.00$). The moderation result showed self-esteem moderates the relationship between self-efficacy and self-confidence ($\beta=-1.8464$; $t=3.1389$; $p=0.00$), with the negative and significant relationships.

Table 4

Path coefficients for hypotheses testing

Hypothesis	Beta	Standard Error	T-Statistic	P-Value	Decision
EFF-> CON	1.4556	0.3829	3.8013	0.00**	ACCEPTED
EST-> CON	1.4331	0.3405	4.2095	0.00**	ACCEPTED
EFF*EST -> CON	-	0.5882	3.1389	0.00**	REJECTED

** $p<0.01$

Figure 2 demonstrates that the relationship will be weaker for undergraduates with higher self-esteem than undergraduates with lower self-esteem.

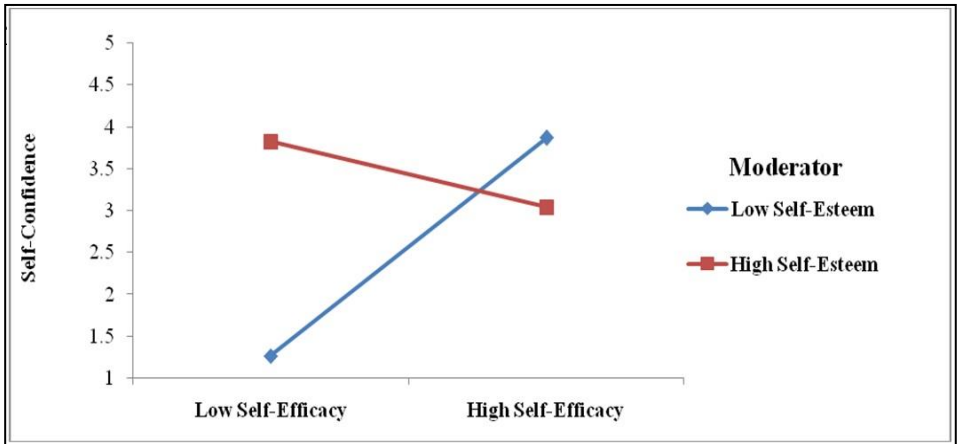


Figure 2. Interaction effects

The analysis also provided strong support to the structural model. The coefficient determination (R^2) of the model is 0.329 implying that self-efficacy and self-esteem together explained 32.9 percent changes or variations in self-confidence among the undergraduates who have participated in WIL Programmes. Chin (1998) classified the R-squared of 0.19, 0.33 and 0.67 as weak, moderate and substantial respectively. The R^2 value can be considered as moderate. The effect-size (f^2) is another criterion for assessing a structural model. Cohen (1988) classified effect-size of 0.02, 0.15 and 0.35 as small, medium, large respectively. The effect size (f^2) of the self-efficacy is 0.13 can be classified as medium. While, the effect sizes (f^2) of the self-esteem (moderator) is 0.21, which is higher than that of independent variables can also be classified as medium. The final evaluation criterion for the structural model is predictive relevance (Q^2). This is evaluated by using the construct-cross validated redundancy. The model is said to have a predictive relevance, if (Q^2) is greater than zero (Geisser, 1974; Stone, 1974). The (Q^2) obtained in the present study is 0.1129, or greater than zero. Predictive relevance of the model is also confirmed.

Discussion

This study was conducted based on the perception of undergraduates with regard to their psychological attributes including self-confidence, self-efficacy, and self-esteem after completing WIL programmes. The study

examined the direct effect of self-efficacy and self-esteem on self-confidence. It also examined the moderating role of self-esteem on the relationship between self-efficacy and self-confidence. The findings revealed that self-efficacy is positively related to self-confidence. This finding is consistent with previous findings. For example, Dickerson and Taylor (2000) revealed that task specific self-efficacy influences individual self-confidence. While, Raelin et al. (2011) demonstrated that self-efficacy has a positive and significant relationship with employees' self-confidence, this result shows that the self-efficacy of WIL undergraduates can be perceived as their belief in their own capabilities in a particular situation. Consequently, this will affect their self-confidence, manifested in the way in which they respond to their environment (Dacre-Pool & Sewell, 2007).

This study also exhibited that self-esteem is positively related to self-confidence. This finding is consistent with the study by Kukulu et al. (2013) which revealed that individuals with high levels of self-esteem have high levels of self-confidence. Moreover, Dickerson and Taylor (2000) demonstrated that self-esteem is one of the strongest predictors of individual self-confidence. In the context of post-WIL undergraduates who have satisfied their need for self-esteem, they will tend to feel confident, competent, strong and useful. This is in strong contrast to undergraduates whose self-esteem has not improved. This group tends to feel inferior, anxious, worried, depressed, weak and helpless (Coetzee and Bergh, 2009). Furthermore, WIL undergraduates with low self-esteem may be more inclined to perform poorly and underachieve compared to individuals with high self-esteem (Brockner & Guare, 1983; Kerka, 1998).

This study also revealed that self-esteem moderates the relationship between self-efficacy and self-confidence in negative direction. The relationship between self-efficacy and self-confidence of undergraduates who had participated in WIL programmes becomes weaker when the level of self-esteem is high. Although previous studies identified the positive influence on the moderating effect of self-esteem, this study found otherwise. This may be due to certain factors such as whether undergraduates value themselves highly (high self-esteem) but do not have the self-confidence to complete a given task (low self-confidence). By contrast, there are undergraduates who may consider themselves as highly competent at a given task (high self-confidence) but do not have

commensurate feelings of self-worth (low self-esteem) (Feltz, 2007). Furthermore the undergraduate's self-esteem may be influenced by 'high' and 'bad' self-esteem (Tracy, Cheng, Robins, & Trzesniewski, 2009). In other words, 'high' self-esteem can be referred to as 'genuine' self-esteem (more socially desirable and achievement oriented) while, 'low' self-esteem can be referred to as 'fragile' self-esteem (more narcissistic and related to arrogance). 'High' self-esteem has been found positively related to supportive relationships, whereas 'low' self-esteem is associated with antisocial behaviour (Tracy et al., 2009). Beside those two factors, the gender of the respondents may influence the results as indicated by Kukulu et al. (2013), who found that male post-WIL undergraduates have higher self-esteem than female post-WIL undergraduates do.

From the perspective of psychological empowerment theory, the study of the relationship of WIL's psychological attributes, including self-efficacy, self-esteem, and self-confidence provide insight with regard to the undergraduates' post-WIL's cognition which is reflected in their orientation to their work roles in WIL programmes as well as on their future careers. For example, self-efficacy is related to competence, which indicates an undergraduate's belief in his/her capability to perform in a given role, while self-esteem is related to the degree to which they feel a sense of influence over the work that they perform. Their self-confidence is related to meaning, which demonstrates that undergraduates want experiences which are personally relevant to them and in which they find deep meaning. At the same time their self-determination refers to their seeking freedom to complete work in a way that they consider to be the most effective (Drewery et al. 2016). Moreover, this study demonstrates that WIL programmes act as psychological empowerment mechanisms, which are vital for an undergraduate's employment prospects. This is manifested through the positive relationship between an undergraduate's self-efficacy and self-confidence developed because of participating in WIL programmes. The moderation effect of self-esteem also demonstrates the significant influences of these psychological attributes related to the undergraduates' psychological empowerment.

This study has practice implications. The study provides valuable insights of the WIL programme to stakeholders, specifically employers who act as hosts for undergraduate WIL programmes. This study also reinforces

the contention that employers must be prepared to implement WIL programmes, because the undergraduates' experience of these programmes varies enormously in terms of their quality, educational value and psychological impact (Smith & Worsfold, 2014).

The findings of this study lead to larger generalization. WIL programmes for undergraduates could be enhanced by having a structured approach (Smith et al., 2016). Administrators in higher education, as well as employers responsible for WIL programmes must aim to improve the undergraduates' self-efficacy, self-esteem and self-confidence for their psychological empowerment.

Limitation and Suggestions for Future Research

As in most empirical studies, this study is not without its limitations. First, rather than just focusing on Malaysian undergraduates from business management degrees, future studies should focus on undergraduates studying for engineering degrees in order to increase the generalizability of the study. Second, this study tested applied to psychological attributes, self-efficacy, self-esteem and self-confidence. However, other variables may have associations. For instance, the measurement of self-esteem comprises three components: general self-esteem, social or peer self-esteem and personal self-esteem. Future research may include alternative measurements of psychological attributes. Third, the sample is not reasonably distributed across gender. Future research can overcome this issue by minimizing the differences between the two genders and study the influence of undergraduate's gender on their psychological attributes. An increasing number of studies that have focused on influence of gender (Asakereh & Yousofi, 2018). Finally, longitudinal study is suggested to examine the effect of the variables in the model over time. Cross sectional data makes inference tenuous. These studies would make worthwhile contribution to body of knowledge.

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The Disordered Mind: What Unusual Brains Tell Us About Ourselves

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Review

Kandel, E.R. (2018). *The Disordered Mind: What Unusual Brains Tell Us About Ourselves*. New York: Farrar, Straus and Giroux.

Eric R. Kandel is professor in Columbia University Medical Center, and Director of the Kavli Institute for Brain Science. He is Senior Investigator at the Howard Hughes Medical Institute. Specialist in neuroscience and neurophysiology, his scientific contributions are mainly linked to the purpose of understanding the nature of the human mind through the study of learning and memory processes. His research was recognized with the Nobel Prize in Physiology or Medicine in 2000.

His most recent book, *The Disordered Mind: What Unusual Brains Tell Us About Ourselves*, aims to unveil the main contributions that are currently known about how to study the neurological and psychiatric brain disorders that cause some of the most incidental illnesses nowadays. As Kandel argues, such disorders provide essential information about the nature of the human mind.

Since diseases such as autism, depression, schizophrenia, Alzheimer, Parkinson, addictions or post-traumatic stress disorder modify the neural connections, they could not be formed well or even at all, this makes them be a good study aim to better understand the normal functioning of the brain. Paradoxically, Kandel explains the relevance of a neurological and social analysis of these disorders to learn more about the neural circuits that take part daily in social interactions, thoughts, feelings, behaviour, memory and creativity of people. Under this premise, Kandel analyzes each of the aforementioned disorders and the information that they reveal about the good functioning of the brain, about us.

This work deepens, for example, the genetic advances that currently exist on the Autism Spectrum and how to better understand the genes and neuronal procedure that explain the human social nature, as well as, what kind of interaction exists between the genetic predisposition and environmental factors at the origin of specific disorders. In this line, the

study of other psychiatric conditions such as depression, bipolar disorder, schizophrenia and dementia is establishing the first connections between genetics, brain physiology and behaviour. This analysis will bring significant advances in the sense of identity of people and in the inhibition and activation of neural circuits that influence, for example, our creativity. On the other hand, Kandel also proposes an analysis of the biological influence in addictions, or also in the recognition of gender identities, to better understand and meet the needs and experiences of people with that difference.

Kandel's latest contribution in the book refers to one of the greatest scientific challenges of the 21st century: the contributions on how human consciousness is born. Emerging advances are introduced on how brain disorders not only cause alterations in aspects of conscious experience (cognition, memory, etc.) but also in the interaction of unconscious processes (information can enter the brain without producing conscious perception); they also can influence conscious decisions (that information could affect behavior).

Kandel shows in this book that there will be greater convergence between neurological and psychiatric diseases, which will continue to demonstrate the interaction between genes and the social environments that make up the brain. In this sense, a challenge present in the book is its contribution to a 'new humanism', a humanism that combines the sciences that deal with the natural world, with the humanities that deal with the meaning of human experience. Kandel exposes a biological basis of the disorders, but also, how from social and educational contexts, we can create environments that, independently from the neural involvement of each person, can be manifested to a greater or lesser extent and affect a greater or lesser opportunity of recovery. E. Kandel reaffirms in this publication the incidence of learning to produce anatomical changes in the connections between neurons. Under this evidence, a more intense interdisciplinarity is surely required in future research on the human mind.

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