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Abstract

Our purpose in this study was to validate the existing Career-Related Parental Support Scale (CRPSS) for use with mainland Chinese students. We conducted two studies involving exploratory and confirmatory factor analyses with samples of more than 1,000 technical education students in China. Based on the data obtained, we retained 24 out of 27 items in the original scale. We identified a bifactor model for the CRPSS (Chinese version), with a general factor of career-related parental support and four specific group factors—instrumental assistance, career-related modeling, verbal encouragement, and emotional support. Ancillary bifactor measures yielded adequate evidence of the reliability of the entire scale and each of the four subscales. We also found measurement invariance across genders, as well as gender differences in the latent variable of emotional support. Concurrent and convergent validity were supported. Implications for the use of CRPSS Chinese version for research and practice are suggested.

Keywords: bifactor model, career-related parental support, Chinese technical education students, measurement invariance

Validation of the Career-related Parental Support Scale (Chinese Version)

Career-related support from parents has been widely recognized as valuable for adolescents and young adults (Ali & Saunders, 2006; Farmer, 1985; Ginevra, Nota, & Ferrari, 2015; Guan et al., 2015; Leung, Hou, Gati, & Li, 2011; Turner, Alliman-Brissett, Lapan, Udipi, & Ergun, 2003). This type of support usually comes in the form of encouragement, emotional support, role modeling, and provision of information on career options.

In China, parents traditionally play a very significant role in influencing their children's career aspirations, usually hoping that their son or daughter will choose employment that takes them above the family's current socioeconomic status (Liu, McMahon, & Watson, 2015; Powers & Myers, 2017)[AQ 1: This citation does not appear in the References section – please add it.]. In particular, Chinese parents encourage their offspring to explore career-path options carefully before making firm decisions (Guan et al., 2015; Guan et al., 2016). Although the precise relation between parental support and adolescents' career development is a topic that invites further research, it has received little attention in China. One reason for this is the lack of relevant culturally sensitive instruments for data collection (Zhang, Yuen, & Chen, 2015). In this study, we addressed this research gap by adapting the existing Career-related Parental Support Scale (CRPSS; Turner et al., 2003) to create a Chinese-language version, and validating it with a sample of Chinese technical education students. The CRPSS was originally developed in the United States and captures key aspects of how children perceive parental support, including how it may relate to their career development.

Context

Technical education students in China leave junior or senior secondary schools to pursue their education at technical colleges and learn specific trade skills for future employment. These

students are similar to those known as vocational students in China, the main difference being that technical education students do not acquire an associate's degree, but rather are certified as junior or senior skilled workers or probationary technicians.

Two characteristics of technical education students must be acknowledged when investigating career-related parental support. First, many technical education students have low self-esteem and believe that their self-efficacy is inadequate because they have already failed to perform well academically in senior secondary school and on college entrance exams (Yu, 2010). Their low self-efficacy may be linked to expectations of future negative career outcomes when they transition from technical college to work (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Lent, Brown, & Hackett, 1994, 2000). Previous studies in other settings have indicated that support from parents is crucial in helping students strengthen their self-efficacy beliefs and overcome career barriers (Fouad et al., 2010; Fouad & Kantamneni, 2008; Gushue & Whitson, 2006; Turner et al., 2003; Turner & Lapan, 2002; Raque-Bogdan, Klingaman, Martin, & Lucas, 2013; Restubog, Florentino, & Garcia, 2010). Second, most technical students come from families with low socioeconomic status and are often marginalized and disadvantaged [AQ 2: Please elaborate – marginalized by whom or in which ways? Disadvantaged in which ways?] (Bai, 2012; Wang, 2014). Their parents may not be able to provide career-related resources and support, and students tend to have less social capital to draw upon (Blustein et al., 2002; Bryant, Zvonkovic, & Reynolds, 2006; Zhang et al., 2015). Thus, it is important to investigate how parents provide career-related support for technical education students in China, and to identify ways through which this form of support could be strengthened in the future. In this effort, the first step was to make available a culturally sensitive tool for assessing parental support. As such, the purpose of this study was to adapt and perform a psychometric validation of a scale that

could be used to collect data on career-related parental support among Chinese technical education students.

Features and Limitations of Existing Scales for Assessing Parental Support

In the West[AQ 3: Please clarify what your meaning is], several scales have been developed to assess support provided by parents for their children's career planning. These have included the 15-item Perceived Parental Career-Related Behaviors Scale (PRPCBS; Dietrich & Kracke, 2009), the 18-item Support, Interference and Lack of Engagement Scale (Boerchi & Tagliabue, 2018), and the 22-item Family Influence Scale (Fouad et al., 2010). None of these instruments are entirely suitable for use in a Chinese context. The PRPCBS, for example, has three dimensions (support, interference, and lack of engagement) and provides a comprehensive model of parents' career-related support for adolescents, but this scale was developed in Germany, a country with a very different education system from that in China. A close inspection of items comprising the scale indicates that some may be unsuitable for Chinese contexts. For example, Item 3 ('My parents support me in getting an apprenticeship') and Item 5 ('My parents talk to me about apprenticeship opportunities in various careers') would not be applicable because apprenticeships are not a feature of the career path that students in China normally follow. The Support, Interference and Lack of Engagement Scale was developed based on the PRPCBS and includes the same dimensions (support, interference, and lack of engagement). Although it is well-validated and reported as suitable for 13- to 14-year-old Italian youths choosing between secondary schools, it is inappropriate for 15- to 22-year-old Chinese technical students [AQ 4: Please state clearly the reason why it is inappropriate.]. The Family Influence Scale, which was developed in the United States, is used to evaluate broader familial influences on career development under categories of informational support, family expectation,

financial support, and values/beliefs. However, the scale considers the combined influences from parents, grandparents, siblings, aunts, and uncles, rather than identifying parents' unique contributions. An additional limitation of the three aforementioned scales is that although they were developed according to extant evidence from qualitative studies, they were not conceptualized based on a theory of parental support.

Given these limitations[AQ 5: Please add information about the Cheng and Yuen (2012) study in this section, also mentioning the reasons that it is not suitable for your particular purposes and why you need to create another Chinese version. Otherwise, it comes as quite a surprise later on in the manuscript. This will help readers better understand the rationale for your study.], we felt it necessary to validate a scale that is more suitable for the Chinese context and that is underpinned by sound theory[AQ 6: Please specify the theory]. We thought that the CRPSS (Turner et al., 2003) would be suitable as a starting point. This instrument has been used in the United States with students from Grades 7–10 (Alliman-Brissett, Turner, & Skovholt, 2004; Turner et al., 2003), although it has not been used with (technical education) students. Thus, our aim was to adapt the scale for use with this Chinese population.

The structure of the 27-item CRPSS is underpinned by social cognitive theory (Bandura, 1977, 1997) and social cognitive career theory (Lent et al., 1994, 2000). According to social cognitive theorists, [AQ 7: It appears that you are describing social cognitive career theory rather than social cognitive theory here.] self-efficacy is one of the key attributes that contribute to a person's academic and career development. *Self-efficacy* refers to the belief an individual may hold concerning their own ability to cope well in various situations. This personal belief develops when the individual consistently experiences positive emotional arousal accompanying successful performance and accomplishment. Self-efficacy is also enhanced indirectly by

observing and successfully imitating the behavior of others, and can be shaped by social persuasion (e.g., receiving verbal encouragement, being given positive and constructive feedback). Drawing on the four main sources of efficacy information, the authors of the CRPSS developed items that assess career-related parental support in four dimensions: (a) instructional assistance, (b) career-related modeling, (c) verbal encouragement, and (d) emotional support.

Previous studies have provided evidence for the convergent and predictive validity of the CRPSS (Raque-Bogdan et al., 2013; Turner et al., 2003), but some issues need to be further explored and addressed. The first issue relates to the construct's underlying dimensions. Turner et al. (2003) proposed a four-factor correlational model that might represent career-related parental support. In previous studies, analyses have yielded medium to high correlations among the four subscales (Alliman-Brissett et al., 2004; Raque-Bogdan et al., 2013; Turner et al., 2003), which might indicate an underlying structure with two factors rather than four (Reise, Morizot, & Hays, 2007). We therefore considered it essential to explore a possible bifactor structure. As suggested by Reise (2012), a bifactor structure could provide a solid foundation for constructing a measure and evaluating its psychometric properties. Moreover, exploration of a possible bifactor structure may help clarify the dimensionality of CRPSS, enabling a more nuanced understanding of the construct's validity in a Chinese context.

The second issue relates to the lack of evidence of measurement invariance across gender for the CRPSS. Testing for measurement invariance determines if items used in survey-type instruments are equally applicable to members of different groups, such as individuals across gender. Performing this test is important to examine any differences between raw scores of men and women responders(Cheung & Rensvold, 2002). In previous studies, findings related to gender differences in scale scores have been inconsistent. For example, some studies have

indicated that girls, as compared to boys, received significantly more career-related modeling, verbal encouragement, and emotional support from their parents (Hu, 2009; Raque-Bogdan et al., 2013; Turner et al., 2003). Other researchers have found that parents' emotional support predicted girls' self-efficacy, whereas boys' self-efficacy was more strongly predicted by parents' career-related modeling (Alliman-Brissett et al., 2004). However, no information on this topic has been reported within Chinese contexts, which suggests that any possible gender differences in subscale scores merit closer study.

Third, there is no evidence of construct validity (i.e., concurrent and convergent validity) of either the original CRPSS English Version or the Hong Kong Chinese Version (Cheng & Yuen, 2012). Thus, in order to investigate concurrent and convergent validity, we considered it necessary to examine the association between students' CRPSS scores and their scores on a closely related concept, namelyconnectedness with parents (Karcher, 2011; Karcher & Sass, 2010). In addition, we examined the association between students' CRPSS scores and those they reported for self-efficacy, as previous empirical findings suggest that parental support and adolescents' self-efficacy are related (Fouad et al., 2010; Fouad & Kantamneni, 2008; Gushue & Whitson, 2006; Restubog et al., 2010; Turner et al., 2003; Turner & Lapan, 2002).

The fourth issue relates to the translation of the CRPSS from English to Chinese. The CRPSS had already been translated into Chinese and used in one study in Hong Kong (Cheng & Yuen, 2012). This first translated version was found to have four factors, similar to the original structure proposed by Turner et al. (2003). The translated version was also found to have adequate reliability when used with participants in Hong Kong (Cheng & Yuen, 2012). However, there are differences between Hong Kong and mainland Chinese students in terms of family influences and interactions, language, and the educational system. These differences are due, in

part, to Hong Kong's past history as a British colony until 1997, and the different dialects spoken (Cantonese in Hong Kong and Mandarin in mainland China; Leung et al., 2011). We therefore thought it necessary to closely consider the suitability of the wording of scale items when applied to individuals in mainland China. As we report elsewhere in this article (see Study 1), we made modifications to the language for some items.

We conducted the current study to ascertain the suitability of the translated CRPSS instrument for use with mainland Chinese technical education students and to evaluate its reliability and validity. Specifically, our study had four aims: (a) to evaluate the previously reported factor structure of the CRPSS using two competing models: a correlational model (four-factor solution originally hypothesized by Turner et al., 2003) and a bifactor solution with a main general factor and four specific group factors, (b) to examine any measurement variance across genders, (c) to investigate any gender differences in career-related parental support, and (d) to provide evidence of concurrent and convergent validities by relating scores on the newly adapted CRPSS to variables of connectedness to parents, career exploration self-efficacy, and career aspiration [AQ 8: This comes as a surprise. Please add the information that career aspiration was used to determine validity where you explain that connectedness to parents and self-efficacy were measured.].

Study 1: Exploratory Factor Analysis

Method

Participants. A total of 309 participants provided usable data for the study (M_{age} = 19.3 years; *SD* = 1.3; range: 18–24 years). We took into account sociodemographic information (gender, grade, majors) to achieve a representative and balanced sample when recruiting participants. Male students comprised two-thirds of the sample (67.30%). Participants were

drawn from two technical colleges in Shenzhen (69.9%[AQ 9: Please ensure all these numbers include a second decimal]) and Zhuhai (30.1%), with 87.3% from the Program for Senior Skilled Workers, and 12.7% from the Program for Probationary Technicians.[AQ 10: Please confirm that this information would not be sufficient to identify participants in the study. If it could help identify participants, then present the information in a more general manner.]

Measure. The original CRPSS (Turner et al., 2003) is a 27-item scale that examines four dimensions of career-related support from parents: (a) instructional assistance, (b) career-related modeling, (c) verbal encouragement, and (d) emotional support. The scale uses a 5-point Likert-type response format, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) for each item. A higher score indicates a greater level of perceived support. The CRPSS (mainland Chinese version) was adapted based on the previously carefully translated and back-translated Hong Kong Chinese version (Cheng & Yuen, 2012). We made slight changes to the Hong Kong version for items 4, 5, 6, 13, 19, 22, and 26, to enhance the items' suitability for mainland Chinese participants. For example, for Item 5, which originally read "My parents help me do my homework,"), homework was translated into "功课" rather than "家课." [AQ 11: Please indicate what the difference signifies for readers who do not understand written Chinese.] Another example is Item 26, "Sometimes my parents and I get excited when we talk about a great job I might have someday", for which the translation of "sometimes" was revised from "时当" to mainland Chinese "有时当" for better understanding[AQ 12: Here again, please help the reader understand the cultural nuance you are describing.. The second author (Y. M.; one of the designers of the Hong Kong version) then reviewed and approved all revisions. Cronbach's alpha values for the four subscales of the CRPSS ranged from .75 to .87 in the original English version

(Turner et al., 2003), from .85 to .88 in the Hong Kong Chinese version (Cheng & Yuen, 2012), and from .79 to .87 in our mainland Chinese version.

Procedure. Teachers collected data from the students using the CRPSS questionnaires during class periods. Teachers completed the assessments within 15 minutes. Before collection, participants signed consent forms and were informed that their answers would be confidential and used only for research purposes.

Results[AQ 13: Please note that information about JASP was deleted from this section because usually information about software is not included in published articles in TCP. Also, please note that according to APA style, data are presented in a table or in the text, but not both. Therefore, the data presented in Tables 1 and 2 were deleted from the text.]

We conducted an EFA using principal axis factoring with a Promax rotation. A Kaiser-Meyer-Olkin value of .93 and Bartlett's test of sphericity, $\chi^2(351) = 4099.33$, $p < .001$, suggested factorable data. We selected a four-factor solution based on (a) the number of factors with initial eigenvalues larger than 1 (see Table 2) and (b) the results of a parallel analysis (Horn, 1965; O'Connor, 2000). In addition, the four-factor solution was consistent with SCCT in emphasizing the four main sources of information that enhance an individual's self-efficacy (Bandura, 1977, 1997; Lent et al., 1994, 2000; Turner et al., 2003).

The criterion we used for item retention was a factor loading higher than .40 (Hinton, McMurray, & Brownlow, 2014). As a result, we deleted three items (Items 16, 21, and 27) with factor loadings lower than .40. The other 24 items loaded at .45 or higher on their respective factors, and almost all had cross-loadings lower than .30 (see Table 1). The exceptions were Items 10, 22, and 24, due to an overlap in meaning between statements. However, we did not delete these three items, as they had a factor loading of .50 or higher. Instead, we revised the

language of Items 22 and 24 before collecting data for the CFA, to more closely adhere to the meanings in the original English version. We did not revise Item 10 because its highest factor loading reached .64, which was .28 higher than the second highest factor loading. According to Worthington and Whittaker (2006), an item is acceptable if the difference between the first and the second highest factor loadings is greater than .15.

The EFA factor solution indicated that the 24 selected items loaded on four factors, consistent with the original version of the CRPSS (Turner et al., 2003), accounting for 60.03% of the total variance. As Table 1 shows, the internal consistency of the subscales was acceptable (George & Mallery, 2003). Lastly, we calculated correlations across the four subscales and total scale scores. The results indicated that the subscales were significantly, positively intercorrelated (see Table 2); similarly, the correlations between the subscales and full-scale scores were also positive and statistically significant. Given these indications of an acceptable scale, we sought further confirmation of scale structure in Study 2. However, we also noted that the correlations across factors were larger than .40, and the ratio of the first eigenvalue to the second was larger than 3.00 (Cho et al., 2015), suggesting a possible bifactor model for the CRPSS. Thus, we assessed the correlational and the bifactor models in Study 2, to test for a possible better factor solution.

Study 2: Confirmatory Factor Analysis and Construct Validity

Our objective in Study 2 was to cross-validate the four-factor solution of the 24-item CRPSS mainland Chinese version using CFA with a new sample of technical education students. We also aimed to (a) examine a possible bifactor structure of the CRPSS, (b) determine any measurement variance across genders, (c) explore any gender differences in career-related parental support, and (d) examine the convergent and concurrent validity of the scale.

Method

Participants. As in Study 1, we used demographic information (gender, grade, and majors) to achieve a balanced sample. Initially, 818 students participated in the second survey (response rate: 96.2%). Of these participants, 787 provided usable data with less than 10% missing values (Bennett, 1999). The students were enrolled at four technical colleges in four cities: Shenzhen (56.4%), Zhuhai (21.2%), Zhongshan (11.8%), and Guangzhou (10.6%)[AQ 14: Please add the second decimal value.], all in Guangdong Province, China. The sample was composed of 56% male and 44% female students, M_{age} =19.4 years, SD = 1.2 , range: 18–25 years [AQ 15: Please add the second decimal value.]).

To avoid participant fatigue, the various components used for the concurrent validity assessment were completed by different subgroups of participants. First, 197 participants (M_{age} = 19.3; SD = 1.1[AQ 16: Please add the second decimal value.], range: 18–22 years) completed the connectedness to parents subscale of the Hemingway: Measure of Adolescent Connectedness (Karcher, 2011). These participants were from Shenzhen, and 65.5% [AQ 17: Please report the number of men] were men (M_{age} = 19.3, SD = 1.1, range: 18 to 22 years) [AQ 18: Please add the second decimal value.] In addition, 637 participants (M_{age} = 19.5 years, SD = 1.2, range: 18–25 years) [AQ 19: Please add the second decimal value.]completed certain items from the Career Exploration Self-Efficacy Subscale (CESS) and the talent development self-efficacy subscales (TDSS) from the Career and Talent Development Self-Efficacy Scale (Fan et al., 2013; Yuen et al., 2010) as well as the Career Aspiration Scale—Revised (Gregor & O'Brien, 2016). The majority of these participants were men (61.9%)[AQ 20: Please add the second decimal value.], and attended three technical colleges in Shenzhen (64.5%),[AQ 21: Please add the second

decimal value.] Zhuhai (23.1%)[AQ 22: Please add the second decimal value.], and Guangzhou (12.4%).[AQ 23: Please add the second decimal value.]

Measures. We used the revised 24-item CRPSS (Chinese Version) to measure students' perceptions of career-related parental support. Eight items covered instrumental assistance, seven items career-related modeling, four items verbal encouragement, and five items emotional support. Participants were asked to rate their perception of career-related parental support using a 5-point Likert-type scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater parental support for career development. Cronbach's alpha values for the subscales in this study ranged from .85 to .88.

We measured connectedness to parents using a six-item subscale from the Hemingway: Measure of Adolescent Connectedness (Karcher, 2011). Participants noted their responses using a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*very true*). This scale had been used previously in Hong Kong and had revealed acceptable reliability and validity (Yuen & Yau, 2015). We evaluated the scale's factor structure using CFA. After deletion of Item 4 (a negative item with a very low factor loading of -.104), results showed an acceptable model fit based on criteria from Quintana and Maxwell (1999) and Hu and Bentler (1999). The revised model fit was acceptable, χ^2 (5) = 18.52[AQ 24: Please report the associated p–value.], comparative fit index (CFI) = .96, RMSEA = .12, standardized root mean square residual (SRMR) = .04. The Cronbach's alpha value for the scale was .82.

We measured career exploration self-efficacy and talent development self-efficacy using the CESS (six items) and TDSS (six items) from the Career and Talent Development Self-Efficacy Scale (Fan et al., 2013; Yuen et al., 2010) first developed in Hong Kong. We used the CESS to measure student competencies related to exploration of career paths, goals, and

relationships between career path and study life[AQ 25:This sentence is a little unclear – please revise it to improve clarity.]. We used the TDSS to measure student capabilities related to academic subjects and extracurricular activities. This scale has a six-point Likert-type scale ranging from 1 (*extremely lacking in confidence*) to 6 (*extremely confident*).

CFA results indicated an acceptable model fit for both subscales (Hu & Bentler, 1999). For the CESS, the model provided acceptable fit, χ^2 (9) = 55.47[AQ 26: Please report the associated p–value.], CFI = .96, RMSEA = .11, SRMR = .03. The value of the RMSEA, which is greater than 0.8, indicates a possible validity issue in this measurement. However, given that the CFI and SRMR meet the criteria of good model fit (Browne & Cudeck, 1993;[AQ 27: Publication year does not match References section entry – please check and correct.] Hu & Bentler, 1999), we regard the CESS as a valid tool for use in this study. For the TDSS, the model fit was also acceptable, χ^2 (6) = 6.52, [AQ 28: Please report the associated p–value.] CFI = .10, RMSEA = .01, SRMR = .01. In this study, the Cronbach's alpha values for the CESS and TDSS were .87 and .85, respectively.

We used the Career Aspiration Scale—Revised (CAS-R; Gregor & O'Brien, 2016) Chinese version to measure students' educational, achievement, and leadership aspirations. The original CAS-R is a 24-item scale with eight items for each category. Respondents rate their aspirations using a 5-point Likert-type scale (0 = *not at all true for me*, 4 = *very true for me*). To create the Chinese version, the scale was translated into Chinese and then back-translated by two professional translators in Chinese and English. The scale's wording was revised until consensus was reached.[AQ 29: a) who made the changes? b) consensus of whom?]

Our CFA results indicated that the Chinese version of the CAS-R had an acceptable model fit after deleting five items (Items 2, 4, 12, 20, and 22) with very low factor loadings (less

than .30), χ^2 (145) = 714.63, CFI = .90, RMSEA = .09, SRMR = .05[AQ 30: Please report the associated p–values.]. The Chinese version of CAS-R consisted of 19 items, with an eight-item educational aspiration subscale, a six-item achievement aspiration subscale, and a five-item leadership aspiration subscale. Internal consistency coefficients were acceptable for the total scale (α = .95) and for the three subscales (educational aspiration, α = .91; achievement aspiration, α = .87; leadership aspiration, α = .84).

Procedure. The survey was administered in two formats during class periods—pencil-and-paper (87%) and identical questions online (13%), both supervised by teachers[AQ 31: Please clarify whether the same students took the version in the two different formats or students in one class took the assessment in a different format than students in the other class]. Every effort was made to create a similar environment and conditions for students taking the survey in the two formats. Participants completed the assessments within 25 minutes. They were informed that they could stop participating at any time, and that their answers were confidential, neither right nor wrong, and would only be used for research purposes.

We conducted preliminary *t*-tests that indicated no statistically significant differences between the two forms of administration for subscale scores or for the total CRPSS ($p > .05$), which suggests that the two approaches yielded similar results. However, the online survey method was more efficient and time-saving during the data collection process.

Results

A preliminary analysis showed that the rates of random missing items ranged from 0.1% to 0.6%; [AQ 32: Please include second decimal place.]therefore, we handled missing values using the full information maximum likelihood method (Schlomer, Bauman, & Card, 2010). A second preliminary analysis confirmed that the data were normally distributed based on skewness values

ranging from 0.07 to -1.28, and kurtosis values ranging from -0.83 to 2.38. According to Byrne (1998), absolute values of skewness that are less than 2, and values of kurtosis that are less than 7, suggest a normal distribution.

Confirmatory factor analysis. According to Pesaran and Weeks (2004), models such as Mk and M1 are considered non-nested if it is not possible to derive Mk (or M1) from the other model, either by means of an exact set of parametric restrictions or as a result of a limiting process. Thus, to find a possibly different factor structure solution for CRPSS, we compared the fit of two non-nested competing models: (a) a correlation model comprising four factors, and (b) a bifactor, orthogonal model. Regarding the criteria for goodness of fit in non-nested models, smaller values for AIC and BIC suggest a better model fit (Burnham & Anderson, 2004).

Results from Study 1 indicated that factor loadings of Item 24 were large (> .39) on both Factor 1 (Instructional Assistance) and Factor 4 (Emotional Support). Therefore, we tested two possible non-nested models separately: Item 24 loaded on Factor 1 (Model 1) and on Factor 4 (Model 2). Results for Model 2 yielded a better fit than Model 1 in both the correlational and bifactor models (results available upon request). As Table 3 indicates, the AIC and BIC values were lower for the bifactor model. In the bifactor model, each item significantly loaded on both the specific and general factors (Table 1 and Figure 1); in addition, the goodness of fit indices were acceptable. Thus, we retained Model 2 for further data analysis.

Ancillary bifactor measures. As the bifactor model represented the best fit to the data, we assessed the ancillary bifactor indices to provide more nuanced evidence of the dimensionalities as well as reliability of the CRPSS total and subscale scores. In order to determine dimensionality, we calculated the explained common variance for the general factor (ECV), the ECV for each factor, the individual item ECV (I-ECV), and the percent of

uncontaminated correlations (PUC). ECV is a ratio value that represents the percentage of common variance (variance of both the general and group factors) attributable to the general factor (Rodriguez, Reise, & Haviland, 2016a). A larger ECV value (such as 0.70 and above) indicates a strong general factor and suggests the common variance is unidimensional (Rodriguez et al., 2016a). The ECV for the general CRPSS factor was 0.57, reflecting that 57% of the common variance was attributable to the general CRPSS factor, with the remaining 43% spread across CRPSS factors. The ECV of the four factors ranged from 0.07 to 0.18, meaning that only 7% to 18% of the common variance was related to specific factors (see Table 4).

The I-ECV is computed at the item level, identifying the percentage of item common variance attributable to the general CRPSS factor. An I-ECV larger than 0.80 or 0.85 indicates that an item reflects the general factor more than group factors (Rodriguez, Reise, & Haviland, 2016b). The I-ECV values of the 24-item CRPSS ranged from 0.26 to 1.00. Items 2, 4, 6, 7, and 8 had I-ECV values larger than 0.80 (see Table 1). The average I-ECV was 0.58, indicating that items in subscales measured the general CRPSS factor to a stronger degree than they did in the intended specific factor. [AQ 33; The I-ECV value is less than 0.80, thus this sentence contradicts the second sentence of this paragraph – is there perhaps a typo in the value? Also, the sentence is unclear - please revise.]

The PUC is another important diagnostic that helps determine whether the bifactor data are unidimensional or multidimensional (Rodriguez et al., 2016a). A higher PUC (such as 0.70) indicates less bias in structural coefficients, and thus indicates that the instrument can be treated as unidimensional (Rodriguez et al., 2016a). The PUC value was 0.76 for this model.

For model-based reliability, we assessed omega coefficients, including omega for the total score (ω), omega for the subscales (ω_S), omega hierarchical (ω_H), and omega hierarchical

subscales (ω_{HS}; Reise, 2012; Rodriguez et al., 2016a, 2016b). The first ω refers to the proportion of total score variance that can be attributed to all common factors (i.e., variance of the general factor plus all group factors); ω_S refers to the proportion of variance of the total and the corresponding subscale scores attributable to the general and the corresponding factor. Higher ω and ω_S scores represent better reliability of the total scale and subscales. ω_H refers to the proportion of total score variance that can be attributed to individual differences in the general factor. A ω_H value higher than 0.80 suggests that the majority of the reliable variance can be attributed to a single general factor (Rodriguez et al., 2016a). A ω_{HS} value signifies the proportion of subscale score variance that can be attributed to a corresponding factor after partitioning the variance of the general factor. A lower ω_{HS} value suggests that a higher proportion of the CRPSS score variance can be attributed to the general factor (Rodriguez et al., 2016a).

In this study, all ω and ω_S values were higher than 0.93 (see Table 4), indicating that a general factor and the four intended specific factors explained more than 93% of the reliable variance. The ω_H value was 0.80, suggesting that 80% of the total CRPSS variance could be attributed to the general factor. According to McDermott et al. (2017), ω_H divided by ω represents the reliable (true) score variance. We found that 85% (0.80/0.94) of the reliable variance in the career-related parental support total score was due to the general factor, meaning that only 15% (1.00-0.85 = 0.15) could be attributed to the four subscales, and that the four specific factors only accounted for 2% to 8% of their corresponding subscale's true score variance. These results, therefore, suggested that we could use the raw CRPSS total score to represent the general career-related parental support construct.

Measurement invariance.

We evaluated the measurement invariance of the bifactor CRPSS model across genders by comparing three nested models step by step (i.e., models examining the configural, metric, and scalar invariance). Configural invariance signifies that the constructs of the measurement (such as the number of items in each factor) are equal across groups, metric invariance indicates that all factor loading parameters are equal across groups, scalar invariance implies that factor loadings and intercepts of all items are equal across groups. Cheung and Rensvold (2002) proposed that (a) if configural invariance exists, metric invariance can then be tested, and (b) if metric invariance exists, scalar invariance can then be assessed.

We used the following criteria to assess the relative fit indexes of two nested models: (a) the overall model fit must be acceptable (Little, 1997), and (b) the change in CFI between the two nested models must be smaller than or equal to .01 (indicating that the null hypothesis of invariance should not be rejected; Cheung & Rensvold, 2002).

Our results (last three rows in Table 3) suggest that the model fit indexes of all of the measurement invariance models were acceptable. The ΔCFIs between the two nested models were smaller than .01, indicating that configural, metric, and scalar invariances existed in the bifactor CRPSS model across genders. These results suggest that participants of both genders interpreted, conceptualized, and responded to all the items in this scale in the same way.

Mean-level gender differences in latent factors.

After confirming the measurement invariance of CRPSS across genders, we further compared the latent mean-level gender differences in M*plus* 7.4 (Muthén & Muthén, 1998-2017). By fixing the means of the general factor and the four specific subfactors (equaling 0) in the baseline group (male), at the same time letting those in the alternative group (female) vary freely, we found significant ($p < .05$) gender differences in the emotional support subfactor. Female students perceived more emotional support then males (results available upon request).

Convergent and concurrent validity. We assessed the convergent validity of the CRPSS by examining the associations between the latent variable scores of the general CRPSS factor, the four specific subfactors of CRPSS, and the questionnaire assessing connectedness to parents. The model fit indices were inadequate, χ^2 (344) = 715.34, CFI = .87, TLI = .85, RMSEA = .07[AQ 34: Please report the associated p–values.], SRMR = .07; however, we maccepted them because our focus was on correlation coefficients among latent variables rather than testing a model. We found that the variable of connectedness to parents was significantly and positively correlated with the general factor ($r = .59$, $p < .001$), providing evidence of convergent validity (see Table 5).

We evaluated the concurrent validity of CRPSS by examining the correlations between five selected latent variables, namely educational aspiration, achievement aspiration, leadership aspiration, talent development self-efficacy, and career exploration self-efficacy. The model fit indices were not adequate, χ2 (1367) = 3636.04, CFI = .89, TLI = .88, RMSEA = .05, and SRMR = .04 [AQ 35: Please report the associated p–values.]; however, again, we accepted them given that our focus was on correlation coefficients among latent variables rather than on testing a model.

Consistent with our proposed bifactor structure, which suggests that a general factor explains most of the variance, our results indicated that correlation coefficients between general factor and all validity variables were larger (r =.25–.42, p < .001) than those for the four group factors (see Table 5). In particular, the general factor had a stronger association with career self-efficacy than career aspiration. These results provided sufficient evidence of concurrent validity.

Discussion

Our primary aim in this study was to provide evidence of the psychometric properties of the CRPSS (Chinese version) based on data from students attending four technical colleges in cities in Guangdong Province, China. We conducted two separate studies. In Study 1, we used EFA to determine the factor structure of CRPSS and to refine the existing items for a Chinese version. In Study 2, we confirmed the factor structure by conducting a CFA with another sample of technical education students. We identified a bifactor model and assessed ancillary bifactor measures to determine dimensionality and model-base reliability. We tested measurement invariance across genders, examined gender differences in career-related parental support, and evaluated construct validity of the CRPSS.

In Study 1, our EFA results indicated the same four factors as in the original version of CRPSS. The four-factor solution of the Chinese version has not only an empirical basis but also a solid theoretical basis. Based on the SCT and the SCCT, which both highlight the significance of self-efficacy, CRPSS measures parents' assistance to their children in the form of exposure to four sources of support that may enhance self-efficacy. These four sources of support (the four factors) can be identified as providing instructional assistance, career-related modeling, verbal encouragement and emotional support, all delivered with the intention of enhancing children's career-related self-efficacy and their likelihood of achieving success.

In the Chinese version of CRPSS, 24 out of the original 27 items form the basis for the scale. These 24 items evidenced high loadings on their corresponding factor and provided good evidence of internal consistency. This finding differs from that reported in an earlier study using the CRPSS Hong Kong Chinese version, which had resulted in the removal of one different item (Item 9; Cheng & Yuen, 2012) versus our removal of Item 27.

Notably, we found high interfactor correlations, consistent with other research evidence (Alliman-Brissett et al., 2004; Raque-Bogdan et al., 2013; Turner et al., 2003). Further CFA analyses indicated that the bifactor structure of CRPSS (with four group factors and a general career-related parental support factor) had a better model fit than the structure of the correlational model suggested in previous studies (Cheng & Yuen, 2012; Turner et al., 2003). This finding is significant because it helps elucidate the issue of the construct-relevant multidimensionality of CRPSS (Reise, 2012). Our ancillary bifactor measures results suggest that CRPSS scores are primarily driven by the general factor. This finding implies the unique value of conceptualizing and evaluating career-related parental support in two ways. Conceptually, it helps simplify the understanding of the concept of career-related parental support by identifying the general factor extractable from four specific factors. Practically, our findings suggest researchers may use the total (or average) score of CRPSS for research when evaluating the career-related parental support; equally well, researchers may still use subdomain constructs as latent variables in a structural equation modeling context (McDermott et al., 2017), as these constructs have good evidence of reliability.

Measurement invariance existed across genders, indicating that males and females had the same ability to perceive and reflect upon types of parental support. On further examination of gender differences in parental support, we found that female students perceived more emotional

support from parents than did male students, similar to findings by Hu (2009) [AQ 36: Year does not match entry in References section – please check and correct.] and Raque-Bogdan et al. (2013). However, our results did not show that females, as compared to males, reported more career-related modeling and verbal encouragement from their parents (Turner et al., 2003). The characteristics of technical education students and their families may account for this gender difference, but the exact nature of any supportive interactions between male and female students and their parents is worthy of further exploration.

To provide evidence of CRPSS construct validity, we evaluated the association between the latent variables of the four group factors and the general factor of CRPSS with validity variables (connectedness with teachers, educational, leadership, and achievement aspirations; career exploration and talent development self-efficacy)[AQ 37:This sentence is difficult to follow – please revise.]. The latent variable score of the general CRPSS factor indicated significantly positive correlations with all validity variable scores, consistent with the results reported in previous research in which CRPSS was found to have good concurrent and convergent validity (Alliman-Brissett et al., 2004; Raque-Bogdan et al., 2013; Turner et al., 2003).

Limitations

The limitations for our studies include the lack of test-retest reliability evidence for the CRPSS; further research is needed to determine the consistency of students' responses over time. In addition, some measures we used (e.g., Hemingway: Measure of Adolescent Connectedness, CESS, TDSS, and CAS-R) lacked information on validity for use in mainland China, although these measures had been validated previously in Hong Kong. It could be argued that they were not the best criterion-related measures against which to validate CRPSS. In future research,

measures should be used that have prior evidence of validity from mainland Chinese samples. As a third limitation, we collected data from two related studies conducted in a Chinese setting. To provide further validation, cross-sectional and longitudinal studies should include other mainland Chinese communities. In future research, it would be useful to explore differences between career development support from fathers and from mothers in China, as the findings reported in studies conducted in other settings (e.g., McWhirter et al., 1998; Zhang et al., 2015) have suggested potential differences in the influence of paternal versus maternal support on career development.

Implications

The validation of a Chinese version of the CRPSS is significant because this tool can help researchers and educators gain new insights into career-related parental support in a Chinese context. We identified a bifactor structure for CRPSS, suggesting that the four subscales actually measure aspects of a general CRPSS factor rather than each measuring distinctly separate factors. Thus, when using the scale for counseling purposes with individual students or small groups, it may be permissible to interpret an individual's total CRPSS score as a sufficiently reliable indication of overall career-related parental support (Gu & Wen, 2017; McDermott et al., 2017; Rodriguez et al., 2016a). As suggested by McDermott et al. (2017), examining each subscale may be also profitably employed in revealing useful information in individual cases[AQ 38: Please revise this sentence to improve its clarity.]. School counselors, educational psychologists, career counselors, and social workers may gain more information on students' perceptions of parental support based on results from CRPSS. When necessary, this may lead to implementing strategies (such as parent counseling) to increase support for individuals. This type of intervention is especially relevant to Chinese technical education students, as well as other

students who come from disadvantaged family backgrounds with access to fewer career resources and less social capital (Blustein et al., 2002; Bryant et al., 2006; Zhang et al., 2015).

Information obtained from CRPSS, particularly the four types of career-related parental support identified in the original and the Chinese version, could have potential applications for parent education courses to help parents understand different types of support and improve their support skills. It is important that parents from low socioeconomic environments seek out community resources such as financial assistance and career information for their sons and daughters. However, even when parents from low socioeconomic backgrounds cannot provide sufficient instrumental and financial assistance, they can still support their children's career development through positive emotional support and verbal encouragement. For all students, this type of encouragement from parents can strengthen career aspiration and self-efficacy. Knowledge of the four types of parental support could also provide new insights for career guidance counselors when they discuss the possible influence of the family system on students' career development.

An additional implication of this study is related to the study procedure. We applied two types of methods of administrating the survey—the paper-and-pencil and the online formats. As there were no significant differences in the raw total and subscale scores of CRPSS across survey methods, we recommend using online survey in future studies, as this was more efficient during the data input process.

In sum, we have provided evidence for the reliability as well as the concurrent and construct validity of the CRPSS when used with Chinese technical education students. CRPSS is best represented by a bifactor model that is primarily driven by a general career-related parental support factor. We established gender measurement invariance, suggesting that the scale can be

used to reveal any significant differences between males and females in certain perceptions of parental support. More studies adopting this tool are needed to further examine the cross-cultural reliability and validity of CRPSS.

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Table 1

Factor Loading of EFA, CFA, and I-ECV in Studies One and Two [AQ 39: Please clarify – not all are included for Study 1 or for Study 2]

Factor	Study 1: EFA				Study 2: CFA					
	F1	F2	F3	F4	F1	F2	F3	F4	GEN	I-ECV
Factor 1: Instructional Assistance										
PS1. My parents reward me for doing my school work well. 当我妥善完成校内的功课后，父母会奖赏我。	.54	.00	-.14	.11	.45	0	0	0	.38	.42
PS2. My parents teach me things that I will someday be to use at my job. 父母会教我一些将来工作中会用到的知识。	.69	-.11	.19	-.06	.13	0	0	0	.62	.96
PS3. My parents help me pick out classes that will help me in my career. 父母会帮我选一些有助于我的职业发展的课程。	.66	.02	-.04	.06	.38	0	0	0	.58	.70
PS4. My parents give me chores that teach me skills I can use in my future career. 父母会让我做日常杂务,从而教我日后就业中可能用到的技能。	.45	.10	.23	-.16	.05	0	0	0	.57	.99
PS5. My parents help me do my homework. 父母会协助我做功课。	.75	.01	-.19	-.01	.55	0	0	0	.39	.33
PS6. My parents let me do activities outside of school that teach me future job-related skills. 父母会让我参与一些能提高我未来的工作技能的课外活动。	.78	-.16	.17	-.10	.28	0	0	0	.63	.84
PS7. My parents talk to me about how what I am learning will someday be able to help me on the job. 父母会告诉我现在所学的东西对将来工作有什么帮助。	.64	-.07	.17	.03	.02	0	0	0	.71	1.00
PS8. My parents help me take pride in my work. 父母会帮助我在工作中建立自豪感。	.69	.11	.01	.02	.20	0	0	0	.74	.93
Factor 2: Career-related Modeling										
PS9. My parents tell me about their jobs. 父母会告诉我有关他们的工作。	.29	.48	.10	-.06	0	.34	0	0	.60	.76
PS10. My parents show me the kind of things they do at work. 父母会向我展示他们工作中所做的事情。	.36	.64	-.16	-.05	0	.39	0	0	.59	.70
PS11. My parents have taken me to their work. 父母曾经带我到他们工作的地方。	-.14	.81	-.02	-.06	0	.51	0	0	.33	.29
PS12. My parents have had me meet someone they work with. 父母会让我跟他们的同事会面。	-.04	.77	-.05	-.01	0	.48	0	0	.35	.35

Factor	Study 1: EFA				Study 2: CFA					
	F1	F2	F3	F4	F1	F2	F3	F4	GEN	I-ECV
PS13. My parents have shown me where they work. 父母会告诉我他们在哪里工作。	-.25	.69	.22	.07	0	.60	0	0	.44	.35
PS14. My parents tell me about things that happen to them at work. 父母会告诉我他们工作上所发生的各种情况。	.11	.61	.01	.07	0	.66	0	0	.48	.35
PS15. My parents tell me about the kind of work they do. 父母会告诉我有关他们工作的类别。	.00	.63	.14	.03	0	.62	0	0	.52	.41
Factor 3: Verbal Encouragement										
PS17. My parents encourage me to learn as much as I can at school. 父母会鼓励我在校内尽我所能去学习。	.03	-.01	.80	-.02	0	0	.55	0	.45	.40
PS18. My parents encourage me to make good grades. 父母会鼓励我争取好成绩。	-.04	.02	.88	-.01	0	0	.68	0	.40	.26
PS19. My parents encourage me to go to a technical school or college or get a job after I graduate. 父母会鼓励我在毕业后继续升学或就业。	.12	.09	.50	.14	0	0	.51	0	.42	.40
PS20. My parents told me they expect me to finish school. 父母会告诉我他们期望我完成学业。	-.09	.07	.58	.15	0	0	.66	0	.47	.33
Factor 4: Emotional Support										
PS22. My parents talk to me when I am worried about my future career. 当我为将来就业的问题感到忧虑时，父母会与我倾谈。	.06	-.07	.36	.51	0	0	0	.32	.63	.79
PS23. My parents say things that make me happy when I learn something I might use in a job Sometime. 当我学习对我将来就业有所需的知识时，父母会说些令我高兴的话。	.28	.06	-.01	.52	0	0	0	.61	.59	.49
PS24. My parents talk to me about what fun my future job could be. 父母告诉我将来我的工作会有哪些乐趣。	.52	-.03	-.21	.39	0	0	0	.44	.61	.66
PS25. My parents tell me they are proud of me when I do well in school. 父母告诉我他会为我在校内表现良好而感到骄傲。	.02	.09	.07	.60	0	0	0	.45	.58	.62
PS26. Sometimes my parents and I get excited when we talk about a great job I might have someday. 偶尔当我和父母谈到我将来可能找到一份非常好的工作时，我们都会感到兴奋。	-.04	-.06	.19	.71	0	0	0	.38	.58	.71

Note. CFA = confirmatory factor analysis; EFA = exploratory factor analysis; GEN = general factor of career-related parental support; I-ECV = item-explained common variance.

Table 2

Descriptive Statistics and Correlations of the 24-item Career-Related Parental Support Scale Subscales: Study 1 (N = 309)

Factors	F1	F2	F3	F4	Mean	*SD*	α	Initial Eigenvalue	% of variance each eigenvalue is of the total[a]
F1: Instrumental support	-	-	-	-	27.61	5.86	.86	9.07	37.78%
F2: Career-related modeling	.49***	-	-	-	26.47	5.09	.87	2.52	10.49%
F3: Verbal encouragement	.48***	.56***	-	-	20.62	3.15	.86	1.77	7.37%
F4: Emotional support	.65***	.52***	.61***	-	15.01	2.78	.79	1.05	4.38%
Total	.85***	.81***	.76***	.81***	89.63	13.80	.93	-	60.03%

[a]Percent of variance accounted for before rotation.
***$p < .001$.

Table 3

Measurement Model Indices of Fit

Model	*N*	χ2	*Df*	CFI	ΔCFI	TLI	RMSEA	SRMR	AIC	BIC
Correlational[a]	787	974.72	243	.920			.06	.05	44599.18	44977.31
Bifactor (orthogonal)[a]	787	848.97	225	.931			.06	.05	44509.43	44971.59
Configural invariance[a,b]	787	1197.21	450	.920			.07	.05	44512.62	45436.93
Metric invariance[a,b]	787	1288.44	493	.914	-.006		.06	.07	44517.85	45241.43
Scalar invariance[a,b]	787	1323.14	512	.913	-.001		.06	.07	44514.55	45149.43

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; TLI = Tucker-Lewis Index.

[a]*p*-value of $\chi^2 < .001$.

[b]The total sample size was 787, with 441 males and 346 females, and there were 12 missing value in gender. [AQ 40: Please clarify whether the 12 with missing gender were included in the analysis.]

Table 4

The Ancillary Bifactor Indices of the CRPSS=CV

	General factor	F1: Instrumental support	F2: Career-related modeling	F3: Verbal encouragement	F4: Emotional support
ECV	.57	.07	.18	.08	.10
PUC	.76	-	-	-	-
ω	.94	.93	.94	.93	.93
ω_H	.80	.03	.08	.02	.03
ω_H/ω	.85	.03	.08	.02	.03

Note. ECV = explained common variance; PUC = percent of uncontaminated correlations; ω = omega; ω_H = omega hierarchical.

Table 5

The Correlations of the Latent Variables of the Total and Group Levels of Career-Related Parental Support with Validation Variables

	Connectedness to parents *(N* = 197*)*	Leadership aspiration *(N* = 637*)*	Achievement aspiration *(N* = 637*)*	Educational aspiration *(N* = 637*)*	CE-SE *(N* = 637*)*	TD-SE *(N* = 637*)*
F1: Instrumental support	.12	.01	.02	.19*	.14	.13
F2: Career-related modeling	.10	.04	.07	.03	.02	.06
F3: Verbal encouragement	.22**	.23***	.24***	.16**	.15**	.13*
F4: Emotional support	-.29**	.04	.08	.15*	.12	.13
General factor	.59***	.25***	.32***	.29***	.42***	.38***

Note: CE-SE = *Career exploration self efficacy*; TD-SE = *Talent development self efficacy*
*$p < .05$. **$p < .01$. ***$p < .001$.

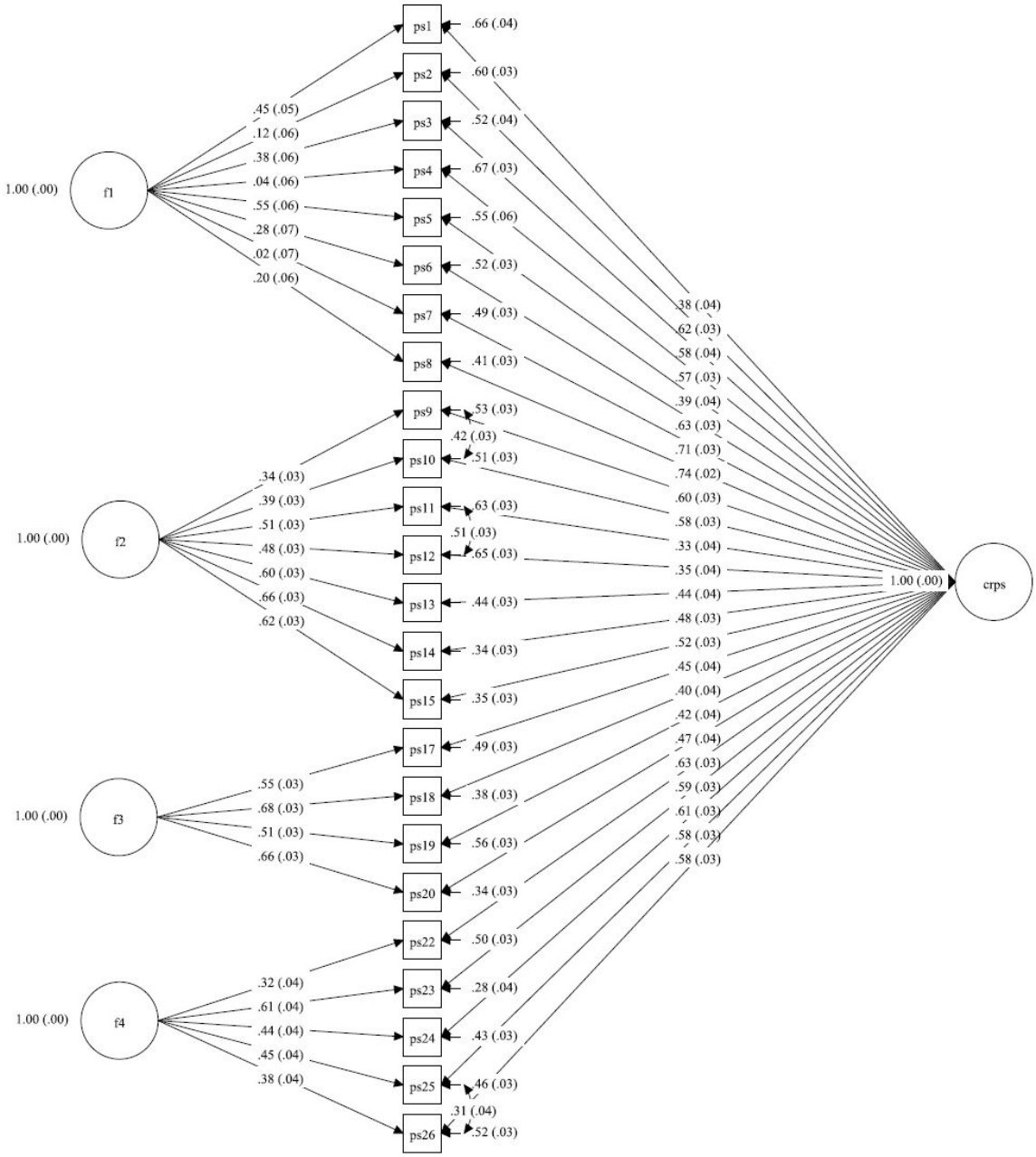

Figure 1. Factor loadings for bifactor model of the Career-Related Parental Support Scale. All factor loadings are standardized and significant at $p < .001$. F1 = instructional assistance; F2 = career-related modeling; F3 = verbal encouragement; F4 = emotional support; CRPS = general factor.