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Reliability and validity of the short Hong Kong Chinese Self-Regulation of Learning Self-Report Scale (SRL-SRS-C)

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Objectives: This study translated and shortened the original English, six-factor, Self-Regulated Learning Self-Report Scale (SRL-SRS). This version was subsequently assessed for its reliability and validity, for use in a Hong Kong Chinese adolescent population. *Design and methods*: The SRL-SRS was translated into Chinese following the back-translation procedure. Exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and test–retest reliability analysis, were conducted on a sample of 314 Hong Kong Chinese adolescents aged 12–17 years (mean age = 13.2 years, SD = .99; male = 155) from one Hong Kong secondary school. Cross-validation was conducted on a second sample of adolescents (n = 477; mean age = 14.92 years; male = 283) from three Hong Kong secondary schools. *Results*: EFA results supported the original six-factor model. Subsequent CFA results supported the short version with sufficient goodness-of-fit statistics (comparative fit index; CFI = 0.93; Tucker–Lewis index (TLI) = 0.92; root square mean error of approximation (RMSEA; 95% CI) = 0.0047 (0.041 – 0.053); SRMR = 0.044). Further support was also found by cross-validation in the second sample (CFI = 0.915; TLI = 0.906; RMSEA = 0.052; SRMR = 0.043). Internal consistency analysis revealed that Cronbach's α ranged from.72 to .89 for all subscales (sample 1); test–retest reliability analysis (sample 1) produced Intra-class Correlation Coefficient (ICC) values ranging from .69 to .80 for all subscales. *Conclusions*: The short SRL-SRS-C is a sufficiently reliable and valid instrument to measure self-regulation of learning in a Chinese adolescent population. In addition, the SRL-SRS-C has demonstrated sufficient content, construct validity, and test–retest reliability.

Keywords: self-regulated learning; reliability; validity; short Chinese self-regulation of learning self-report scale; Chinese adolescents

Self-regulation is a key process in psychological functioning, enabling people to adapt to ever-changing social and physical environments (Schmeichel & Baumeister, 2004). This adaptation occurs through processes that help individuals exert control over thoughts, feelings, and behaviours (Vohs & Baumeister, 2004). From a social cognitive perspective, self-regulation of learning (SRL) refers to those self-regulated processes that give learners the opportunity to transform mental abilities into performance skills (Zimmerman, 2008). Zimmerman's definition of SRL is "the extent to which individuals are metacognitively, motivationally and behaviourally proactive participants in their own learning and developmental processes" (Zimmerman, 1986, p. 308).

Cyclical self-regulatory processes (including planning, self-monitoring, and self-evaluation) have the potential to contribute to positive feelings of competence and self-esteem through

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enhancing an individual's ability (e.g. Jonker, Elferink-Gemser, & Visscher, 2010; Toering, Elferink-Gemser, Jordet, & Visscher, 2009; Zimmerman, 2006). For example, self-regulated individuals recognise an absence in skills and initiate actions to acquire the relevant skills to support their progress (Chen & Singer, 1992). Additionally, learning emerges as a result of reflection on the whole process of goal attainment. This new knowledge is then transformed into new strategies for future task performance (Ertmer & Newby, 1996). Importantly, individuals must believe they are capable of both coping with and achieving task requirements (self-efficacy) to sustain motivation (Bandura, 1997). These self-efficacy beliefs will determine (a) the types of goals that individuals set for themselves, (b) how much effort and persistence they are prepared to invest, and (c) their resilience in the face of failed attempts (Bandura, 1997). Thus, self-regulated individuals act rather than react, showing initiative, perseverance, and adaptability, which all stem from motivational beliefs and favourable metacognitive strategies (Zimmerman, 2006, 2008).

It is not surprising to find that individuals with a tendency to take a more proactive approach to personal learning and development can also apply this to other areas. For example, talented athletes were found to be high self-regulators and high academic achievers (Jonker, Elferink-Gemser, & Visscher, 2009). Learning and SRL are both important for performance improvement, including performance of physical activity (Toering, Elferink-Gemser, Jonker, van Heuvelen, & Visscher, 2012). Indeed, Rosenbaum, Carlson, and Gilmore (2001) suggest that it is difficult to find meaningful differences between those factors affecting the acquisition of intellectual skills and those factors affecting the acquisition of perceptual motor skills. As such, self-regulation is positively related to performance and skill level in various domains, such as sport (e.g. Cleary & Zimmerman 2001; Toering et al., 2009), physical education (e.g. Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012), music performance (e.g. Nielsen, 2001), and academic achievement (e.g. Zimmerman, Moylan, Hudesman, White, & Flugman, 2011). AQ4

SRL could also play an important role in increasing physical activity levels (Matthews & Moran, 2011; Toering et al., 2012; Winters, Petosa, & Charlton, 2003). In this context, individuals must be motivated to improve, and to continue to improve, despite considerable internal (boredom, discomfort, and amotivation) and external (lack of equipment, facilities, and weather) barriers, all of which must be overcome to achieve beneficial health improvements (e.g. Salmon, Owen, Crawford, Bauman, & Sallis, 2003). In China, there is a growing need to counteract the growing rate of obesity related to physical inactivity (Ha, Abbott, Macdonald, & Pang, 2009; Tudor-Locke, Ainsworth, Adair, Du, & Popkin, 2003). There is also a growing necessity for China to develop strategies for improving adolescent physical activity levels, for psychological reasons. For example, Salili, Lai, and Leung (2004) found Hong Kong students to be more anxious than Canadian students. Yet, it is widely accepted that physically active adolescents are less likely to suffer from mental health issues, such as anxiety (Biddle & Asare, 2011).

Cultural considerations AQ3

Student learning and motivation are influenced by cultural beliefs (Holloway et al., 1990), values (Stevenson et al., 1990), and practices (Salili, 1995; Salili, Chiu, & Lai, 2001). Much of the education psychology literature around the world is based on research conducted in Western countries, particularly America (e.g. Lonner, 1990). This also applies to cultural differences in learning and academic achievement across ethnicity (e.g. Steinberg, Dornbusch, & Brown, 1992). However, it is important to consider the social context in the country of origin (Rao, Moely, & Sachs, 2000; Stanley & Okazaki, 1990), as it is understood that important cultural differences can be obscured by research using English language questionnaires with people from different cultures who may share English as a common language (Harzing, 2005). "Cultural

accommodation" occurs when respondents subconsciously adjust their responses to reflect the cultural values associated with the language the questionnaire is presented in (Harzing, 2005).

Currently, the measurement of an individual's general tendency for SRL is only possible with a valid English and Dutch measure (SRL-SRS). While English proficiency is good among many Hong Kong Chinese adolescents, in its current form, the SRL-SRS may not accurately capture SRL among this non-Western culture. For example, cultural differences have been demonstrated by variations in the factor structures of Western body image questionnaires that have been translated for use in non-Western cultures (Swami, 2009; Swami & Chamorro-Premuzic, 2008). AQ5

There is also growing Asian interest in SRL education research (e.g. Law, Chan, & Sachs, 2008; Rao et al., 2000; Sha, Looi, Chen, & Zhang, 2012; Tang & Neber, 2008). Most of these studies have used the *education-specific* Motivated Strategies for Learning Questionnaire – Chinese Version (MSLQ-CV) (Rao et al., 2000; Rotgans & Schmidt, 2008). Therefore, a valid a tool to measure learners' general tendency for SRL, across multiple learning domains (e.g. academic achievement, sport, and music; Toering et al., 2012), would not only benefit education researchers, but also enable much needed research in the Chinese adolescent PA domain. AQ6

Assessment of SRL

The original, English SRL-SRS (Toering et al., 2012) comprises 46 items. Reliability and validity for the original scale were established by two confirmatory factor analyses (CFAs) with 601 and 600 adolescents (aged 11–17 years), respectively. The final six-factor adjusted CFA model demonstrated a good fit ($\chi^2 = 3193.70$, df = 970, CFI = .95, root square mean error of approximation (RMSEA) = .061, RMSEA (90%CI) = [.059, .064]), and factor loadings were all statistically significant. The original SRL-SRS demonstrated Cronbach's α coefficients as follows: planning = .81, self-monitoring = .73, evaluation = .82, reflection = .78, effort = .85, and self-efficacy = .81. Relative and absolute test–retest reliability was satisfactory. All Intraclass Correlation Coefficients (ICCs) varied between .69 and .84, indicating relative temporal stability.

In addition to translating and validating the SRL-SRS, the current study aimed to develop a shorter version. Reynolds and Richmond (1978) noted in child anxiety research, "An omnipresent concern … is the efficiency of the measuring instrument. Keep it as brief as possible to do the job needed". Shorter questionnaires have higher response rates (Edwards et al., 2002). Respondents of longer questionnaires often omit questions and give inconsistent responses, resulting from frustration due to the length of the questionnaire (Stanton, Sinar, Balzer, & Smith, 2002). This frustration may result in transient measurement errors (e.g. Schmidt, Le, & Ilies, 2003). Younger populations may be less likely to respond with their full attention to long questionnaires. Indeed, questionnaires containing around 50 items are considered too long for adolescents (e.g. Myers, MacPherson, McCarthy, & Brown, 2003). Additionally, young adolescents are mostly accessible in school settings, which, particularly in Hong Kong, are notoriously pressed for time (Salili et al., 2004). However, shortened questionnaires must be developed through reliable factor analysis techniques and provide sufficient criterion-related validity (Donnellan, Oswald, Baird, & Lucas, 2006; Tsaousis & Kerpelis, 2004; Stanton et al., 2002). AQ7

Factor structure and item selection

It has been found that factor structures in translated questionnaires have been less applicable in some Asian cultural contexts (Swami, 2009). Therefore, the current study first assessed the factor structure held in the translated version before confirming this with CFA. This analysis was conducted to understand whether the Chinese version of the SRL-SRS would be applicable

in a Chinese youth population. Swami (2009) applied this methodology with the original Socio-cultural Attitudes towards Appearance Questionnaire (SATAQ-3). Similarly, Jackson and Chen (2010) translated the SATAQ-3 into Chinese for use with adolescent boys. The authors argued that establishing the utility of the measure in new cultural contexts would be achieved more effectively by using Exploratory factor analysis (EFA), with subsequent CFA testing. Additionally, EFA factor loadings (Donnellan et al., 2006; Stanton et al., 2002), corrected item-total correlations, and judgmental item qualities (clarity of expression, relevance to the target population, semantic redundancy, and face validity) were examined for item selection (Stanton et al., 2002). These steps were taken to avoid narrow measurement of the construct (Cattell, 1973), or decrease in validity (Kline, 1986), or any potential inability to transfer the instrument across cultures (Boyle, 1991).

Thus, the aim of this study was to examine the factor structure of the translated SRL-SRS and develop and validate a short, Chinese version to serve as a concise, time-efficient measure of SRL. This would enable the study of SRL and its association with performance in a variety of domains (e.g. sport, physical activity, and academic achievement) in an adolescent Hong Kong Chinese population.

Methods

Participants

EFA, CFA (Step 1), and test–retest reliability analyses were conducted with 314 Hong Kong Chinese adolescents aged 12–17 years (mean age = 13.2, SD = .99; male = 155) recruited from one English-medium (lessons taught predominantly in English), government-aided secondary school in Hong Kong. The sample size was decided a priori to meet standards appropriate to factor analysis (i.e. at least 300, Field, 2009). Cross-validation analysis (Step 2) was conducted with an additional sample of 477 Hong Kong Chinese adolescents, aged 11–19 years (mean age 14.92; male = 283), from three English-medium, government-aided secondary schools in Hong Kong.

Recruitment was conducted through PE teachers in existing networks. The principals of each school were approached in writing, and upon receipt of their written consent, parents were contacted and informed of the study. All parents provided written consent, and participants assented prior to questionnaire completion. AQ8

Procedure

Ethical approval was obtained from Hong Kong Baptist University. Participants completed the questionnaires in classroom settings with class teachers present. Teachers were fully informed about the study and prepared for any potential issues surrounding questionnaire completion. Sample 1 participants took 20 minutes to complete the questionnaires and 20 minutes for the test–retest data collection. Sample 2 participants took 10 minutes to complete the questionnaires.

Measure adaptation

The SRL-SRS was translated into Chinese following the back-translation procedure (Guillemin, Bombardier & Beaton, 1993). Three professional, bilingual individuals (physical education, sport psychology, and behaviour modification) individually translated the items from English into Chinese. Translations were assessed for congruency through a committee approach between the three translators and the two authors. Initial linguistic modifications were made; for

example, it was considered that the translated word "task" may not be easily understood by Chinese adolescents and this was changed to "work". Thereafter, the amended Chinese version was translated back into English by a bilingual professor (the second author) and further minor linguistic adjustments were discussed and amended with the original translators.

Data analysis

Step 1 – EFA. EFA was conducted in SPSS (IBM Corp., 2012; version 21.0). Principal component analysis, with varimax rotation, was carried out as it was considered that the six factors (planning, self-monitoring, self-evaluation, self-efficacy, effort, and reflection) were independent (e.g. Toering, Jordet, & Ripegutu, 2013). To determine the number of factors, analysis of a scree plot and eigenvalue > 1.00 were used as criteria (e.g. Stevens, 2002).

Item selection. In order to produce a shorter questionnaire, EFA was used to select appropriate items. Factor loadings below 0.40 would be removed from the analysis (e.g. Martens & Webber, 2002; Toering et al., 2012). Items that loaded strongly onto one factor with relatively low loadings on other factors were considered for inclusion, as well as the examination of corrected item-total correlations, and semantic judgments (Stanton et al., 2002).

Step 2 – CFA (*sample 1*). Initial data entry and data checking were conducted in SPSS (version 21.0). EFA was conducted in SPSS, and both sample CFAs were conducted in R software (R Core Team, 2013). To confirm whether the short version model fitted the observed data, correlation matrices were analysed, and CFA was conducted with maximum likelihood estimation. The metric of each latent variable was determined by fixing the variances to 1.0. All factors were allowed to correlate freely, and standardised values were calculated. Unexplained variances were estimated (theta–delta diagonal). After adjustments had been made to the first sample, the new model was cross-validated with the second sample ($n = 477$).

In line with Toering et al. (2012), this study used multiple criteria. Model fit was assessed with χ^2, CFI (Bentler, 1990), Tucker–Lewis index (TLI); Bentler & Bonett, 1980) criterion > .90 (Byrne, 1998; Hu & Bentler, 1999), RMSEA (Steiger, 1990) criterion < .05 (Joresko & Sorbom, 1993), and SRMR criterion < .08 (Byrne, 1998; Hu & Bentler, 1999). Factor loadings were tested using a significance level of .05, and all loadings were required to be at least .40 (e.g. Martens & Webber, 2002). The modification indices were also examined, where the χ^2 statistic indicated model fit. The internal consistency of the scale was determined by calculating Cronbach's coefficient criterion value of > .70 (Nunnaly, 1978). Corrected item-total (criterion .30–.70; Ferketich, 1991), inter-item (criterion between .30 and .90; Field, 2009, p. 657), and inter-scale correlations (criterion not exceeding .80; Carron, Widmeyer, & Brawley, 1985) were also examined. AQ9 AQ10

Step 3 – Cross-validation CFA (*sample 2*). Cross-validation procedures and related criteria adopted were the same as those described for Step 2 CFA.

Step 4 – Test–retest reliability (*sample 1*). The questionnaire completion was repeated in sample 1. The two-week time interval was considered most feasible for teachers' schedules, and considered long enough to ensure that adolescents could not remember the questionnaire in any great detail (e.g. Goldfield et al., 2011).

Relative test–retest reliability is the extent to which participants, in a repeated measures sample, maintain their rank. This was assessed by conducting one-way random consistency analyses of variance to calculate average measures ICCs of repeated measures. Confidence intervals for all ICCs (95%) were calculated, and ICC values are required to be at least .70 (Litwin, 1995). *Absolute* test–retest reliability, conducted on sample 1, indicates how the scores vary for participants in a sample regardless of rank (Atkinson & Nevill, 1998). This was calculated by measuring the mean difference between both time points and conducting a one-sample *t*-test ($p = .05$) to determine if the difference between measurements was significant.

Results

EFA factor structure and item selection

Step 1 – EFA (*sample 1*) A series of EFAs were conducted to determine whether the factor structure of the Chinese version of the SRL-SRS was similar to that of the original English version (Jackson & Chen, 2010; Swami, 2009), and to select items for the short Chinese version (Donnellan et al., 2006). Values for the Kaiser–Meyer–Olkin statistic and Bartlett's test of sphericity indicated an interpretable factor solution (KMO = .94; Bartlett's test, $p < 001$).

Results of the first EFA showed that eight factors explained most of the variance (see Table 1). The original six-factor structure was clearly evident in the translated version, for example, original items 1, 5, 9, 13, 17, 25, 28, from planning, clustered together in one separate factor. Additionally, all items belonging to the original self-evaluation and reflection subscales emerged in exactly the same structure as the original version. Items that loaded onto any factor lower than .40 were removed (one item: *I double-check to make sure I did it right*). A subsequent EFA revealed that one of the two additional factors comprised only one item (self-monitoring). As this single factor item was disconnected from the rest of the questionnaire, and after checking the item-total correlation and the "if-item deleted" option, it was removed. The other additional factor comprised a combination of items from three of the original SRL-SRS factors. AQ11

Further EFA again produced an 8-factor structure (see Table 1), within which items from the original SRL-SRS 6 factor version clustered together. One of the two additional factors comprised a combination of items from three of the original scale's factors (planning, effort, and self-efficacy). The other additional factor only contained two double-loaded items (see Table 1). The items in the other additional factor were checked for meaning and scale consistency was examined. For example, if planning items 21 "I figure out my goals and what I need to do to accomplish them" and 34 "I ask myself questions about what a problem requires me to do to solve it, before I do it" were deleted, the planning scale ($\alpha = .86$) would still have a reliability of .86. Table 1 shows all 32 items (in bold), their factor loadings, and explained variance of selected items in each factor.

Confirmatory factor analysis

Missing data. The amount of missing data was 5.1% in sample 1 and 2.1% in sample 2. These data were replaced using missing values with maximum likelihood estimation, which takes all subscales into consideration when replacing missing values (Acock, 2005). Normal distributions were not violated.

Step 2 – CFA (*sample 1*). CFA was conducted on the selected 32 items. Goodness-of-fit indices for CFA sample 1 are $\chi^2 = 4660.370$; df = 496; CFI = 0.93; TLI = 0.92; RMSEA = 0.0047; RMSEA (95% CI) = 0.041 – 0.053; and SRMR = 0.044. See Table 2 for the standardised factor loadings for CFA sample 1, which were all positive and significant ($p < .05$). Cronbach' α coefficients for sample 1 were all above the criterion of .70 and ranged from.72 to .89 (planning = .86, self-monitoring = .72, effort = .83, self-efficacy = .77, self-evaluation = .89, and reflection = .79).

Corrected item-total correlations within each scale were all positive: planning .52–.66; self-monitoring .48–.52; effort .60–.65; self-efficacy .51–.60; self-evaluation .62–.75; and reflection .59–.65. The ranges of inter-item correlations, for each subscale, are as follows: planning .29–.56; self-monitoring .39–.45; effort .43–.53; self-efficacy .35–.49; self-evaluation .37–.65; and reflection .41–.56. Inter-scale correlations (for both samples) are presented in Table 3.

Step 3 – Cross-validation CFA (*sample 2*). Goodness-of-fit indices for CFA cross-validation sample are $\chi^2 = 7202.115$; df = 449; CFI = 0.92; TLI = 0.91; RMSEA = 0.052; RMSEA (95% CI) = 0.048 – 0.056; and SRMR = 0.043. Standardised factor loadings were all positive and significant ($p < .05$), and ranged from .61 to .81. Cronbach' α coefficients, for all six subscales, were

Table 1. Final EFA factor loadings (sample 1) for 46 translated SRL-SRS items (32 selected items in bold).

Original Items (ordered according to subscale)	Factor 1: (Self-evaluation) ($R^2 = 27.8\%$)	Factor 2: (Planning) ($R^2 = 12.3\%$)	Factor 3:	Factor 4: (Reflection) ($R^2 = 13.8\%$)	Factor 5: (Self-efficacy) ($R^2 = 5.1\%$)	Factor 6: (Effort) ($R^2 = 7.7\%$)	Factor 7: (Self-monitoring) ($R^2 = 3.5\%$)	Factor 8:
1		**.563**						
5		**.485**						
9		**.512**						
13		**.484**						
17		**.472**	(.413)					
21			.522					.418
24		**.481**						
27		**.512**						
34			.533					
2		(.432)					**.594**	
6							**.616**	
10							**.669**	
18		.465						
3		(.475)				**.511**		
7						**.721**		
11						**.595**		
15						**.487**		
22						**.463**		
25			.461			.413		
29								
31			.604					
4					**.619**			
8		.714						
12		.554						
16			(.496)		**.420**			
20								
23					**.678**			
26			.426					
28					**.537**			
30		.532						
33		.404	.510					

(*Continued*)

Table 1. Continued.

Original Items (ordered according to subscale)	Factor 1: (Self-evaluation) ($R^2 = 27.8\%$)	Factor 2: (Planning) ($R^2 = 12.3\%$)	Factor 3:	Factor 4: (Reflection) ($R^2 = 13.8\%$)	Factor 5: (Self-efficacy) ($R^2 = 5.1\%$)	Factor 6: (Effort) ($R^2 = 7.7\%$)	Factor 7: (Self-monitoring) ($R^2 = 3.5\%$)	Factor 8:
34	**.549**							(.493)
35	**.698**							
36 *I*	**.722**							
37	**.637**							
38	**.642**							
39	**.692**							
40	**.628**							
41	**.704**							
42				**.735**				
43				**.766**				
44				**.793**				
45				**.723**				
46				**.697**				

Note: Factor loadings below .40 were excluded from the analyses.

Table 2. Factor loadings and explained variance (R^2) of items after first CFA for sample 1.

Item		Planning ($R^2 = 21\%$)	Self-monitoring ($R^2 = 3.9\%$)	Effort ($R^2 = 12.2\%$)	Self-efficacy ($R^2 = 7\%$)	Self-evaluation ($R^2 = 33.7\%$)	Reflection ($R^2 = 10.8\%$)	R^2
1	*I determine how to solve a problem before I begin*	0.578						0.33
2	*I carefully plan my course of action to solve a problem*	0.658						0.43
3	*I think through in my mind the steps of a plan I have to follow*	0.622						0.39
4	*I ask myself questions about what a problem requires me to do to solve it, before I do it.*	0.652						0.43
5	*I imagine the parts of a problem I still have to complete*	0.652						0.43
6	*I clearly plan my course of action to solve a problem*	0.698						0.49
7	*I develop a plan for the solution of a problem*	0.722						0.52
8	*I check how well I am doing when I solve a task*		0.667					0.44
9	*I check my work while doing it.*		0.652					0.43
10	*I check my accuracy as I progress through a task*		0.641					0.41
11	*I keep working even on difficult tasks*			0.722				0.52
12	*I put forth my best effort when performing tasks*			0.650				0.42
13	*I concentrate fully when I do a task.*			0.670				0.45
14	*I do not give up even if the task is hard*			0.735				0.54
15	*I work as hard as possible on all tasks*			0.714				0.51
16	*If I persist on a task, I will eventually succeed*				0.599			0.36
17	*If I am in a bind, I can usually think of something to do*				0.654			0.43
18	*I always manage to solve difficult problems if I try hard enough*				0.661			0.44
19	*I can solve most problems if I invest the necessary effort*				0.732			0.54
20	*I look back and check if what I did was right*					0.685		0.47
21	*I make sure I complete each step*					0.696		0.48
22	*I double-check to make sure I did it right*					0.720		0.52
23	*I check to see if my calculations are correct*					0.680		0.46
24	*I stop and rethink a step I have already done*					0.760		0.58

(*Continued*)

Table 2. Continued.

Item		Planning ($R^2 = 21\%$)	Self-monitoring ($R^2 = 3.9\%$)	Effort ($R^2 = 12.2\%$)	Self-efficacy ($R^2 = 7\%$)	Self-evaluation ($R^2 = 33.7\%$)	Reflection ($R^2 = 10.8\%$)	R^2
25	*I look back to see if I did the correct procedures*					0.794		0.63
26	*I look back at the problem to see if my answer makes sense*					0.669		0.45
27	*I check my work all the way through the problem*					0.802		0.64
28	*I think about my past experiences to understand new ideas*						0.651	0.42
29	*I reappraise my experiences so I can learn from them*						0.741	0.55
30	*I try to think about how I can do things better next time*						0.695	0.48
31	*I think about my actions to see whether I can improve them*						0.672	0.45
32	*I try to think about my strengths and weaknesses*						0.528	0.23

Table 3. Inter-scale correlation matrix for CFA sample 1 and CFA sample 2.

	Planning Sample 1/Sample 2	Self-monitoring Sample 1/Sample 2	Effort Sample 1/Sample 2	Self-Efficacy Sample 1/Sample 2	Self-Evaluation Sample 1/Sample 2	Reflection Sample 1/Sample 2
Planning	1					
Self-monitoring	.618** /.703**	1				
Effort	.694** /.591**	.548** /.516**	1			
Self-efficacy	.671** /.689**	.518** /.528**	.664** /.601**	1		
Self-Evaluation	.687** /.671**	.573** /.615**	.622** /.520**	.550** /.528**	1	
Reflection	.366** /.331**	.207** /.299**	.372** /.368**	.285** /.293**	.363** /.403**	1

Note: Correlations are significant at the .01 level (2-tailed).

Table 4. ICC and absolute test–retest statistics, for sample 1, for the short SRL-SRS-C.

	ICC Sample 1	95% CI for ICC Sample 1	Mean T1 (SD)	Mean T2 (SD)	Mean diff M10T1−M10T2	Significance of one-sampled *t*-test (.05) M1	SE of T1−T2 M3	95% CI for T1 – T2 M1
Planning	.82	.77–.86	2.44(.52)	2.43(.52)	.01	.74	.02	−.04 to .05
Self-monitoring	.69	.74–.83	2.32(.55)	2.34(.58)	−.05	.12	.03	−.11 to .01
Effort	.79	.68–.8	2.51(.55)	2.58(.55)	.07	.01	.03	.02 to .12
Self-efficacy	.69	.61–.75	2.48(.55)	2. 47(.54)	−.01	.81	.03	−.07 to .05
Self-evaluation	.8	.75–.84	3.27(.67)	3.23(.64)	.03	.39	.03	−.03 to .09
Reflection	.73	.66–.78	3.63(.62)	3.55(.57)	.08	.01	.03	.02 to .14

higher than the required .70 and ranged from .72 to .89 (planning = .84, self-monitoring = .68, effort = .80, self-efficacy = .75, self-evaluation = .89, and reflection = .84).

Corrected inter-item correlations within each scale were as follows: planning .59–.65; self-monitoring .51–.59; effort .59–.70; self-efficacy .55–.60; self-evaluation .60–.75; and reflection .55–.64. The range of inter-item correlations, for each subscale, was as follows: planning .34–.55; self-monitoring .40–.49; effort .44–.61; self-efficacy .39–.52; self-evaluation .40–.64; and reflection .30–.54. Table 3 presents inter-scale correlations (for both samples), which were all positive.

Step 4 – Test–retest reliability (*sample 1*). Relative test–retest analysis (see Table 4) demonstrated that ICCs varied from .69 to .8. This indicates that all subscales achieved sufficient temporal stability, apart from self-monitoring (.69) and self-efficacy (.69), which were slightly below the .70 criterion. Absolute test–retest reliability analysis revealed that mean differences for subscales were non-significant, except for effort ($p < .05$) and reflection ($p < .05$). This means that sufficient absolute temporal stability was demonstrated for all subscales, except for effort and reflection, although mean differences were small (.01 and .08).

Discussion

This study translated the English SRL-SRS questionnaire into Chinese. To address any potential cross-cultural issues of English to Asian language questionnaires (e.g. Jackson & Chen, 2010), EFA was conducted to assess the factor structure of the Chinese version. Internal consistency measures and judgmental item quality assessments were made to select items for the shorter version. As a result, the original SRL-SRS six-factor structure was kept by selecting items that had acceptable factor loadings, and clustered together just as they appear in the original SRL-SRS. In total, fourteen items were removed, and subsequent CFAs confirmed that the selected 32 items produced an acceptably reliable instrument with which to measure a general tendency for self-regulated learning among Hong Kong Chinese adolescents. Furthermore, relative and absolute test–retest reliability analyses revealed that the short SRL-SRS-C was sufficiently stable over time.

However, this does suggest that the full 46-item translated version is not as structurally sound as the original version. This is due to two additional factors that emerged in the Chinese version. Despite these two additional factors, and in accordance with Zimmerman's theory (1986, 2006), closer inspection did not raise any concerns that new and distinct subscales of SRL had emerged. The self-evaluation and reflection factors had emerged in exactly the same structure as in the original version, suggesting that these items were effectively translated and well understood. However, five of the items that were not selected for the short version emerged in the planning subscale of the new measure (1 self-monitoring, 1 effort, and 4 self-efficacy), along with another five items in factor 3 (2 planning, 1 effort, and 2 self-efficacy items). It appears that, for Chinese adolescents, the motivational components (effort and self-efficacy) correlate higher with planning than was the case in the Dutch sample. This may be due to cultural differences in motivational components. For example, despite similar strategy use between Australian and Japanese students (Purdie, Hattie, and Douglas 1996), the Japanese notion of persistence and effort in relation to studying is for the benefit of the group, whereas, generally for Westerners, the effort is for personal gain. Furthermore, Rotgans and Schmidt (2008) found that although students from culturally different backgrounds (Chinese, Malay, and Indian) did not differ significantly in their use of self-regulated learning strategies, differences in latent mean values suggested minor cultural variations in motivational beliefs.

It is also possible that translation problems occurred despite the systematic back-translation method. According to Phillips (1960), achieving conceptual equivalence is a common AQ12

but unsolvable problem as every word carries a set of assumptions, values, and feelings unique to each individual and his or her culture. Despite these issues, sufficient items clustered together under the six factors and were subsequently confirmed with CFAs, in two separate samples.

All items in the short SRL-SRS-C represent important aspects of self-regulatory processes, which contribute to the achievement of personal potential (Toering et al., 2012). According to Zimmerman (1986, p. 308), the metacognitive component refers to the continuous cycle of planning, self-monitoring, and self-reflection related to the development process. The importance of metacognition, in the learning process, dates back to Socrates' questioning methods, and Dewey (1933) suggested that we learn more from reflection than the experience itself. The motivational component in SRL relates to the level of autonomy, self-efficacy, and effort, which are required during learning or development of any kind (Bandura, 1997). Therefore, the confirmation of the SRL-SRS-C points to the existence of self-directed processes and self-beliefs among Chinese adolescents.

Toering et al. (2011) assessed behavioural correlates of SRL and discovered that self-regulated adolescents (elite youth soccer players) optimised opportunities for learning, were more focused and prepared for training, took more responsibility and initiative, and were aware of their abilities and inabilities. Considering this amongst adolescents in any learning domain, good self-regulators will pay attention to instructions and process information effectively. They will assess their strengths and deficiencies in skills or strategies, and create opportunities and productive environments to facilitate learning. Additionally, regardless of domain, good self-regulators will relate new knowledge to existing knowledge and act accordingly, while maintaining the belief that they are capable of learning, developing, and achieving their learning goals.

Content validity of the short SRL-SRS-C is supported as it is based on Zimmerman's theory, which also supports the original SRL-SRS (Toering et al., 2012). Four out of six subscales of the original SRL-SRS were adapted from English questionnaires that were also developed in line with this theory (e.g. Herl et al., 1999; Hong & O'Neil, 2001). Furthermore, as in Toering et al. (2012), the CFA results are acceptable, and the content validity is further strengthened by demonstrating stability across two samples. Construct validity of the short SRL-SRS-C was supported because the theory-based model fitted the data acceptably in two samples, as in Toering et al. (2012). All subscales were significantly correlated, demonstrating their associations with the overall SRL construct (Zimmerman, 1989, 2006). Although the planning subscale demonstrated higher correlations with self-monitoring, effort, self-efficacy, and self-evaluation, none of the inter-scale correlations exceeded .80 (Carron et al., 1985). Planning was also highly correlated with self-monitoring and evaluation, in the original SRL-SRS, because these subscales represent the three associated phases of SRL (Cleary & Zimmerman, 2001; Zimmerman, 2006, 2008). In the same way, the Chinese SRL-SRS results support the construct validity of the model. Additionally, the SRL-SRS-C was sufficiently stable over time with only self-monitoring and self-efficacy being just below the criterion, although there is no consensus for what constitutes a good ICC (Weir, 2005).

The cross-sectional nature of this study limits the findings. Additionally, the short SRL-SRS-C is only applicable to an adolescent population; therefore, extending these findings into younger or older populations would require further research. The SRL-SRS-C can also only be applied in a Hong Kong Chinese population as the cultural context in any other part of China is different. Additionally, this validation study has not evaluated the selected items with external criteria, such as other related questionnaires which may limit its external validity.

Toering et al. (2012) pointed out that the behavioural correlates of SRL may be different in academic situations compared to sport or physical activity. Considering this, behavioural correlates of SRL may also turn out to be different in Chinese populations compared to Western

samples, as the differences in the full Chinese version of the SRL-SRS may indicate. As such, future research should consider developing local, domain-specific instruments (such as the soccer-specific instrument, Toering et al., 2013), to measure behavioural correlates of SRL; it may then be possible to ascertain whether SRL can predict certain behaviours. It may also be important to create a locally developed SRL questionnaire rather than reliance on translated Western questionnaires (Swami, 2009). Additionally, it is important to note that researchers have recommended that self-regulation should be taught explicitly (e.g. Chen & Singer, 1992). As such, future research should consider experimental research with SRL skill training to assess the impact on various behaviours, for example, increasing physical activity levels.

In conclusion, the short SRL-SRS-C is a sufficiently reliable instrument to measure SRL in an adolescent Hong Kong Chinese population. The short SRL-SRS-C has demonstrated sufficient content and construct validity and stability over time. Recommended use of the short SRL-SRS-C should include experimental research to assess the impact of training SRL skills to improve performance and health behaviours.

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