



Original

## Longitudinal Relations Between School Self-concept and Academic Achievement<sup>☆</sup>

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### ABSTRACT

In self-concept research, there is a dearth of longitudinal studies which examine whether the structure of the two-factor self-concept consisting of *competence* and *affect* is stable across time. Using data collected among 608 (male = 294, females = 313, one missing gender information) Chinese secondary students from 7<sup>th</sup> grade ( $M_{\text{age}} = 13.41, SD = 1.35$ ) to 9<sup>th</sup> grade, our study used confirmatory factor analyses to compare the internal structure of separating and conflating *competence* and *affect* of the general school self-concept. The structural equation modeling (SEM) was then applied to examine longitudinal relations between *competence*, *affect*, and *academic achievement*. Consistently across the three time points, the two-factor self-concept structure was favored. However, SEM showed that the reciprocal effects were obtained only between competence and achievement from grade 7 to 8 but not from grade 8 to 9 and not between affect and achievement. Such inconsistency could be attributed to the transition from pre-puberty to adolescence.

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### Relaciones longitudinales entre el autoconcepto escolar y el rendimiento académico

#### RESUMEN

En la investigación del autoconcepto, hay escasos estudios longitudinales que examinen si la estructura del autoconcepto de dos factores relacionados con *competencia* y *afecto* es estable a lo largo del tiempo. En base a los datos recopilados entre 608 (hombres = 294, mujeres = 313, 1 información de género faltante) participantes chinos de educación secundaria desde 7<sup>o</sup> grado ( $M_{\text{edad}} = 13.41, DT = 1.35$ ) hasta 9<sup>o</sup> grado, el estudio utiliza análisis factoriales confirmatorios para comparar la estructura interna del autoconcepto académico general separando y combinando *competencia* y *afecto*. El modelo de ecuaciones estructurales (SEM) se aplica para examinar las relaciones longitudinales entre *competencia*, *afecto* y *rendimiento académico*. Consistentemente en los tres puntos temporales, se favorece la estructura del autoconcepto de dos factores. Sin embargo, la SEM muestra que los efectos recíprocos se obtienen solo entre la competencia y el logro del grado 7<sup>o</sup> al 8<sup>o</sup>, pero no del grado 8<sup>o</sup> al 9<sup>o</sup> y no entre el efecto y el logro. Dicha inconsistencia se puede atribuir a la transición de la pubertad a la adolescencia.

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#### Palabras clave:

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### Introduction

School self-concept is widely acknowledged as a prominent psychological construct contributing to students' learning outcomes, both short-term, such as cognitive-oriented performance outcomes

(e.g., adaptive academic behaviors and academic achievement) and long-term outcomes (e.g., future course selection and persistence) (Arens, Yeung, Craven, & Hasselhorn, 2011; Craven & Marsh, 2008; Pinxten, Marsh, De Franine, Van Den Noortgate, & Van Damme, 2014). Recent research has focused on validating a twofold structure of academic self-concept by separating competence and affect components (e.g., Arens et al., 2011; Pinxten et al., 2014). The rationale for a distinction of competence and affect is that the two aspects may not necessarily have equal contribution to short-term and long-term learning outcomes (Yeung, 2011). Previous investigations examining the impact of the competence and affect

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aspects on academic outcomes have provided some evidence of differential relations in cross-sectional studies (e.g., Abu-Hilal, Abdelfattah, Alshumrani, Abduljabbar, & Marsh, 2013; Yeung, Craven, & Kaur, 2012). A more recent study conducted by Pinxten et al. (2014) modeled the longitudinal relations between competence and affect in relation to academic achievement. The study was conducted with primary school students in a Western country in the maths domain. There is a lack of research on the longitudinal relations between competence and affect in relation to academic achievement with secondary school students in a non-Western context. In the present study, we filled the gap by investigating the relations between competence and affect in general school and academic achievement across three years among secondary school students in China.

### *The models of academic self-concept*

Self-concept is defined as “a person’s perception... formed through experience... and influenced... by environmental reinforcements and significant others” (Shavelson, Hubner, & Stanton, 1976, p. 411). In the last four decades, a number of models have been proposed to describe self-concept. Historically, self-concept has been viewed as unidimensional (e.g., Marx & Winne, 1978; Rosenberg, 1965) until Shavelson et al. (1976) challenged this perspective and introduced a perspective of multidimensional self-concept. The multidimensionality of self-concept, according to Shavelson et al. (1976) consists of two second-order factors: academic and non-academic self-concepts. For the structure of academic self-concept, Shavelson et al.’s initial model proposed that self-concepts in various school subjects (e.g., verbal, maths, science, history) can be represented by a higher-order general school self-concept. Shavelson et al.’s proposal was later on modified by Marsh (1990a) as the Marsh/Shavelson model in order to address the unexplained correlations among sub-domains. In the Marsh/Shavelson model, the general school self-concept is also a first-order factor paralleled with self-concepts in other school subjects, such as verbal and maths. In the more recent development of the academic self-concept model, a bipolar model was proposed (Brunner, Lüdtke, & Trautwein, 2008) and substantiated in a number of studies (Brunner, Keller, Hornung, Reichert, & Martin, 2009; Esnaola, Elosua, & Freeman, 2018; Schmidt et al., 2017). In the bipolar academic self-concept, self-concept in general school influences all manifest measures of academic self-concept and the latent factors of the specific domains.

### *Competence and affect distinction of self-concept*

Apart from research of evaluating models of academic self-concept, another controversial area of the structure of self-concept is concerned with whether academic self-concept should be represented by a cognitive and an affective component or by conflating them as one factor (Abu-Hilal et al., 2013; Arens et al., 2011; Bong & Skaalvik, 2003; Pinxten et al., 2014). On the one hand, some researchers maintain that the differentiation between the self-evaluation of competence and affect is difficult (e.g., Shavelson et al., 1976). This can be seen in the research which has consistently measured the academic self-concept by combining the two components (e.g., Jansen, Schroeders, & Lüdtke, 2014), or has predominantly used the competence aspect alone (Pinxten, De Fraine, Van Damme, & D’Haenens, 2013; Seaton, Parker, Marsh, Craven, & Yeung, 2014).

On the other hand, some researchers hold strong beliefs that the two components are theoretically distinguishable (e.g., Arens et al., 2011; Marsh & Köller, 2003). Irwing (1996) detailed a theoretical basis for the distinction between competence and affect. He reasoned that the competence dimension is more related to

external benchmarks, by which an individual establishes oneself through comparisons with other people, known as social comparison. The affective dimension is more associated with one’s internal references, through which an individual builds his/her self by gauging his/her qualities in one domain against other domains, which is primarily a process of intra-personal comparisons. This reasoning is consistent with Marsh’s (1990b) internal/external frame of references.

Support for the separation of the two components of academic self-concept is also partially observed through theories in achievement motivation research. In expectancy-value theory of motivation, Eccles and Wigfield (1995) propose that the constituents of ability and task value are separable facets, even though the two are positively correlated (Guo, Marsh, Parker, Morin, & Yeung, 2015). Likewise, in constructing the self-determination theory, Deci and Ryan (2000) suggest that it is necessary to distinguish between competence and affect, as a self-evaluation of one’s capabilities may affect one’s affective status of intrinsic motivation.

In testing the construct of self-concept, the Self Description Questionnaire (SDQ) I and SDQ II contain both competence and affect related items in general school, maths, and reading domains. In testing a competence-affect distinction of self-concept, researchers suggest that that one should test both the internal structure of self-concept by comparing one-factor model with two-factor model in a particular domain; and use educational outcomes as external validity criteria to evaluate the relations between the competence and affect aspects of self-concept and different outcomes (Marsh, Craven, & Debus, 1999; Pinxten et al., 2014).

### *Internal structure of self-concept*

A common method to examine the internal structure of self-concept often applies confirmatory factor analysis (CFA) to compare the fit of models in which the competence and affect components of self-concept are treated as a single factor and models treating them as two separate latent variables. In an earlier study conducted by Marsh et al. (1999) with Australian students, CFA models separating competence and affect components in general school, maths, and reading self-concepts resulted in a better fit than models conflating competence and affect. This led the researchers to propose a twofold model of self-concept distinguishing between competence and affect.

To further support such a claim, Arens et al. (2011) found an enhanced model fit when general school, maths, and German self-concepts were separated into competence and affect components within each domain although the two components were highly correlated ( $r$ s were .73, .81, and .78 for general school, maths, and German, respectively). In two studies with Middle Eastern students, Abu-Hilal (2005), and Abu-Hilal and Darweesh (2004) also found that compared with models which combined competence and affect into one single factor, models which distinguished the two produced the better fit. As these studies were cross-sectional, which are not able to examine whether such twofold structure is valid and stable across time. Furthermore, there is no study which tests a two-factor structure of self-concept among Chinese students. Therefore, our first aim is to test the internal structure of self-concept with Chinese students utilizing a longitudinal design.

### *Relations between self-concept and educational outcomes*

Previous studies have examined the relations between competence and affect in relation to various educational outcomes, including academic achievement – a short-term and tangible educational outcome, schoolwork effort and aspirations in future courses and careers – long-term and ongoing educational outcome (Pinxten et al., 2014). Among these external validity criteria, the

most commonly used is academic achievement, which has generally been found to have stronger relations with competence than with affect (e.g., Abu-Hilal et al., 2013; Arens et al., 2011; Goetz, Frenzel, Hall, & Pekrun, 2008). For instance, Arens et al. (2011) found that on average the correlations between competence and achievement were twice as strong as those between affect and achievement. Among Middle Eastern students, the differences in the strength of correlations between competence and achievement, and affect and achievement were also pronounced ( $r$ s ranging from .41 to .58 for competence, and  $r$ s ranging from non-significance to .17 for affect in maths and science domains) (Abu-Hilal et al., 2013).

However, when the educational outcomes are course or career aspirations, the pattern of correlations was reversed, with the strength of correlations being higher between affect and outcomes than between competence and outcomes (e.g., Marsh et al., 2013; Nagengast et al., 2011). For example, Marsh et al. (2013) reported that liking maths ( $r$ s ranging from .49 to .70) was more strongly associated with maths course selection in future than perceived competence in maths ( $r$ s from .27 to .49). Likewise, Yeung (2011) observed a similar relational pattern when using effort goal as an external validity criterion. Such results led Yeung to argue that the affect aspect seemed to be related more closely to long-term educational outcomes whereas the competence aspect might be associated more closely with short-term and performance-based outcomes. Hence, the twofold structure of self-concept permits a fine-grained examination of the relations between competence, affect, and various educational results. In this sense, it will be useful to examine the longitudinal relations between each self-concept component and educational outcomes using longitudinal data to verify if both components have stable and reciprocal relations with a particular outcome measure, as the established reciprocal relations between competence and achievement (Marsh & Craven, 2006).

### The current study

To date, there is little research which purposefully tests longitudinal relations between competence and affect in relation to educational outcomes. A recent study by Pinxten et al. (2014) examined competence and affect in relation to achievement and effort expenditure in the domain of maths. With Dutch primary students, Pinxten et al. found that CFAs with separate competence and affect produced a substantially better fit than CFAs conflating them. Across five waves of data, prior perceptions of competence in maths positively predicted subsequent maths achievement but negative affected maths effort expenditure. In contrast, prior liking of maths negatively predicted maths achievement but positively predicted subsequent efforts in maths. The longitudinal modeling between competence, affect, and academic achievement has not been tested with students in China and in secondary school. Therefore, our second aim is to test longitudinal relations with Chinese secondary school students. Moreover, we will focus on general school self-concept, which is representative of a more complete picture of students' learning than just focusing on one school subject.

In summary, our study addressed two research questions: (1) Is the separation of competence and affect of school self-concept supported longitudinally among Chinese secondary school students? (2) What is the longitudinal relationship between competence and affect aspects of school self-concept, and achievement among Chinese secondary students?

## Method

### Participants

The participants were 299 male (47.6%) and 328 female (52.3%) students (one missing gender information) in a Chinese secondary school. Students were in year 7, 8, and 9 for data collection at Time 1 (T1), Time 2 (T2), and Time 3 respectively. At T1 students aged between 13 and 15 years old ( $M = 13.41$ ,  $SD = 1.35$ ). Due to missing data: two students did not participate in T2 data collection (.32%), and 17 did not participate in T3 data collection (2.71%), which accounted for a small percentage of the total data (3.03%), we removed the 19 students. Hence, the final data of 608 students were retained for the analyses.

### Instruments

**SDQII.** We used the four items in the general school domain in the SDQ II (Marsh, 1990a) to measure self-perceptions of *competence* (e.g., I learn things quickly in most school subjects) and four items for self-evaluation of *affect* (e.g., I like going to school). We excluded the two negatively worded items in the original SDQ II because past studies demonstrated that negative items produced negative item bias and reduce the reliability of the scales (Arens et al., 2011; Marsh, 1990b). The items in the questionnaire were translated into simplified Chinese by a two-way translator qualified by the National Accreditation Authority for Translators and Interpreters. The translation was checked against the translation in Hau, Kong, and Marsh's (2003) validation study of the Chinese SDQ II with middle school students in Hong Kong. The reason why we did not use their version was because the mainland China uses simplified Chinese whereas Hong Kong uses traditional Chinese. We compared our translation and theirs and made sure that our translation in simplified Chinese carried the identical meanings of those in the traditional Chinese version. The items were on a 6-point Likert scale, with 1 being "strongly disagree" to 6 being "strongly agree".

**Academic achievement.** Under the consent of the school and the students, students' academic achievement was obtained from the registrar's office using the average scores of the end-of-year written exams, which covered subject areas of Chinese, math, and English, all of which were the compulsory school subjects as stated in the national curricula. The maximum achievable score of the written exam was 100 points. The scores were standardized and used in the analyses. As the academic achievement scores were a single item indicator, the measurement error of scores was fixed with a perfect reliability estimate in the analyses (Marsh & Yeung, 1997).

### Procedure

Data collection followed a stringent consent procedure approved by the ethics committee in the University. Before data collection, the purpose and procedures of study was discussed in the school meetings and the approval of the study from the school management board was obtained. The parents and the students were informed by Participant Information Statement that participation of the research was voluntary. Parental and student consent was obtained before the study was conducted, and they were assured of the confidentiality of the data and the anonymity of their identification. Under the assistance of the school teachers, the questionnaires were administered in the participants' classrooms at the beginning of each year for the three years.

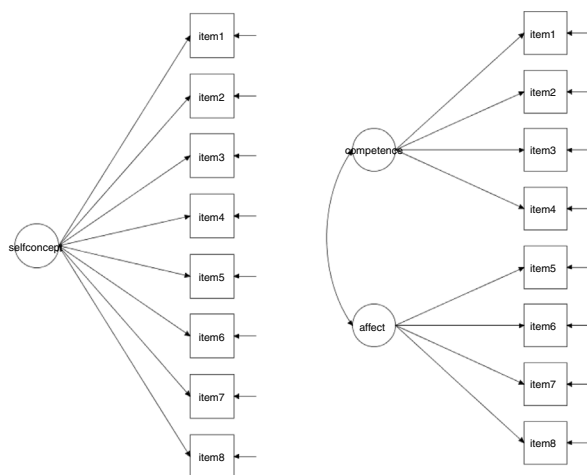


Figure 1. One-factor and two-factor models.

### Data analysis

The data analyses were performed in Mplus 7, which is a powerful statistical program specifically designed for a wide variety of different latent variable models (Geiser, 2012). The analyses consisted of two stages. The first stage involved testing the internal structure of self-concept by confirmatory factor analyses (CFAs) of two sets of models. The first set models (model 1A–1D) were constructed by conflating all the eight items to form a one-factor self-concept for the individual wave and for the three waves together. The second set models (model 2A–2D) were two-factor models, wherein four items represented a *competence* scale and four items indicated an *affect* scale for the individual wave and for the three waves together. The one-factor and two-factor models are conceptually visualized in Figure 1.

In order to evaluate if the retained model was equivalent across the three time waves, we conducted a series of measurement invariance tests (model 3A–3C). The invariance tests involved evaluating three levels of restricted models and proceeded in a stepwise manner from loose to tight. Therefore, the invariance models are nested because the imposed constraints are progressively added. We followed Brown's (2006) recommended procedure for performing the invariance tests by starting from a configural model (3A), which tested whether the factor structures were identical across years. Following the configural model, we tested whether the factor loadings were equal in the metric model (3B). Lastly, we tested the scalar model (3C), in which the intercepts were constrained to be equal. To assess the fit of the nested models for the invariance tests, we used the change of Comparative Fit Index ( $\Delta$ CFI) recommended by Cheung and Rensvold (2012): when the  $\Delta$ CFI is less than or equal to .01, the specified equal constraints are tenable, and when the  $\Delta$ CFI is greater than .01 between two nested models, the more constrained model is rejected. The results of CFAs and invariance tests were used to answer the first research question.

The second stage of analysis examined the longitudinal relations between *competence*, *affect*, and *achievement* using structural equation modeling (SEM) for both the total sample and for boys and girls using multi-group SEM. Before conducting multi-group SEM, we conducted a series of invariance tests based on the grouping variable gender: models 4A–4C were the configural, metric, and scalar invariance tests, which examined whether there were equivalent factor structures, factor loadings, and intercepts between boys and girls respectively. Lastly, we constructed model 5A, which examined the longitudinal relations amongst variables for the total sample; and the multi-group SEM (model 5B), which estimated the longitudinal relations for boys and girls.

We followed the general procedures for conducting and evaluating CFA and SEM (e.g., Kline, 2005; Jöreskog & Sörbom, 2005), and considered primarily the following goodness-of-fit indices: the Tucker–Lewis Index (TLI, Tucker & Lewis, 1973), the Comparative Fit Index (CFI, Bentler, 1990), and the root mean square error of approximation (RMSEA, Browne & Cudeck, 1993). The values of TLI and CFI greater than .90 are generally considered acceptable fit (Bentler, 1990; Hu & Bentler, 1999), and a value of .06 for RMSEA represents a good fit between the hypothesized model and the observed data (Browne & Cudeck, 1993). In addition to fit statistics, three other criteria were also consulted: (1) the item factor loadings for each corresponding scale should be above .30; (2) the correlations among factors should be below .90 in order for the scales to be distinguishable from each other; and (3) the scale should have an acceptable Cronbach's reliability ( $\alpha > .70$ ) (Jöreskog & Sörbom, 2005). Apart from the Cronbach's reliability, we also calculated the Composite Reliability, McDonald's omega, and the Extracted Average Variance.

## Results

### Results of CFAs

The fit statistics of models 1A–1D and 2A–2D are displayed in Table 1, which shows that all the one-factor models (models 1A–1D) did not produce appropriate fit (model 1A:  $\chi^2(20) = 429.92$ , CFI = .70, TLI = .58, RMSEA = .18; model 1B:  $\chi^2(20) = 670.62$ , CFI = .66, TLI = .53, RMSEA = .23; model 1C:  $\chi^2(20) = 636.38$ , CFI = .68, TLI = .55, RMSEA = .23; model 1D:  $\chi^2(225) = 1774.48$ , CFI = .76, TLI = .71, RMSEA = .11). All of the two-factor models with *competence* and *affect* factors forming two separate factors showed good fit (model 2A:  $\chi^2(19) = 52.10$ , CFI = .98, TLI = .96, RMSEA = .05; model 2B:  $\chi^2(19) = 49.91$ , CFI = .98, TLI = .98, RMSEA = .05; model 2C:  $\chi^2(19) = 90.58$ , CFI = .96, TLI = .95, RMSEA = .07; model 2D:  $\chi^2(213) = 377.64$ , CFI = .98, TLI = .97, RMSEA = .04). The CFA results supported a two-factor self-concept of *competence* and *affect* model. The factor correlations between *competence* and *affect* were .35, .39, and .42 for T1 to T3 respectively, suggesting that *competence* and *affect* scales could be clearly distinguished. The reliability (including Cronbach's alpha, the composite reliability, McDonald omega, and the average variance extracted) and the descriptive statistics of the scales from T1 to T3 are displayed in Table 2. The values of Cronbach's alpha of the two scales were all above .80 in the three years. The figures of the composite reliability were also exceeded the required .60. The values of the average variance extracted were also above the acceptable .40 (Fraering & Minor, 2006).

### Results of the invariance tests across time

The results of the invariance tests across time are also displayed in Table 1, which shows that the configural model produced a good fit:  $\chi^2(237) = 680.51$ , CFI = .93, TLI = .92, RMSEA = .06, suggesting the equal factor structure across the time. The metric model also produced an appropriate fit:  $\chi^2(249) = 695.08$ , CFI = .93, TLI = .92, RMSEA = .06, and there was no change of the CFI, suggesting that the factor loadings were equal across the three time waves. A good fit of the scalar model was also attained:  $\chi^2(261) = 796.29$ , CFI = .92, TLI = .91, RMSEA = .06, with  $\Delta$ CFI being .01, supporting the intercept invariance across time.

### Results of the invariance tests across gender

In Table 1, the results of the invariance tests across gender showed that all the three models (models 4A–4C) yielded appropriate fit: model 4A:  $\chi^2(534) = 854.74$ , CFI = .96, TLI = .95, RMSEA = .04; model 4B:  $\chi^2(552) = 887.08$ , CFI = .96, TLI = .95, RMSEA = .05; model

**Table 1**  
Goodness of fit of models

Models		$\chi^2$	df	TLI	CFI	RMSEA
Model 1A	One-factor CFA for T1	429.92	20	.70	.58	.18
Model 1B	One-factor CFA for T2	670.62	20	.66	.53	.23
Model 1C	One-factor CFA for T3	636.38	20	.68	.55	.23
Model 1D	One-factor CFA for T1–T3	1774.48	225	.76	.71	.11
Model 2A	Two-factor CFA for T1	52.10	19	.98	.96	.05
Model 2B	Two-factor CFA for T2	49.91	19	.98	.98	.05
Model 2C	Two-factor CFA for T3	90.58	19	.96	.95	.07
Model 2D	Two-factor CFA for T1–T3	377.64	213	.98	.97	.04
Model 3A	Configural CFA across time	680.51	237	.93	.92	.06
Model 3B	Metric CFA across time	695.08	249	.93	.92	.06
Model 3C	Scalar CFA across time	796.29	261	.92	.91	.06
Model 4A	Configural CFA across gender	854.74	534	.96	.95	.04
Model 4B	Metric CFA across gender	887.08	552	.96	.95	.05
Model 4C	Scalar CFA across gender	906.86	570	.96	.95	.04
Model 5A	SEM for the total sample	455.74	267	.95	.94	.05
Model 5B	Multi-group SEM	887.08	552	.96	.95	.05

**Table 2**  
Descriptive statistics

Variables	M	SD	Cronbach's alpha	Composite reliability	McDonald omega	Average variance extracted
COMP 1	3.25	.61	.79	.74	.80	.44
COMP 2	3.29	.67	.74	.67	.89	.55
COMP 3	3.29	.69	.83	.65	.87	.55
AFF 1	4.06	.66	.76	.68	.81	.47
AFF 2	4.14	.69	.81	.77	.86	.53
AFF 3	4.07	.70	.80	.72	.84	.52

Note. COMP 1-3: competence scales T1 to T3, AFF 1-3: affect scales T1 to T3.

4C:  $\chi^2(570) = 906.86$ , CFI = .96, TLI = .95, RMSEA = .04. The three models produced exactly the same CFIs, which supported the equal factor structures, factor loadings, and the intercepts between boys and girls.

### Results of the SEM

The fit statistics in Table 1 show that model 5A produced good fit:  $\chi^2(267) = 455.74$ , CFI = .95, TLI = .94, RMSEA = .05 for the total sample. The multi-group SEM (model 5B) also yielded appropriate fit:  $\chi^2(552) = 887.08$ , CFI = .96, TLI = .95, RMSEA = .05. The factor correlations of model 5A are displayed in Table 3. The correlations between T1 to T3 competence scales were all positive and moderate ( $r$ s ranging from .46 to .64). Similarly, T1–T3 affect scales were also positively and moderately related to each other ( $r$ s ranging from .41 to .59). The correlations of the achievement scores between the three time waves were also positive: the T2 and T3 achievement scores ( $r = .77$ ,  $p < .01$ ) had much strong association than the one between T1 and T2 ( $r = .55$ ,  $p < .01$ ) and between T1 and T3 ( $r = .41$ ,  $p < .01$ ). In terms of two components of self-concept and achievement, we found that competence and achievement were significantly and positively related for the three years ( $r$ s = .22, .42, and .40 for T1–T3 respectively), whereas the correlations between affect and achievement were only significant for T2 and T3 ( $r$ s = .14 and .26 for T2 and T3 respectively). The z-tests comparing correlations showed that the strength of relations between competence and achievement were consistently stronger than that between affect and achievement for T1 to T3 (T1:  $z = 3.14$ ,  $p < .01$ ; T2:  $z = 4.03$ ,  $p < .01$ ; T3:  $z = 3.88$ ,  $p < .01$ ).

The paths of model 5A are presented in Figure 2, which shows that the prior competence, affect, and achievement all significantly and positively predicted the competence, affect, and achievement a year later (T1–T2 competence:  $\beta = .56$ ,  $p < .01$ ; T2–T3 competence:  $\beta = .45$ ,  $p < .01$ ; T1–T2 affect:  $\beta = .62$ ,  $p < .01$ ; T2–T3 effort:  $\beta = .59$ ,  $p < .01$ ; T1–T2 achievement:  $\beta = .49$ ,  $p < .01$ ; T2–T3 achievement:  $\beta = .82$ ,  $p < .01$ ). Among these paths, the path from T2 to T3

achievement was noticeably stronger than the other paths, suggesting that the students' achievement in the last year of their secondary school were substantially attributable to the previous year's achievement. Between competence and achievement, we found significant and positive paths from prior competence to subsequent achievement only between T1 and T2 (T1 competence to T2 achievement:  $\beta = .26$ ,  $p < .01$ ; T2 competence to T3 competence:  $\beta = .01$ ,  $p = .74$ ). The paths from prior achievement to subsequent competence were positive and significant between both T1 and T2, and T2 and T3 (T1 achievement to T2 competence:  $\beta = .15$ ,  $p < .01$ ; T2 achievement to T3 competence:  $\beta = .14$ ,  $p < .01$ ). None of the paths was significant between affect and achievement (T1 affect to T2 achievement:  $\beta = .03$ ,  $p = .41$ ; T2 affect to T3 competence:  $\beta = .02$ ,  $p = .63$ ; T1 achievement to T2 affect:  $\beta = -.03$ ,  $p = .45$ ; T2 achievement to T3 affect:  $\beta = .04$ ,  $p = .42$ ).

The paths of multi-group SEM showed some different relations between males (Figure 3) and females (Figure 4). While T1 affect to T2 competence was not significant for boys ( $\beta = -.05$ ,  $p = .52$ ), T1 affect significantly predicted T2 competence for girls ( $\beta = .16$ ,  $p < .05$ ). In addition, T2 achievement positively predicted T3 competence for boys ( $\beta = .14$ ,  $p < .05$ ) but not for girls ( $\beta = .11$ ,  $p = .11$ ).

### Discussion

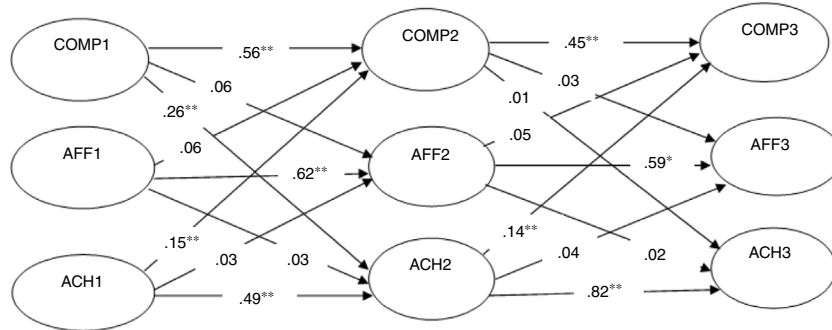
The aim of the current study was to rigorously scrutinize the separation of the competence and affect components of general school self-concept from a longitudinal perspective, and to examine the longitudinal relations of the two components and academic achievement among a less researched population – Chinese secondary school students. The study used data collected from the 3 years of the participants' secondary schooling. To answer research question 1, our CFA results supported the claim that the two aspects of self-concept were clearly separable and such separation was stable across the three waves of time. Using academic achievement as an external criterion, we observed significantly stronger associations between achievement and competence than between affect

**Table 3**  
Factor correlations of model 5A

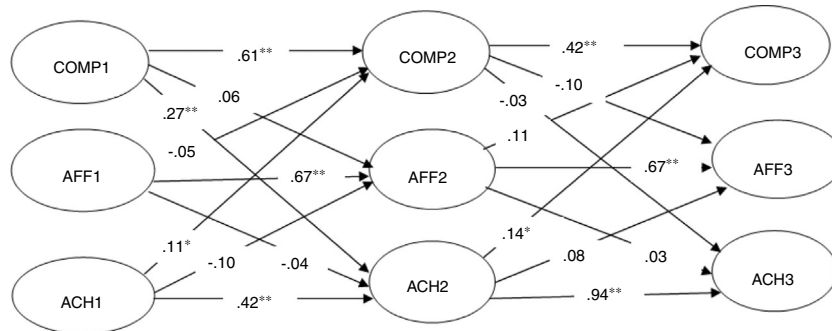
	COMP 1	COMP 2	COMP 3	AFF 1	AFF 2	AFF 3	ACH 1	ACH 2
COMP 1	–							
COMP 2	.54**	–						
COMP 3	.46**	.64**	–					
AFF 1	.36**	.25**	.22**	–				
AFF 2	.26**	.42**	.34**	.51**	–			
AFF 3	.22**	.35**	.53**	.41**	.59**	–		
ACH 1	.22**	.25**	.20**	.08	.04	.05	–	
ACH 2	.34**	.42**	.42**	.17**	.14**	.17**	.55**	–
ACH 3	.27**	.40**	.40**	.13**	.20**	.26**	.41**	.77**

Note. COMP 1-3: competence scales T1 to T3, AFF 1-3: affect scales T1 to T3; ACH 1-3: achievement scores T1 to T3.

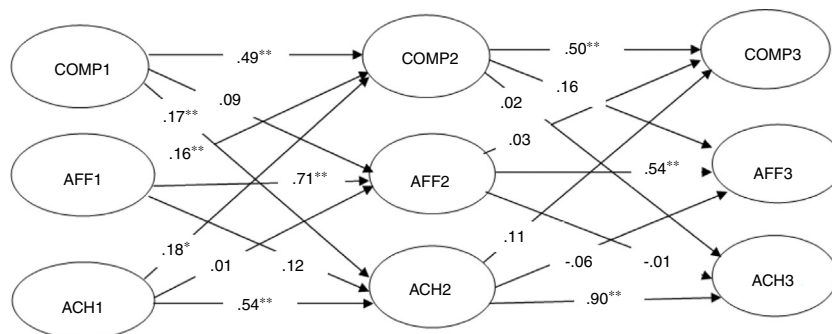
\*\*  $p < .01$ .



**Figure 2.** Paths of model 5A.



**Figure 3.** Paths for boys.



**Figure 4.** Paths for girls.

and competence across the three time points. These results are similar to those found in previous cross-sectional studies conducted with Western and Middle Eastern students (e.g., Abu-Hilal, 2005; Abu-Hilal et al., 2013; Abu-Hilal & Darweesh, 2004; Arens et al., 2011; Marsh et al., 1999; Yeung, 2011). The results of the stronger associations between achievement and competence than between

affect and competence also align with Pinxten et al.'s (2014) study in maths subject.

We found significant and positive correlations between self-concept of competence and affect in the matched years ( $r_s = .36, .42, \text{ and } .53$  for T1–T3 respective), however, the values of the correlation coefficients appeared to be much lower than those found in

previous cross-sectional studies (e.g., Abu-Hilal et al., 2013:  $r_s = .71$  and  $.69$  for maths and science respectively; Arens et al., 2011:  $r_s = .73, .81, .78$  for general school, maths, and German respectively; Yeung, 2011:  $r = .60$  for general school; Yeung et al., 2012:  $r = .77$  for general school); as well as the longitudinal study (Pinxten et al., 2014:  $r_s = .72, .69, .66, .60$  for T1 to T4 respectively). The relatively low association between the competence and affect in our study might be attributable to Chinese educational system and traditional Chinese beliefs. Chinese education is heavily oriented toward examinations which may undermine fostering students' interest in learning, the furious competition among a large population of students for better future opportunities does not favor the development of interest. To successfully win the competition in terms of exam results, the teaching model is ironically described as "duck feeding". Chinese students, who are referred to as "stuffed ducks", are the products of the "duck feeding" model of teaching, which keeps feeding the different kinds of teaching and learning materials and knowledge no matter whether the "ducks" like them or share interests in them (Chiu, Salili, & Hong, 2001). In this sense, the phenomenon that a student performs well in school work does not necessarily mean that the student wants to do, or likes to do. Rather Chinese students may simply feel that their obligations to excel in school work. This could imply that Chinese students' level of genuine interest may not go hand in hand with their sense of competence even when they feel confident about their capabilities to handle studies in schools. However, this interpretation will need to be tested in more studies or to be examined in other academically competitive cultures by separating the competence and affect components of self-concept.

The lower associations between competence and affect might also be influenced by Chinese students' beliefs in the effort and persistence to develop competence (Salili & Hau, 1994; Yeung, Han, & Lee, 2016). Chinese students have long been influenced by the Confucius' teaching and learning doctrine dated back to 500 BC (Lee, 1996; Li, 2003). According to this ideology, Chinese people believe that an individual's ability is much influenced by the effort he/she puts in rather than the nature of an individual and the interests associated with the nature. Competent Chinese students are often students who are good at self-disciplines and who set higher self-evaluation criteria emphasizing effort and commitment. As a result, students' perceptions of competence in school work are not commensurate with their affect toward it.

The results of the longitudinal relations between competence, affect, and achievement did not find consistent reciprocal relations for the total sample. Such inconsistent reciprocal relations were also observed when the male and female students were separated. The reciprocal effects were only supported between competence and achievement between T1 and T2 but not between T2 and T3. There were neither reciprocal effects between affect and achievement from T1 to T2 and from T2 to T3. The lack of reciprocal effects between affect and achievement aligns with the argument that affect does not have much predictive power to performance-oriented educational outcomes, such as exam results; but affects long-term and less tangible educational outcomes, such as learning engagement, future aspirations in study and careers, and students' effort expenditures.

The inconsistent of reciprocal relations between competence and achievement seemed to suggest that such relations may depend on students' development stage. The lack of significant reciprocal relations between competence and achievement occurred in the grade 8 to grade 9 when the students developed from pre-puberty into adolescence. This period is well known as a critical developmental stage when students experience changes in cognitive, psychological, emotional, and social developments of their beliefs, world views, values, and conceptions of the self and others (Alsaker & Olweus, 2002; Hines, 2007). This period may alter

the predictions between competence and academic achievement. Such influence seemed to be more prominent among the girls than the boys. For both boys and girls, students' achievement scores measured in grade 7 positively predicted their self-perceptions of the competence in grade 8. However, such positive predictor was not found between grade 8 and grade 7 among girls. While previous meta-analyses showed not much gender differences in the reciprocal relations (Huang, 2011; Valentine, Dubois, & Cooper, 2004), the majority of the previous studies conflated competence and affect, hence might not be sensitive to detect gender differences (Pinxten et al., 2014; Skaalvik & Valas, 1999). Whether the gender differences obtained in our study was specific to the transition between pre-puberty to adolescence or because of the separation of competence and affect in measuring self-concept needs to be systematically investigated.

#### *Limitations and directions for future studies*

A number of limitations affect the scope and the interpretation of the study and may be addressed in future research. First, as noted above that we speculated that the inconsistent reciprocal relations between competence and achievement might be caused by students' development stage. In order to further testify this speculation, future studies should be conducted with other samples in this period of ages between 13 and 15.

Second, our study only provided the evidence supporting the stability of the structure of self-concept in terms of a distinction between competence and affect in the domain of general school. Future studies should continue to expand this line of research by examining the stability of the structure of self-concept in non-academic domains, such as social self-concept.

Third, our study only used academic achievement, which is regarded as a short-term educational outcome. Future studies may attempt to include long-term educational outcomes (e.g., future career aspirations, and retention of schooling) in a single longitudinal study to test whether competence and affect of general school self-concept have differential predictions to the short- and long-term educational outcomes.

Lastly, as we found differential predictions between boys and girls, in particular, during grade 8 to grade 9, further research should testify if such gender difference is general or specific for this transitional period between pre-puberty to adolescence.

#### *Conclusion*

Using longitudinal data collected across three years, the current study empirically validated the separation of the competence and affect aspects of school self-concept among Chinese secondary students. Based on our results, we recommend that future self-concept research should include both competence and affect aspects in order to obtain more fine-grained relations between different aspects of self-concept and various educational outcomes. Conflating the two aspects of self-concept, or just focusing on the competence aspect as in many previous studies, will limit the practical value of self-concept research in designing self-concept interventions to target either cognitive or affective aspects in order to foster different aspects of educational outcomes.

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