MEASURING PERCEIVED PARENTAL SACRIFICE AMONG ADOLESCENTS IN HONG KONG: CONFIRMATORY FACTOR ANALYSES OF THE CHINESE PARENTAL SACRIFICE SCALE

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ABSTRACT

Based on a sample of 373 Chinese adolescents in Hong Kong, the dimensionality of the 23-item Chinese Parental Sacrifice Scale and measurement invariance across perceived paternal and maternal attributes from the perception of adolescents were examined. Confirmatory factor analysis provided support for the hypothesized dimensions of the measure (striving for family resources, time spent on children's education, restructuring of daily routine, sacrifice of lifestyles and aspirations, shielding of worries). Results also showed that the related measures of adolescents' perceived parental sacrifice were equivalent in terms of model structure, factor loadings, intercepts of measured variable and factor variance-covariance across the paternal and maternal versions. Hence, the Chinese Parental Sacrifice Scale can be regarded as an objective measure assessing perceived parental sacrifice with high factorial validity and measurement equivalence that can be used by family practitioners working with Chinese adolescents.

Keywords: parental sacrifice, children's education, Chinese, confirmatory factor analysis, measurement equivalence

INTRODUCTION

Education has been regarded as a vehicle to attain individual success and upward social mobility of children and adolescents in the future (Bryant 1995; Chao and Sue 1996). It plays an important role on the cultivation of "chun-tzu" (man of virtue or noble character; Ho 1995) in the Chinese culture. No one will doubt the importance of family in contributing to children's education. Family theorists have sketched different facets of parental contributions to child's education and development, including models on family investment (Conger and Donnellan 2007), parental involvement (Epstein 1987, 1992; Grolnick et al. 1997) and family capital (Coleman 1988, 1990). Among the parental contributions to children's education and development, parental sacrifice is one of the distinctive features in family socialization, especially in the Chinese communities (Chao 1994). Lam (2005) commented that the Chinese understanding of parenthood is "associated with the notion of 'responsibility for children' and 'making sacrifice for the benefit of children'" (p. 118).

Although parental sacrifice is a distinctive feature of Chinese family socialization, it was grossly ignored in the academic literature. Using the search term "parental sacrifice" to conduct an advanced search of PsycINFO, Social Work Abstracts, Sociological Abstracts and ERIC in January 2015 for the period 1980 to 2014, there were only 126, 0, 38, and 5 publications. The results further reduced to 20, 0, 4, 1 respectively when "parental sacrifice" and "Chinese" were used as the search terms.

Besides the severe lack of studies pertinent to parental sacrifice, there are other observations from the literature review. First, many studies on parental sacrifice were

qualitative in nature (Dreby and Stutz 2012; Gofen 2009; Weiling 2003), while quantitative research is severely lacked. Second, a majority of studies that explored parental sacrifice focused mainly on migrant families (Chao and Kaeochinda 2010; Fuligni and Yoshikawa 2003; Shen et al. 2014). Exploration of parental sacrifice as a family attribute of Chinese families in the general population was neglected.

Third, research related to parental sacrifice mainly focused on the perspectives from the parents (Schlee et al. 2009; Weiling 2003) without taking the perspective of adolescents into account. Previous studies suggested that parents and adolescents may have different perspectives in family socialization and parent-child relationship (Leung and Shek 2014; Steinberg 2001), and parents may not truly reflect adolescents' experience and feelings accurately (Ben-Arieh 2008). Nevertheless, the importance of children's and adolescents' experiences has been highlighted in recent childhood research (Elstad and Stefanen 2014; Gofen 2009). Adolescents may perform the role of "acute observers" (Casas 2011) and "receivers" of parenting (Elstad and Stefanen 2014) which provides a critical perspective on understanding adolescents' subjective family experience and predicting their well-being. Hence, a tool that can accurately assess adolescents' perceptions of parental sacrifice is essential.

Fourth, there was a severe lack of validated measurement tools assessing parental sacrifice. Apart from the Chinese Parental Sacrifice Scale discussed in this paper, Chao and Kaeochinda (2010) developed a six-item measurement tool to assess parental sacrifice of Chinese migrants of the United States. Two factors, including sacrifice and hard work of parents in providing a better life for their children, as well as children's gratitude and recognition to their parents' sacrifice, were identified. However, as the scale was deliberately designed to measure parental sacrifice of

Chinese immigrants who had migration experience, the measurement tool was not suitable for Chinese in their native places. Furthermore, the attribute of parental sacrifice was viewed as a component of parental support rather than regarding the attribute as an independent construct with its unique dimensions. In addition, there are few items in the scale and the dimensionality of the scale was not assessed by confirmatory factor analyses.

Last but not least, many studies on parental sacrifice did not address role difference in parent gender (i.e., many studies did not differentiate between paternal and maternal sacrifice, Chao and Kaeochinda 2010; Fuligni and Yoshikawa 2003). In fact, there was empirical evidence showing that fathers and mothers do have differences in socialization practice (Lewis and Lamb 2003; McKinney and Renk 2008). The sex-role theory (Bem 1974) proposed that gender determines the differentiated roles in the family, with masculinity and femininity associated with instrumentality and expressiveness, respectively (Spence 1993). Typically, fathers are expected to fulfil the instrumental functions in the family, such as earning income for the family and disciplining the children, whereas mothers perform the expressive functions, such as taking care of the children and sharing their emotions (Russell et al. 1998). It is especially important in the Chinese families as role differentiation is salient based on the role theory in the cultural perspectives (Hosley and Montemayor 1997; Leung and Shek 2012). As the bread-winners of the family, fathers are responsible for mobilizing resources for the family and child development, whereas mothers are involved in family management and taking care of the children. The Chinese maxim of "*nan zhu wai, nu zhu nei*" (men manage things outside the family; women manage things inside) truly reflects gender role difference in the family. The difference in gender roles may result in difference in parental contributions to the

family and child development. As far as assessment of parental sacrifice is concerned, it is essential to understand whether the dimensions of paternal and maternal sacrifice are isomorphic. Psychometrically speaking, it raises the question of whether there is evidence of equivalence of paternal sacrifice and maternal sacrifice in terms of factor structure, factor loadings, intercepts of measured variable and factor variance-covariance.

Methodologically, there are few studies examining family measures in the Chinese contexts (Shek 2010). In particular, no study has been conducted using confirmatory factor analyses to examine the factor structure and measurement invariance of parental sacrifice. As suggested by Hair et al. (2010), confirmatory factor analysis suggests "how well our theoretical specification of the factors matches reality (the actual data)" (p. 693). This is particularly essential for parental sacrifice, as the conceptualization of the construct was under-developed.

Parental sacrifice is a process whereby parents surrender their personal needs to the needs of their children. The process involves three steps. First, children's education and development require parents to mobilize different family resources (money, time, effort etc.). Second, due to limitation of resources, parents face the struggle in resource mobilization and distribution in order to meet the diverse needs of the family, including the needs of their children. Lastly, parents prioritize the needs of children over their own personal needs, and thus there is a trade-off of resources for child's education and development over their personal fulfilment (Leung and Shek 2011a).

In order to conceptualize the family attribute of "parental sacrifice", a survey of literature on the theories and models of parental contributions and distribution of family resources to children's education and development is in order. Based on the

family capital theory, family capital is “the ensemble of means, strategies, and the resources embodied in the family’s way of life that influences the future of their children” (Gofen 2009, p. 115). It is further categorized into physical resources that facilitate children’s learning, human resources that create a cognitive environment for their children, and the family and social networks that bring their children with the resources (Coleman 1988, 1990).

Family investment model identifies four types of family resources that influences the children’s physical, cognitive and psychological development, namely availability of learning materials, parent’s stimulation of learning, family’s standard of living such as food, housing, and residing location that promote children’s development (Conger and Donnellan 2007). van Horn et al. (2001) further classified family resources into three components: adequacy of basic needs, money, and time. Broadly speaking, there are two categories of family resources: the home environment that provides a stimulating learning environment for children, and parental involvement in child’s schooling and activities. Home environment is the physical and cognitive environment for children and adolescents to develop, which includes physical environment, learning materials, modeling, instructional activities, regulatory activities, variety of experience, acceptance and responsiveness (Bradley and Corwyn 2006).

Regarding parental involvement on children’s schooling and activities, Grolnick et al. (1997) suggested three essential components: school involvement (e.g. involving in school events, talking to teacher before and after school), cognitive involvement that facilitates the children to be involved in cognitive stimulating activities (e.g. going to library), and parental acquaintance of the child’s experience in school.

Parental sacrifice shares some similarities with family capital, parental investment and parental involvement that it is related to the contributions of parents to

their children's welfare and development. However, unlike family capital, parental investment and parental involvement that underscore the direct contributions of parents to their children, parental sacrifice focuses on the surrender of parents' desires for the sake of their children's benefits. The former highlights what is "given out" to the children, whereas the latter emphasizes on what is "given up" by parents. For instance, poor parents may provide limited investment for their children's development due to scarce resources, but they may have made many sacrifices for the investment.

Besides, parental sacrifice contains strong cultural characteristics rooted in Chinese familism (Chao and Kaeochinda 2010; Lam 2005). Under Chinese familism where the ideal of collectivism and interdependent relationship is stressed (Chao and Tseng 2002), family members are expected to subordinate their personal interests and goals to the glory and welfare of the family as a whole (Yeh and Yang 1997). Hence, parents are obliged to nurture their children and invest for their children's development, even though they have to surrender their own personal needs and interests. Based on Confucian ideologies, the cardinal rule is that parents must devote their love, care and guidance to their children out of benevolence, and reciprocally children should obey and respect their parents out of filial piety (Yeh & Yang, 1997). The perception of parental sacrifice by adolescents is in fact critical, as Chinese adolescents are filially obliged and motivate for achievement in order to show their gratitude toward their parental sacrifice (Fuligni and Yoshikawa 2003). Hence, perceived parental sacrifice forms one of the bases for the formation of filial piety (Yeh and Bedford 2003). The indigenous Chinese parental sacrifice makes family investment to be more sentimental and less calculating (Lau 1981).

Based on a literature review on family investment (Conger and Donnellan 2007),

family capital (Coleman 1988, 1990), parental involvement in children's education (Epstein 1992; Grolnick et al. 1997), as well as a qualitative study of focus group interviews with the Chinese parents and adolescents in the community (Leung and Shek 2011a), five dimensions of parental sacrifice (striving for financial resources, time spent on children's education, reorganization of daily routine, sacrifice of lifestyles and aspiration, and shielding of worries) were identified from the integrated scientific literature which has guided the development of the indigenous Chinese Parental Sacrifice Scale (Leung and Shek 2011a). Previous validation studies showed that the scale was valid and reliable (Leung and Shek 2011b). In the previous study, three factors based on exploratory factor analysis were extracted from the adolescent sample: financial striving for financial resources, time spent on children's education, and changes of the daily routines and lifestyles (a combination of reorganization of daily routine, sacrifice of lifestyles and aspiration, and shielding of worries).

There are four reasons why it is essential to examine the dimensionality of a measurement tool that assesses parental sacrifice for child's education through confirmatory factor analysis. First, as the concepts and related theories of parental sacrifice are under-developed, the measurement tool would help to develop research that contributes to its theorization and conceptualisation. Second, as suggested by Bornstein and Cheah (2006), culture plays a critical role in shaping the ecology of parenting and childhood. Hence, the study of parental sacrifice helps us understand the family process on how Chinese parents nurture their children, which may be different from the Western world. There is always an urge on the development of indigenous Chinese family models that assess the family quality of life in the Chinese communities (Shek 2006; Yang 1999). Third, it is interesting to examine both paternal and maternal sacrifice as two separate attributes, and assess whether the dimensions

are similar with reference to paternal as well as maternal sacrifice. The results will give insights on the generalizability of dimensions of a measure that assesses parental sacrifice across parent gender, as well as the gender role difference of parental sacrifice in the Chinese contexts. Last but not least, perceived parental sacrifice has been identified as a predictor of adolescent achievement motivation, especially in the contexts of adversity (Fuligni and Yoshikawa 2003; Leung and Shek 2013a, b). Thus, it is essential to validate a measurement tool that can assess different dimensions of parental sacrifice in the contexts of adversity which can help to develop Chinese models of family resilience.

Methodologically, there is an advantage in examining factor structure of the measurement by performing confirmatory factor analysis (CFA) as it offers a more stringent method to study the factor structure of the scale such as the generation of goodness-of-fit statistics when comparing alternative models (Kline 1994). Furthermore, given the generality of the concept of sacrifice, it is important to ask whether the measurement of sacrifice is equivalent in fathers and mothers (Millsap and Kwok 2004; Schwartz et al. 2009; Vandenberg and Lance 2000). In fact, social scientists have used measurement invariance tests to examine measurement equivalence of a scale across adolescents' perceived paternal and maternal perspectives (Finley et al. 2008; Schwartz et al. 2009; Yap et al. 2014). Finley, Mira and Schwartz (2008) used measurement invariance tests to compare the factor structures and means of parental involvement as perceived by young adult children. Schwartz et al. (2009) also performed measurement invariance tests to examine whether the factor structures of fathering and mothering were isomorphic, and whether their factor loadings were equivalent. Yap et al. (2014) performed similar studies to assess measurement invariance and latent mean differences of the

Father/Mother Involvement Scale across adolescents' perceived paternal and maternal involvement. Hence, it would be conceptually and methodologically interesting to test whether paternal and maternal sacrifice are equivalent in configural, factor loadings, intercepts of measured variable and factor variance-covariance (Meredith 1993).

Against this background, there were two objectives in this study. First, the factor structure of the Chinese Parental Sacrifice Scale was tested via confirmatory factor analysis based on the responses of the Chinese adolescents in Hong Kong. It was hypothesized that if the scale conforms to the proposed conceptual model, the related factor model would yield the best fit. Second, equivalence of this measure across perceived paternal and maternal responses in terms of configural, factor loadings, intercepts of measured variable and factor variance-covariance was examined among a sample of Chinese adolescents.

METHODS

Participants and Procedure

A cross-sectional survey with convenience sampling was conducted. The students studying in Secondary 1 to Secondary 3 (Grade 7 to Grade 9) in two secondary schools in Hong Kong were invited to participate in the study. There were 373 students participating in the study, with 65 students from Secondary 1 (Grade 7), 90 from Secondary 2 (Grade 8) and 218 from Secondary 3 (Grade 9). There were 216 boys (57.9%), 153 girls (41.05%) (4 did not respond). The mean age was 14.0 years (SD=1).

During data collection, the purpose of the study was described to students and confidentiality of the data was repeatedly emphasized to all students in attendance on the day of testing. The students were asked to indicate their wish if they did not want

to participate in the study. The schools acted in a “loco parentis” manner (Freedman et al. 1993; Tigges 2003) to conduct the study. Those students voluntarily participated in the study and responded to the Adolescent Questionnaire which contained both measurements of paternal and maternal sacrifice in a self-administered format. Adequate time was provided for the students to complete the questionnaire. The students took around 20 minutes to complete the questionnaire. Conforming to the ethics of human subject research, the study was approved and monitored by Human Subjects Ethics Sub-committee of an internationally recognized university.

Instruments

The Paternal/Maternal Sacrifice Scale (APSA/AMSA). Based on the literature on family investment (Conger and Donnellan 2007), family capital (Coleman 1990), and parental involvement (Grolnick et al. 1997), together with qualitative findings from focus groups of parents and adolescents respectively, an indigenous 23-item measurement tool measuring dimensions of sacrifice in terms of financial resources, time on children’s education, reorganization of daily routine, sacrifice of lifestyle and aspiration, and shielding of worries was developed (Leung and Shek 2011a). Participants were requested to rate the degree of agreement to each item on a 6-point Likert scale ranging from “strongly agree” to “strongly disagree”. An example of the item is “the expense of my education is more important than my father’s/mother’s personal expenses”. Higher scores indicate greater perceived parental sacrifice. Reliability analyses showed that the measurements assessing perceived paternal sacrifice (APSA) and maternal sacrifice (AMSA) by adolescents had excellent reliability in this study ($\alpha = 0.96$ and 0.95 for APSA and AMSA, respectively).

Data analytical plan

There were two steps in the analyses. First, based on the theoretical framework and prior exploratory factor findings (Leung and Shek 2011b), five hypothesized models were tested (i.e., one 1-factor model, one 2-factor model, two 3-factor models and a 5-factor model). As two different 3-factor structures were shown in paternal and maternal sacrifice (APSA and AMSA) based on the previous EFA results (Leung and Shek 2011b), it would be desirable for conducting CFA separately in two different measures (paternal and maternal) before performing invariance tests across APSA and AMSA (Byrne et al. 1993; Schwartz et al. 2009).

Model 1 (a one-factor model): All 23 items loaded on a latent factor (Paternal: Model 1a; Maternal: Model 1b).

Model 2 (a two-factor model): The second model was based on the financial and non-financial sacrifice of parents on children's education. It is especially important for economically disadvantaged families as they may have difficulties in mobilizing financial resources for their children. In this model, 9 and 14 items loaded on two latent factors, respectively, with Factor 1 (Items 1, 2, 3, 4, 5, 6, 7, 8 and 9) indicates financial sacrifice of parents, and Factor 2 (Items 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 and 23) indicates non-financial sacrifice of parents (Paternal: Model 2a; Maternal: Model 2b).

Model 3 (a three-factor model): Based on prior EFA results of APSA (Leung and Shek 2011b), all 23 items loaded on a three factor model: Factor 1 (Items 1, 2, 3, 4, 5, 6, 7, 8 and 9 which indicates "striving for financial resources"), Factor 2 (Items 10, 11, 12, 13, 14 and 16) which represents the "time spent on children's education", and Factor 3 (Items 15, 17, 18, 19, 20, 21, 22 and 23) which reflects changes and adaptations of parents for their children's education and development by combining

the dimensions of “restructuring of family routine”, “sacrifice of lifestyle and aspirations” and shielding of worries” (Paternal: Model 3a; Maternal: Model 3b). The model could be regarded as an empirically derived model.

Model 4 (a three-factor model): Another three-factor model was tested based on the prior EFA results of AMSA (Leung and Shek 2011b). In this model, 9 items (Items 1, 2, 3, 4, 5, 6, 7, 8 and 9) loaded on Factor 1 (i.e. “striving of financial resources”), 5 items (Items 10,11, 12, 13 and 16) loaded on Factor 2 (i.e. time spent on children’s education), and 9 items (Items 14, 15, 17, 18, 19, 20, 21, 22 and 23) on Factor 3 (i.e. changes and adaptations of parents for their children’s education and development, which combines the dimensions of “restructuring of family routine”, “sacrifice of lifestyle and aspirations” and shielding of worries” (Paternal: Model 4a; Maternal: Model 4b). The difference between this model and Model 3 is that Item 14 is loaded on Factor 2 (i.e. time spent on children’s education) in Model 3, whereas Item 14 is loaded on Factor 3 (i.e. changes and adaptations of parents for their children’s education and development) in Model 4. Adolescents may perceive differently on Item 14 (i.e. “when my child studies at mid-night, I never sleep”) based on the differential roles of fathers and mothers. As fathers are involved in the teaching role and they assist the children in their revision, Item 14 belongs to Factor 2 (i.e. time spent of children’s education) in Model 3. However, as mothers are involved in the caring role of children and the act represents their change of daily routine for the sake of their children’s needs, Item 14 belongs to Factor 3 (i.e. changes and adaptations of parents for their children’s education and development) in Model 4 (Leung and Shek 2011b).

Model 5 (a five-factor model): Based on the original conceptual model (Leung and Shek 2011a), we hypothesized that all 23 items loaded on five factors, Factor 1

(Items 1, 2, 3, 4, 5, 6, 7, 8 and 9) represents “striving for financial resources”; Factor 2 (Items 10, 11, 12 and 13) indicates “time spent on children’s education”; Factor 3 (Items 14, 15, 16, 17 and 18) suggests “reorganization of daily routine”; Factor 4 (Items 19, 20 and 21) represents “sacrifice of lifestyle and aspiration”; and Factor 5 (Items 22 and 23) suggests “shielding of worries” (Paternal: Model 5a; Maternal: Model 5b).

Second, measurement invariance across APSA and AMSA was tested using a mean and covariance structure analysis approach (MACSA, Little 1997). To perform multiple-group CFA (MCFA), equality constraints were imposed on the following parameters, including a) invariance of factor pattern (configural invariance), b) invariance of factor loadings (metric invariance), c) invariance of factor variance, d) invariance of factor covariance and e) invariance of the intercepts (scalar invariance) of all measured variables.

In the present study, the sample size was adequate because the recommended ratio of estimated indicators to observations is 1:16 (Cattell 1978; Gorsuch 1983). In perceived paternal and maternal responses, less than 8% of the data was missing in both responses (i.e., 5% in maternal responses, N=353 and 8% in paternal responses, N=343). Given that our missing data were less than 15%, which is commonly found in educational and psychological studies (Enders 2003) and was below the cut-off criteria (i.e., 10%, Bennett 2001), listwise deletion was used to handle missing data.

Descriptive statistics was conducted using SPSS 21.0 program. CFA and MCFA tests were performed using LISREL 8.80 (Jöreskog and Sörobom 2005). To achieve identification purpose, an observed indicator per factor was fixed at 1.0. To determine whether the model fits the data well, several global fit measures were used, including comparative fit index (CFI), root mean square error of approximation (RMSEA),

standardized root mean square residual (SRMR), Bentler-Bonnett Non-Normed Fit index (NNFI) and the expected cross-validation index (ECVI). In general, the fit of the model was acceptable when the CFI and NNFI values are higher than .90 (Hu and Bentler 1999; Kline 1994). For RMSEA and SRMR, the values less than .08 and .06 respectively indicate a reasonable fit between the model and the data (Hu and Bentler 1999; Browne and Cudeck 1993). For EVCI, a model with a smaller value is preferable when comparing alternative models (Browne and Cudeck 1993). This index is recommended when the sample size is small (MacCallum and Austin 2000). Lastly, a higher value of squared multiple correlation (SMC) is preferred to show the acceptable properties of the observed variables (Fabrigar et al. 1999). Modification index (MI) was inspected to identify misfit parameters in the model.

To assess the adequacy of alternative models, changes of chi-square test and the CFI values were used. Given the Chi-square difference test is sensitive to sample size (Cheung and Rensovld 2002), difference in the values of CFI was used. A non-significant change in the CFI values (i.e., less than or equal to .01) suggests that the null hypothesis of invariance should not be rejected (Cheung and Rensvold 2002).

RESULTS

Prior to confirmatory factor analysis, normality of all observed variables was examined. Results showed that all items were normally distributed (univariate skewness values of APSA ranged from -.961 to .455; univariate skewness values ranged from -.910 to .520 of AMSA, Finney and DiStefano 2006). Therefore, maximum likelihood with the covariance matrices was used.

The goodness-of-fit statistics of all CFA models are shown in Table 1. The five-factor model fits the data better as compared to the rest of the model in terms of

smaller values of RMSEA and SRMR (<.05) and higher values of CFI and TLI (>.90). In particular, when comparing to other hypothesized models, the fit indices of a five-factor model shows the best fit to the data in both paternal and maternal sacrifice (Model 5a (Paternal): $\chi^2_{220} = 664.07$, $p < .01$, RMSEA=.07, CFI=.98; NNFI= .98, SRMR=.04, ECVI=2.08; Model 5b (Maternal): $\chi^2_{220} = 688.95$, $p < .01$, RMSEA=.08, CFI=.98; NNFI= .98, SRMR=.05, ECVI=2.21). Therefore, this model was chosen as the finalized model. In both models, all factor loadings were significant and above .60 (Paternal: ranging from .61 to .92; Maternal: ranging from .79 to .93, see Table 2) with small standardized residuals (Paternal: ranging from .15 to .62; Maternal: .14 to.41) and absence of high modification indices (highest MIs are 35.28 and 50.68 in Paternal and Maternal measures, respectively). Figures 1 and 2 show the factor structures and the completely standardized coefficients of Paternal and Maternal Sacrifice Scales based on Model 5a and 5b, respectively. In general, all models were identified.

Based on the CFA results, the five-factor model (i.e., Models 5a and 5b) was employed to test the equivalence across the paternal and maternal sacrifice measures (APSA and AMSA). To assess whether APSA and AMSA have the same factor pattern, the configural model (Model 1) was tested first. In this model, no equality constraint was imposed. This model fitted the data quite well ($\chi^2_{440} = 1353.03$, $p < .01$, RMSEA=.08, CFI=.98; NNFI= .98, SRMR=.05), suggesting that the factor pattern was equivalent across paternal and maternal perspectives. As configural invariance was supported, we then examined the metric invariance (Model 2). Although there was a significant drop in χ^2 ($\Delta\chi^2 = 45.64$, $\Delta df = 18$, $p < .01$), the values of ΔCFI did not show change between Models 1 and 2 ($\Delta CFI = .00$, $\Delta df = 18$, $p > .05$), indicating the factor loading was invariant across the two perspectives (Cheung and Rensvold 2002).

Given the metric invariance was supported, scalar invariance was tested (Vandenberg and Lance 2000). The scalar model did not differ from the baseline model (Model 3), suggesting the intercepts of the measured variables were invariant across paternal and maternal perspectives (ΔCFI =.00, Δdf =52, p>.05). We also assessed whether the factor variance and covariance were invariant across the two perspectives in Models 4 and 5, respectively. Despite the significant difference in the $\Delta\chi^2$ between the nested models and the baseline model, there was no change in the values of ΔCFI (Models 1 vs 4: ΔCFI =.00, Δdf =23, p>.05; Models 1 vs 5: ΔCFI =.00, Δdf =33, p>.05), suggesting the invariance of factor variance-covariance of the measurement across paternal and maternal perspectives. The results of the measurement invariance tests showed that there was measurement equivalence of both perceived paternal and maternal responses. The inter-relationships of the latent factors and its internal consistency are shown in Table 4.

DISCUSSION

The objectives of this study were to examine the dimensionality of the APSA and AMSA via confirmatory factor analysis (CFA) and to assess the equivalence across perceived paternal and maternal sacrifice based on the perspectives among a sample of Chinese adolescents in terms of configural, factor loadings, intercepts of measured variable and factor variance-covariance. The results are generally promising and robust. Consistent with the original conceptual model, a five factor model (striving for financial resources, time spent on children's education, reorganization of daily routine, sacrifice of lifestyles and aspiration, and shielding of worries from children) yielded the best good-of-fit statistics among all tested models. The subscales also showed good reliability and were inter-related with each other. The present findings

suggested that the measurement tool was a reliable and valid multidimensional measure to be used in assessing perceived paternal and maternal sacrifice in the Chinese communities.

In line with the original conceptual model of parental sacrifice, five dimensions were identified. This observation is inconsistent with the prior EFA results that could only yield three factors of the measure. Hence, the present study underscores the importance to perform CFA to examine the factor structure of the measure.

Furthermore, there was evidence of equivalence in both perceived paternal and maternal sacrifice (APSA and AMSA) perceived by adolescents in terms of model structure (i.e. the pattern of fixed and non-fixed parameters), factor loadings, intercepts of measured variable and factor variance-covariance, suggesting that both paternal and maternal sacrifice (APSA and AMSA) were isomorphic sharing equivalent dimensions. Item 14 was significantly loaded on the latent factor of "reorganization of daily routine" in both APSA and AMSA respectively. Despite the differentiation of instrumental and expressive functions exhibited in fathers and mothers (Russell et al. 1998) as well as cultural inclination of the gender roles in the Chinese family (Leung and Shek 2012), this study suggests that adolescents use the same conceptual framework to assess perceived paternal and maternal sacrifice, and perceived parental sacrifice shared identical dimensions in both paternal and maternal aspects. As the conceptions of parental sacrifice are culturally originated from Chinese familism where parental devotion to child development is critical in maintaining family solidarity and pursuing family prosperity as a whole (Yeh and Yang 1997), it is justified to claim that adolescents use the same conceptual framework to look at parental sacrifice across parents of different gender.

The present findings have several theoretical and practical implications. Theoretically, with reference to the remark by Chao and Kaeochinda (2010) that "parental sacrifice has been suggested as a central feature of parenting in Asian culture (Chao 1994), yet this dimension of parenting has not been conceptualized" (p. 61), the present study is an encouraging response to fill the conceptual gap. The results of CFA indicated that parental sacrifice is a multidimensional construct that have five dimensions (striving for financial resources, time spent on children's education, reorganization of daily routine, sacrifice of lifestyles and aspiration, and shielding of worries), which contributes to the conceptualization of parental sacrifice in the Chinese contexts.

Moreover, the study provides important insights on understanding the cultural meaning of parental sacrifice in Chinese adolescents, particularly on how they interpret sacrifice that they have experienced from their parents. The measurement tool is useful for scholars and researchers to assess family socialization in the Chinese context and build up indigenous Chinese family models that predict children's and adolescents' well-being. Particularly, the measurement is robust in capturing adolescents' perceptions of parental sacrifice, which may help in the examination of how adolescents' experience of parental sacrifice influences their psychosocial development and relational qualities.

Practically, the subscales of the measurement allow clinical practitioners to understand the strengths in different dimensions of parental sacrifice that fathers and mothers may contribute to their children with the expense of their personal needs. In fact, the degree of sacrifice in different domains may be different between fathers and mothers. As the breadwinners of the family, fathers may sacrifice more on the financial resources. On the other hand, as the care-giver in the family, mothers may

sacrifice their time in nurturing their children. Given that the measurement showed equivalent dimensionality of parental sacrifice across paternal and maternal perspectives, the measurement and subscales can be used to assess the strength of different dimensions of perceived paternal and maternal sacrifice.

Furthermore, the measurement can be used to explore parental sacrifice as a protective factor for adolescents facing adverse circumstances such as poverty. Becker and Tones (1985) commented that it was investment preference rather than income that would affect children's education and development in economically disadvantaged families. Despite financial constraints, parents who appreciate children's education and development would mobilize more resources to their children, though this may require them to sacrifice their own needs (Schlee et al. 2009). As suggested by the resilience literature that positive family attributes are important protective factors to protect adolescents against adversity and hardship (Walsh 2006), the measurement tool can be used by clinical practitioners to assess parental sacrifice to explore the strengths and resilience of the families in face of adversity.

Last but not the least, it is essential to examine the influence of parental sacrifice in fostering filial piety of Chinese children, as adolescents who have greater family obligation and stronger adherence to their family are more ready to take care of their parents in the future (Chao and Kaeochinda 2010). In fact, previous studies showed that Asian American adolescents were expected to provide primary care for their ageing parents in the future, take care of their siblings and manage household chores than were European American adolescents (Chen et al. 2007; Hardway and Fuligni 2006). Hence parental sacrifice not only serves as a protective factor for children in

their success and development, but also as a protective factor for parents to be taken care of in an ageing society (Cheung et al. 2006).

There are several limitations of the present study. First, as the adolescent respondents were not randomly sampled, generalizability of the findings may be limited. Second, assessment of paternal and maternal sacrifice was based on self-report measures from the adolescents' perspective only. As parents and adolescents may have different views on family processes (De Los Reyes et al. 2010; Paulson and Sputa 1996; Steinberg 2001), it is advisable to gather information on the perceptions of parental sacrifice from the parents. Third, as the findings were based on an adolescent sample in Hong Kong, there is a need to assess the generalizability of the findings in different Chinese communities (e.g. mainland China) and Chinese people living in non-Chinese contexts (e.g. Chinese-Americans) in future studies. Last but not least, the dimension of "shielding of worries from the children" has only two measured items which is at odd with the preferred standard of having at least three items loaded on each factor (Bollen and Hoyle 2012; Henson et al. 2004). However, it was found that the internal consistency of the subscale of "shielding of worries" in paternal and maternal responses was sound (Paternal: .82; Maternal: .82), and this factor was interrelated with other dimensions (construct validity) (Table 4). Thus, it is acceptable to have two items for this subscale.

Despite the above limitations, this is the first scientific study on a measurement tool on parental sacrifice in the Chinese contexts using confirmatory factor analysis. Moreover, the study showed that the dimensions of paternal and maternal sacrifice were isomorphic (i.e., paternal sacrifice shared the equivalent factor pattern, factor loadings, intercepts of measured variable and factor variance-covariance with those of maternal sacrifice). The results suggest that the Chinese Parental Sacrifice Scale is a

reliable and valid measurement tool to assess parental sacrifice among the Chinese adolescents. In view of the under-development of validated indigenous Chinese family measurements (Shek 2006; Yang 1999), the present study is a constructive response.

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Table 1. Summary of Goodness of Fit for all CFA models

Model	Description	χ^2	df	RMSEA (90% CI)	CFI	NNFI	SRMR	ECVI (90% CI)
1a	One-factor model (Paternal)	2237.56**	230	.21 (.20-.21)	.91	.90	.11	10.70 (10.16-11.25)
1b	Same as Model 1a (Maternal)	2472.31**	230	.23 (.22-.23)	.92	.91	.10	12.73 (12.15-13.34)
2a	Two-factor model (Paternal)	1150.12**	229	.12 (.11-.13)	.96	.96	.06	4.20 (3.88-4.53)
2b	Same as Model 2a (Maternal)	1488.57**	229	.14 (.14-.15)	.95	.95	.08	5.66 (5.29-6.06)
3a	Three-factor model (Paternal)	883.72**	227	.09 (.09-.10)	.97	.97	.05	2.79 (2.55-3.06)
3b	Same as Model 3a (Maternal)	1127.94**	227	.11 (.10-.12)	.97	.96	.07	3.60 (3.32-3.91)

CFA, Confirmatory factor analysis; CFI, Comparative fit index; Bentler-Bonnett Non-Normed Fit index (NNFI); RMSEA, Root mean square error of approximation; SRMR, Standardized root mean square residual; CI, Confidence interval; ECVI, the expected cross-validation index.
**p <.01

Table 1 (con't)

Model	Description	χ^2	df	RMSEA (90% CI)	CFI	NNFI	SRMR	ECVI (90%CI)
4a	Three-factor model (Paternal)	906.23**	227	.09 (.09-.10)	.97	.96	.05	2.86 (2.61-3.13)
4b	Same as Model 4a (Maternal)	1029.09**	227	.10 (.10-.11)	.97	.97	.06	3.33 (3.05-3.62)
5a	Five-factor model (Paternal)	664.07**	220	.07 (.07-.08)	.98	.98	.04	2.08 (1.88-2.30)
5b	Same as Model 5a (Maternal)	688.95**	220	.08 (.07-.08)	.98	.98	.05	2.21 (2.01-2.44)

CFA, Confirmatory factor analysis; CFI, Comparative fit index; Bentler-Bonnett Non-Normed Fit index (NNFI); RMSEA, Root mean square error of approximation; SRMR, Standardized root mean square residual; CI, Confidence interval; ECVI, the expected cross-validation index.
**p <.01

Table 2. Standardized factor loadings, error variances and SMC for both APSA and AMSA

	APSA (Model 5a)			AMSA (Model 5b)		
APSA/AMSA items	FL	ER	SMC	FL	ER	SMC
Striving for family resources (SFR)						
1. To fulfill my educational needs, My father/mother eats and wears less.	.68	.53	.47	.79	.38	.62
2. My father/mother saves money for me to study in university, despite how hard the work he/she faces.	.76	.42	.58	.82	.33	.67
3. The expense of my education is more important than my father's/mother's personal expenses.	.61	.62	.38	.78	.38	.62
4. If I need tutoring, my father/mother would fulfill my needs even if family expenses have to be tightened.	.80	.36	.64	.84	.30	.70
5. If I need to join extra-curricular activities, my father/mother would fulfill my needs even if family expenses have to be tightened.	.81	.35	.65	.78	.38	.62
6. My father/mother saves rigorously as to reserve funds for my education.	.79	.37	.63	.82	.33	.67
7. Even if the family faces financial stress, my father/mother will not stop any educational expenses of me.	.75	.44	.56	.83	.32	.68
8. If I need to buy reference books, my father/mother would fulfill my needs even if family expenses have to be tightened.	.88	.23	.77	.85	.28	.72
9. In case the family faces financial stress, my father/mother will borrow money to fulfill my educational needs.	.65	.58	.42	.77	.41	.59
Time spent (TS)						
10. During the examination period, My father/mother will try my best to stay at home and accompany with me.	.82	.32	.68	.79	.38	.62
11. If the teacher calls my father/mother to discuss about me, he/she will stop his/her work and see the teacher even he/she is busy at the time.	.78	.38	.62	.84	.29	.71
12. My father/mother always reserves the time for participating in the parent day of school.	.77	.40	.60	.83	.31	.69
13. Even my father/mother is tired, he/she tries his/her best to understand my school life.	.84	.30	.70	.82	.33	.67

All coefficients are statistically significant ($p < .05$). FL=standardized factor loadings. ER=standardized error variances; SMC=squared multiple correlation. APSA=Chinese Paternal Sacrifice Scale perceived by adolescents. AMSA=Chinese Maternal Sacrifice Scale perceived by adolescents.

Table 2 (con't)

APSA/AMSA items	APSA (n=373)			AMSA (n=373)		
	FL	ER	SMC	FL	ER	SMC
Restructuring of daily routine (RDR)						
14. When I study at mid-night, my father/mother will never sleep.	.81	.34	.66	.79	.38	.62
15. My father/mother routine is adjusted according to my educational needs.	.83	.30	.70	.88	.23	.77
16. During the examination period, my father/mother is more conscious in taking care of me.	.84	.29	.71	.80	.37	.63
17. My father/mother will change the family habits in order to fit my educational needs.	.83	.31	.69	.91	.18	.82
18. In order to have a silent environment for my study, my father/mother gives up family entertainment.	.76	.42	.58	.77	.41	.59
Sacrifice of lifestyles (SLA)						
19. My father/mother gives up his/her hobbies for me.	.89	.20	.80	.93	.14	.86
20. My father/mother sacrifices his/her aspiration for me.	.92	.15	.85	.93	.14	.86
21. My father/mother gives up his/her social life for me.	.91	.17	.83	.89	.21	.79
Shielding of worries (SW)						
22. My father/mother will hide the family worries in order not to disturb me.	.87	.25	.75	.88	.22	.78
23. In order not to disturb me, my father/mother will hide his/her sickness when it happens.	.81	.35	.65	.81	.35	.65

All coefficients are statistically significant ($p < .05$). FL=standardized factor loadings. ER=standardized error variances; SMC=squared multiple correlation. PSA=Chinese Parental Sacrifice for Children's Education Scale. APSA=Chinese Paternal Sacrifice Scale perceived by adolescents. AMSA=Chinese Maternal Sacrifice Scale perceived by adolescents.

Table 3 Summary of Goodness of Fit for all invariance models

Model	Description	χ^2	df	RMSEA (90% CI)	CFI	SRMR	NNFI	ECVI (90%CI)	$\Delta\chi^2$	ΔCFI	Δdf
1	Baseline model (i.e., configural invariance)	1353.03**	440	.08 (.07-.08)	.98	.05	.98	2.15 (2.00-2.30)			
2	Equal factor loadings (i.e., metric invariance)	1398.67**	458	.08 (.07-.08)	.98	.06	.98	2.17 (2.02-2.32)	45.64** (Model 1 vs Model 2)	.00	18
3	Equal intercepts of measured variables (i.e., scalar invariance)	1527.10**	492	.08 (.07-.08)	.98	.07	.98	2.37 (2.15-2.47)	174.07** (Model 1 vs Model 3)	.00	52
4	Equal factor variances (i.e., imposing equality constraints on factor loadings and factor variances)	1401.14**	463	.08 (.07-.08)	.98	.07	.98	2.16 (2.01-2.32)	48.11** (Model 1 vs Model 4)	.00	23
5	Equal factor covariances (i.e., imposing equality constraints on factor loadings, factor variances and factor covariances)	1451.42**	473	.08 (.07-.08)	.98	.07	.98	2.21 (2.06-2.37)	98.39** (Model 1 vs Model 5)	.00	33

Note: CFI, Comparative fit index; Bentler-Bonnett Non-Normed Fit index (NNFI); RMSEA, Root mean square error of approximation; SRMR, Standardized root mean square residual; CI, Confidence interval; ECVI, the expected cross-validation index.

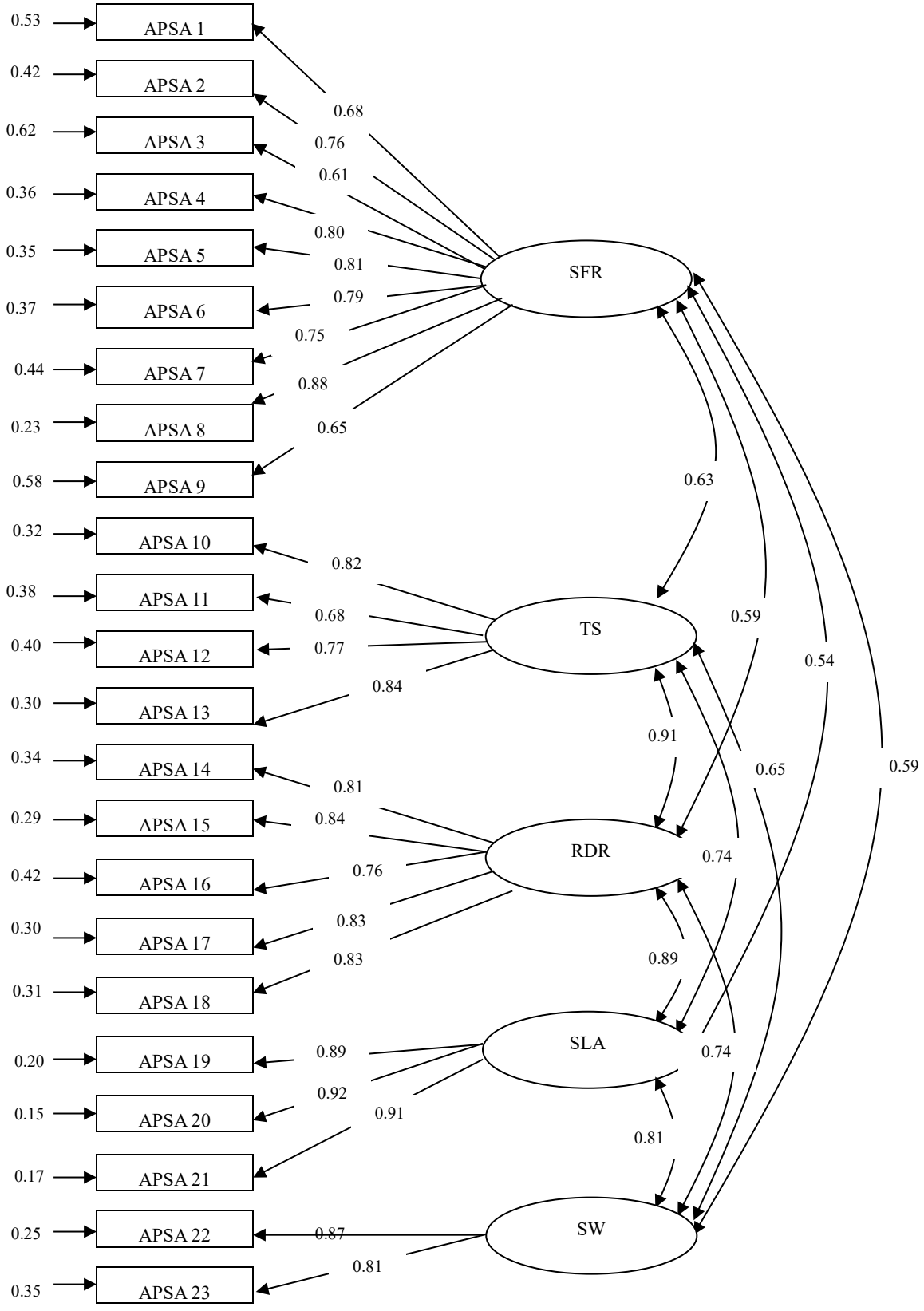
**$p < .01$

Table 4.
Descriptive statistics, Cronbach's α and correlations among the latent factors across paternal (APSA) and maternal (AMSA) perspectives

				Paternal (APSA)				
Factors	M	SD	α	1	2	3	4	5
SFR	4.04	1.04	.92	-				
TS	3.25	1.24	.88	.63	-			
RDR	3.01	1.20	.91	.59	.91	-		
SLA	2.77	1.28	.93	.54	.74	.89	-	
SW	3.19	1.40	.82	.59	.65	.74	.81	-
				Maternal (AMSA)				
SFR	4.35	1.09	.94	-				
TS	4.28	1.24	.89	.74	-			
RDR	3.64	1.24	.91	.66	.74	-		
SLA	3.33	1.35	.94	.63	.59	.88	-	
SW	3.61	1.39	.82	.67	.53	.72	.80	-

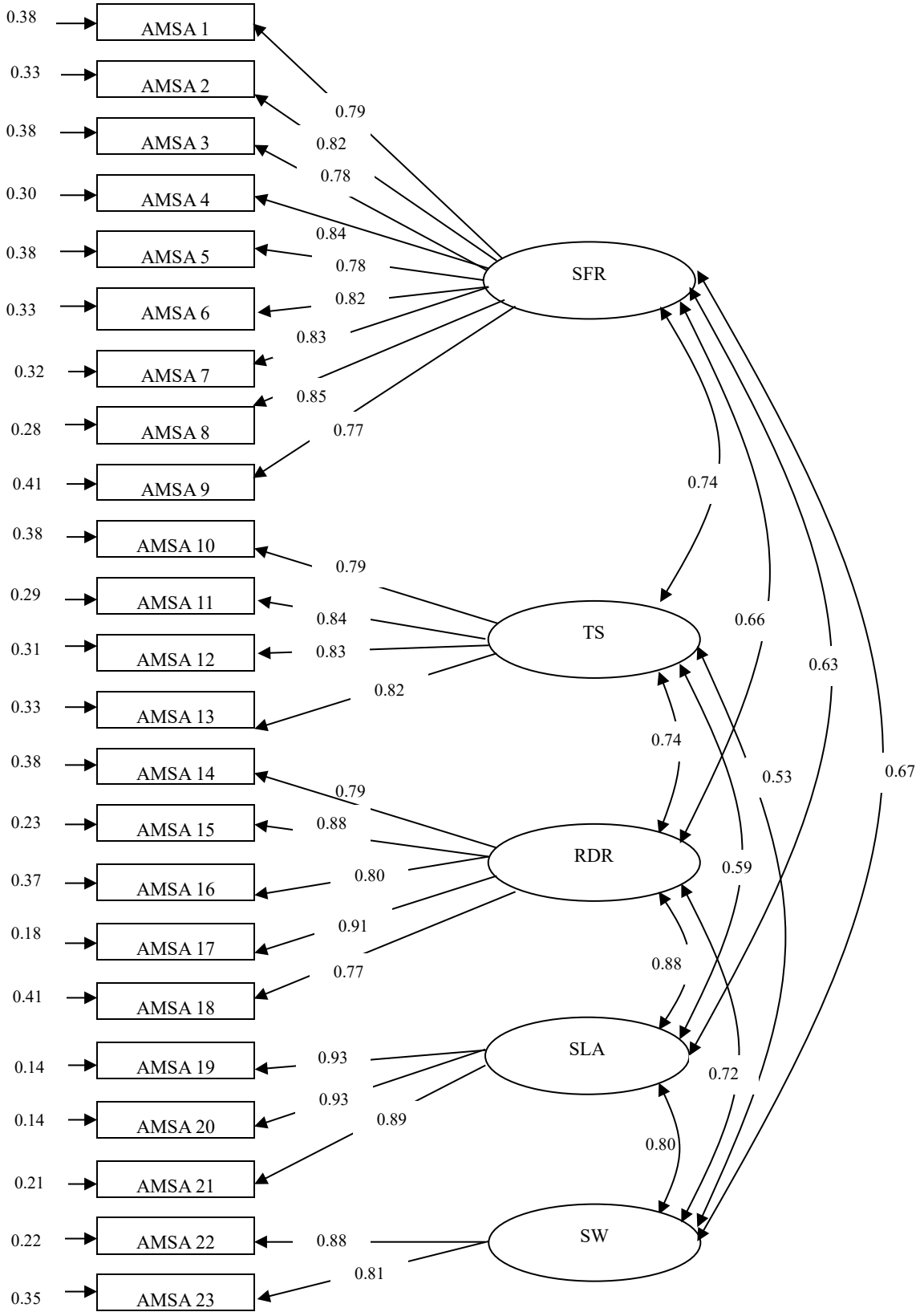
SFR=striving for family resources; TS= time spent on children's education; RDR=restructuring of daily routine; SLA=sacrifice of lifestyles and aspirations; SW=shielding of worries. APSA=Chinese Paternal Sacrifice Scale perceived by adolescents. AMSA=Chinese Maternal Sacrifice Scale perceived by adolescents.

Figure 1. Factor structure and completely standardized coefficients of Chinese Paternal Sacrifice Scale based on Model 5a.



APSA=Chinese Paternal Sacrifice Scale. SFR=striving for family resources; TS= time spent on children's education; RDR=restructuring of daily routine; SLA=sacrifice of lifestyles and aspirations; SW=shielding of worries.

Figure 2. Factor structure and completely standardized coefficients of Chinese Maternal Sacrifice Scale based on Model 5b.



AMSA=Chinese Maternal Sacrifice Scale. SFR=striving for family resources; TS= time spent on children's education; RDR=restructuring of daily routine; SLA=sacrifice of lifestyles and aspirations; SW=shielding of worries.