
Title	Construct, convergent and discriminant validity of the Beach Center Family Quality of Life Scale for Singapore
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Source	<i>Infants and Young Children</i> , 32(3), 201-214
Published by	Lippincott, Williams & Wilkins

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Waschl, N., Xie, H., Chen, M., & Poon, K. K. (2019). Construct, convergent, and discriminant validity of the Beach Center Family Quality of Life Scale for Singapore. *Infants and Young Children*, 32(3), 201-214. <http://dx.doi.org/10.1097/IYC.000000000000145>

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Construct, convergent and discriminant validity of the Beach Center Family Quality of Life

Scale for Singapore

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Conflicts of Interest and Source of Funding: Data used in this paper is from a study funded by a grant from the Ministry of Social and Family Development, Singapore entitled Factors Affecting the Child and Family Outcomes of EIPIC in Singapore.

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[Construct,_Convergent,_and_Discriminant_VValidity.5.aspx](https://journals.lww.com/iyjournal/Abstract/2019/07000/Construct,_Convergent,_and_Discriminant_VValidity.5.aspx)

The citation for the final published version is as follows:

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Postprint

Abstract

Family quality of life (FQoL) constitutes an important aspect of early intervention. However, the culture bound nature of this construct necessitates validation of FQoL measures when being used in a culture different from the one in which they were developed. This study sought to understand the psychometric properties and construct validity of the Beach Center FQoL (BCFQoL) scale in Singapore. Data from 307 caregivers of children in an early intervention programme were used. These caregivers completed the BCFQoL scale and external validity measures of family outcomes, psychological distress and life situation. Confirmatory factor analysis and correlations were used to examine the factor structure and convergent and discriminant validity of the BCFQoL scale. Results indicated support for five FQoL dimensions and a higher-order FQoL factor. External convergent and discriminant validity, as well as internal statistical discriminant validity of the individual BCFQoL dimensions were supported. Despite evidence of internal statistical discriminant validity, there was little variation in the strength of the relationships between individual BCFQoL dimensions and the various external validity measures. Overall, the results of this study support the use of the BCFQoL scale as a valid measure of FQoL in Singapore.

Keywords: Family quality of life; Early intervention; Family outcomes; Intellectual disability

The family context is important as the proximal context where child development occurs, however the family context can be impacted by a child's developmental delay. Therefore, family context factors are important outcome measures with regard to child disability and early intervention services. Specifically, family quality of life (FQoL) has been recognised since the late nineties as contributing to family outcomes for families of children with disabilities (Bailey et al., 1998; Dunst & Bruder, 2002) and has since been conceptualised as an outcome for developing and evaluating programmes, services, and policies for children with disabilities (C. Y. Chiu, Seo, Turnbull, & Summers, 2017; Meral, Cavkaytar, & Turnbull, 2013; Summers et al., 2007). Family quality of life can be defined as: "a dynamic sense of well-being of the family, collectively and subjectively defined and informed by its members, in which individual family-level needs interact" (Zuna et al., 2010, p. 262).

In order to assess FQoL, adequate evidence for the validity of its measurement must exist. The Beach Center's Family Quality of Life Scale (BCFQoL; Beach Center on Disabilities, 2006; Hoffman, Marquis, Poston, Summers, & Turnbull, 2006) assesses the family's perceptions of five different FQoL dimensions: parenting, family interactions, emotional wellbeing, physical and material wellbeing, and disability-related support. The first four dimensions consider the general roles of the family as a social unit, and the fifth is specifically relevant to families with children with disabilities. While the BCFQoL scale has demonstrated good psychometric properties for the general USA population, its factor structure and validity could differ across groups culturally, economically and diagnostically (Hoffman et al., 2006). The World Health Organization defines (individual) quality of life as culturally dependent (World Health Organization, 1997), therefore it follows that FQoL is likely to be similarly culturally-dependent.

Consequently, there has been substantial international interest in the validation of the BCFQoL scale cross-culturally. The psychometric properties of the scale have been investigated in several languages and cultures, including French (Rivard et al., 2017), Spanish (Balcells-Balcells, Gine, Guardia-Olmos, & Summers, 2011; Verdugo, Cordoba, & Gomez, 2005), Greek (Parpa et al., 2016), Turkish (Meral & Cavkaytar, 2013), Chinese (X. Hu, Wang, & Fei, 2012) and Taiwanese (S. J. Chiu, Chen, Chou, & Chien, 2017; C. Y. Chiu et al., 2017). This research has largely supported the cross-cultural validity of the five-factor structure of the BCFQoL scale. However, a three-factor structure was found to be more appropriate in the Greek population (Parpa et al., 2016) and although the factor structure was confirmed in the Quebecoise French and Chinese populations, there were some issues with model fit (Rivard et al., 2017) and strength of factor loadings (X. Hu et al., 2012). Together, these cross-cultural studies suggest that although it is likely that the BCFQoL measure will be valid in different populations, it cannot be assumed. Further evidence for this measure's validity cross-culturally would not only provide further support for FQoL as an internationally valid construct, but also enable greater understanding of how this construct operates cross-culturally.

The present study firstly considers whether the previously reported five-factor structure of the BCFQoL scale can be replicated in Singapore. Although the BCFQoL scale can generally be administered in English for Singaporeans, Singapore presents an interesting case study for the validity of the measure given its diverse population and blend of Eastern and Western philosophy and culture. The construct of FQoL is inherently linked to the wider ecological environment of the child and family (see C. Y. Chiu et al., 2013); and research suggests cultural perceptions related to disability differ across cultures (Ravindran & Myers, 2012). Previous research into the validity of the BCFQoL scale in Eastern cultures has generally supported its validity (S. J. Chiu

et al., 2017; C. Y. Chiu et al., 2017; X. Hu et al., 2012). However, given that C. Y. Chiu et al. (2017) considered only a short version of the BCFQoL scale, and X. Hu et al (2012) reported issues with factor loading strength, the measure's validity in Eastern cultures requires further investigation. Furthermore, some aspects of the environment in which families exist are more unique to Singapore specifically; for example, the size of the country means that extended family members are often more easily available.

Secondly, in validating a measure it is necessary to ensure good convergent and discriminant validity. Convergent validity concerns the degree to which a measure is related to other measures of similar constructs, while discriminant validity considers the degree to which a measure can be differentiated from measures of conceptually distinct constructs (Campbell & Fiske, 1959; Strauss & Smith, 2009). The concepts of convergent and discriminant validity can refer to relationships with external measures but can also refer to internal relationships among scores on different dimensions of a construct (Campbell & Fiske, 1959).

In the case of internal relationships between BCFQoL dimensions, the concepts of convergent and discriminant validity consider the extent to which the five individual dimensions measure a single overarching FQoL concept (convergent validity), while also measuring separable dimensions of this overarching concept (discriminant validity). This is important, because on the one hand, total scores on the BCFQoL scale can be interpreted as a summary of the family's overall quality of life, while on the other hand subscale scores can also be interpreted individually. For both of these interpretations to be valid, there needs to be both an overarching FQoL factor as well as separable FQoL dimensions.

Results from previous studies provide mixed evidence regarding internal convergent validity, reporting both some support for a general FQoL factor (S.J. Chiu et al., 2017; C. Y.

Chiu et al., 2017), and also evidence of worsened model fit when including a second-order general FQoL factor (Rivard et al., 2017). In terms of internal discriminant validity of the five BCFQoL dimensions, C. Y. Chiu et al. (2017) reported that statistically, the five dimensions were distinct, however, few papers have investigated this. Thus, the issues of internal convergent and discriminant validity of this measure require further attention generally, and also in the specific case of cross-cultural adaptation.

There is some existing evidence for the external convergent validity of the BCFQoL scale. Positive and significant relationships have been identified between BCFQoL dimensions and family functioning and resources (Hoffman et al., 2006), and between BCFQoL total score and a single-item FQoL question (S. J. Chiu et al., 2017), while negative correlations have been found between BCFQoL and parenting stress (Rivard et al., 2017). However, there is a need for further evidence of external convergent and discriminant validity of the BCFQoL scale in Asian countries. S. J. Chiu et al.'s (2017) study only used one single-item criterion measure in assessing convergent validity, and other Asian studies did not report external convergent and discriminant validity information (C. Y. Chiu et al., 2017; X. Hu et al., 2017).

Finally, although C. Y. Chiu et al. (2017) provided some evidence of internal statistical discriminant validity of the five BCFQoL dimensions, these authors did not consider the degree to which the different dimensions may be differentially related to certain outcomes, and thus the practical utility, or substantive discriminant validity, of the individual dimensions. For example, Hoffman et al. (2006) found a significant correlation specifically between the BCFQoL dimension of family interaction and an external measure of family functioning. However, Parpa et al. (2016) found all three BCFQoL dimensions identified showed a substantial and significant correlation with family functioning, suggesting a potential lack of internal substantive

discriminant validity in terms of the relationships of different BCFQoL dimensions with different outcomes. Again, this issue therefore requires further investigation generally, and also in the context of cross-cultural adaptation.

Consequently, this study sought to:

- 1) Confirm the five-factor structure of the BCFQoL scale in Singapore, in order to provide further evidence for the cross-cultural utility of this measure in the Asian context;
- 2) Investigate evidence for the internal statistical convergent and discriminant validity of the five BCFQoL dimensions, in order to provide further statistical information regarding the utility of a total BCFQoL score as well as of individual subscale scores;
- 3) Investigate evidence for the external convergent and discriminant validity of the five BCFQoL dimensions and total score, in order to provide further information regarding the substantive utility of the BCFQoL generally and;
- 4) Investigate evidence for the internal substantive discriminant validity of the five BCFQoL dimensions, in order to provide further information regarding the substantive utility of the individual BCFQoL dimensions.

Method

Participants

Participants were 404 child-caregiver dyads who were participants in a larger study. The current study uses data from 307 caregivers for which complete item-level data was available on the BCFQoL scale. Children of these caregivers were aged five to eighty-two months old ($M =$

46, $SD = 15$) and the majority (74%) of child participants were male. All children were enrolled in one of 15 Early Intervention Programme for Infants and Children (EIPIC) centres in Singapore. Within these centres, the children receive early intervention services provided by a transdisciplinary team of early childhood special educators, psychologists, and therapists in a specialized environment (see Poon & Lim, 2012, and Poon & Yang, 2016 for a description). All children would have exhibited significant developmental concerns (typically global developmental delay or sufficient signs for the referring pediatrician to suspect autism spectrum disorder) but a comprehensive assessment is typically conducted later just before school entry so diagnosis and severity of disability are not reported.

Most survey respondents were mothers (73%), followed by fathers (21%), others, such as grandparents (4%), and both parents (1%).

Measures

Participants completed several measures upon entry into the larger study. The vast majority of surveys were completed in English, but Mandarin, Malay and Tamil versions were available. These versions were translated into the target language and back-translated to ensure accuracy. Information regarding the proportion of the sample who completed the measures in each language was not available. Data included in the current study were collected on the following measures:

Family Quality of Life. The BCFQoL scale (Beach Center on Disabilities, 2006) consists of 25 items assessing satisfaction with five dimensions of family quality of life (family interaction, parenting, emotional wellbeing, physical and material wellbeing and disability-

related support). Each item is rated on a Likert scale from 1-5 (“Very dissatisfied” to “Very satisfied”). Item-level data was used for factor analysis, while sum total and sum subscale scores were used for assessing convergent and divergent validity.

Psychological Distress. The Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond, 1995) consists of three scales measuring depression, anxiety and stress, respectively. This study used the 21-item short form of the DASS with 7 items per scale, rated on a 4-point frequency scale (“Does not apply”, “Some of the time”, “A good part of the time”, “Most of the time”). Sum total and sum subscale scores on this measure were used.

Family Outcomes. The Singapore adaptation of the Family Outcomes Survey – Revised (Bailey et al., 2011; Poon, Ooi, Bull, & Bailey, 2014) assesses five different family outcomes for families of children with disabilities: 1) understanding the child’s strengths, abilities and special needs; 2) knowing their rights and advocating effectively for the child; 3) helping the child develop and learn; 4) having support systems; and 5) accessing desired services and activities in the community. Each outcome is measured by 4 to 5 questions answered on a 5-point Likert scale (“Not at all” to “Completely”). Sum total and sum subscale scores on this measure were used.

NEILS Optimism and Life Situation questions. Three single-item measures from the National Early Intervention Longitudinal Study (NEILS; Hebbeler et al., 2007) were used to measure caregiver optimism and the family’s current and future life situation:

- 1) Optimism: “How agreeable are you with the following statement? The early intervention professionals make me feel optimistic and hopeful about my child’s future.”

Answer options: Strongly disagree, Disagree, Agree, Strongly agree

- 2) Current situation: “Thinking about your family’s overall life situation now, would you describe it as ...”

Answer options: Excellent, Very good, Fair, Poor, Don’t know

- 3) Future situation: “Looking forward to the future, do you expect that your family’s overall life situation will be:”

Answer options: Excellent, Very good, Good, Fair, Poor, Don’t know

Questions one and two were scored on a four-point Likert scale from 1-4, while question three was scored on a five-point Likert scale from 1-5. Responses indicating “Don’t know” were treated as missing.

Analysis

Confirmatory Factor Analysis. To examine the factor structure of the BCFQoL scale, confirmatory factor analysis (CFA) was conducted using Mplus 8 (Muthen & Muthen, 1998-2017). A robust maximum likelihood estimator (MLM) was used due to non-normality of item distributions. Acceptable fit was indicated by a comparative fit index (CFI) or Tucker Lewis index (TLI) $\geq .95$, root mean square error of approximation (RMSEA) $\leq .06$ and standardized root mean square residual (SRMR) $\leq .08$ (L. T. Hu & Bentler, 1999). These fit statistics were used to compare the fit of the single-factor and five-factor BCFQoL models.

Internal Statistical Convergent and Discriminant Validity. To examine internal statistical convergent and discriminant validity of the BCFQoL scale, the Santorra-Bentler scaled chi-square was used to compare between models and a $p < .05$ level of significance was applied

as indicating a significant difference in model fit. The first comparison was the single-order five-factor model to the higher-order model with a general FQoL factor, to test the appropriateness of the use of a total BCFQoL score. Subsequently, Wald tests were used to investigate whether the five-factor CFA model fit would worsen when the correlation between different pairs of factors was constrained to 1, indicating the two separate factors measure the same construct. A significantly worse model fit would provide evidence for statistical discriminant validity of the BCFQoL dimensions.

External Convergent and Discriminant Validity. To examine the external convergent and discriminant validity of the BCFQoL scale, correlations between BCFQoL scores and the validity measures (FOS-R, DASS and NEILS questions) were computed using the Psych package (Revelle, 2017) in R (R Core Team, 2017). Percent missing data for validity measures was mostly less than 5%, and thus pairwise deletion was used for correlational analyses.

Good practice suggests that in order to examine evidence for external convergent and discriminant validity, the researcher should have an a priori hypothesis as to the strength and direction of the correlations expected between the measures of interest (Chmielewski, Sala, Tang & Baldwin, 2016; Westin & Rosenthal, 2003). Previous correlations between scores on the BCFQoL and measures of family functioning, resources and quality of life have ranged from $r = .60$ to $r = .86$ (S. J. Chiu et al., 2017; Hoffman et al., 2006; Parpa et al., 2016), while a correlation of $r = -.49$ was reported between BCFQoL and parenting stress (Rivard et al., 2017). Given that family functioning, resources and quality of life may be considered conceptually more highly related to FQoL than the validity variables considered in the present study, we would not expect correlations as strong as those found by S. J. Chiu et al. (2017), Hoffman et al. (2006) and Parpa et al. (2016), but more similar in strength to those reported by Rivard et al. (2017).

Furthermore, given the exploratory nature of the current study the criteria for initial evidence of convergent validity should not be overly stringent. We would expect correlations to be significant but somewhat lower than previous studies. Therefore, the a priori criterion for evidence of convergent validity was set at $r = .40$. For the FOS-R and NEILS life situation questions these correlations would be expected to be positive, while for DASS these correlations would be expected to be negative.

Given that the NEILS optimism question refers to optimism about the child's future rather than optimism about the family's future, this question can be thought of as conceptually distinct to FQoL. Therefore, this question was considered a discriminant validity variable. The magnitude of the correlation for discriminant validity would be expected to be substantially smaller than that expected for convergent validity. Therefore, the a priori expectation for the relationship between BCFQoL scores and NEILS optimism score would be a non-significant correlation below $r = .30$.

Internal Substantive Discriminant Validity. To examine the internal substantive discriminant validity of the five BCFQoL dimensions, correlations between BCFQoL and the validity measures (FOS-R, DASS and NEILS questions) were again inspected. The strength of the correlations between the total BCFQoL score and validity measures were compared to the strength of the correlations between individual BCFQoL dimensions and validity measures. If there was a substantial difference between the strength of these correlations, this would provide evidence of substantive discriminant validity. For a correlation of $r = .40$, and a sample size of 307, the 95% confidence interval for the correlation would range from $r = .30$ to $.49$, a difference of up to $r = .10$. Therefore, the a priori criterion for evidence of substantive internal discriminant validity was a difference between correlations of $r = .10$.

Results

Descriptive Statistics

Table 1 presents the descriptive statistics for all 25 items on the BCFQoL scale. Responses indicated a general feeling of satisfaction with quality of life with 50-87% of respondents indicating that they were “satisfied” or “very satisfied” on the items.

[Insert Table 1 here.]

Confirmatory Factor Analysis

Next, the construct validity of the BCFQoL scale was examined via CFA. Firstly, the factor structure of each dimension was examined individually. Fit statistics indicated excellent fit in nearly all cases, with CFI and TLI $\geq .97$ and SRMR $\leq .03$. RMSEA was $\leq .06$ for all cases except the disability-related support factor, for which it exceeded the recommended value (Table 2). However, given the remaining fit indices indicated excellent fit, it can be concluded that overall, each factor showed excellent fit.

Secondly, two models were assessed for the whole BCFQoL scale; a single-factor model where all items loaded on a general FQoL factor and a five-factor model where all items loaded on their respective BCFQoL dimension. The five-factor model demonstrated superior fit to the one-factor model (see Table 2). Although the CFI and TLI values were slightly lower than the a priori threshold of .95 (L. T. Hu & Bentler, 1999) for the five-factor model, the RMSEA and SRMR of .06 were acceptable. In some cases, the accepted rules of thumb for the cut-off values

for these fit indices may be too restrictive (see Marsh et al., 2004 for a discussion). Therefore, given that CFI and TLI values were greater than .90 and were similar to some of those reported previously (S. J. Chiu et al., 2017; C. Y. Chiu et al., 2017; Rivard et al., 2017; Zuna et al., 2009), the five-factor model was deemed acceptable.

[Insert Table 2 here.]

Internal Convergent Validity

Following confirmation of the five-factor structure, this five-factor model was compared to a higher-order model including a general FQoL factor. The Santorra-Bentler scaled chi-square difference (S-B χ^2 [df]) indicated that the five-factor model fit statistically significantly better than the second-order model (TRd = 37, $df = 5$, $p < .001$), although there was no corresponding difference in CFI, TLI, RMSEA or SRMR. This statistically significant chi-square difference appeared to be due to the disability-related support factor. When a four-factor model (second-order Ind. 1-4) excluding the disability-related support items was compared to the corresponding second-order model, the second-order model did not show significantly worse fit (TRd = 1.7, $df = 2$, $p = .434$).

Inspection of the factor loadings in the second-order model indicated the disability-related support factor showed a substantially lower loading on the general factor than did the other dimensions. However, exclusion of this factor did not significantly improve model fit, and given its theoretical importance in assessing the FQoL construct, it was retained. Table 3 displays the standardised factor loadings for the second-order model, indicating the amount of

variance in each dimension explained by the general FQoL factor as well as the amount of variance in each item explained by the relevant dimension.

[Insert Table 3 here.]

Internal Discriminant Validity

Next, a series of Wald tests were used to examine internal statistical discriminant validity amongst the five BCFQoL dimensions. Constraining correlations between pairs of factors equal to one in the five-factor BCFQoL CFA model resulted in a statistically significant Wald test ($p < .001$) in all cases except one; for the correlation between parenting and emotional wellbeing, the Wald test was significant at $p = .024$. Therefore, although the BCFQoL dimensions were significantly correlated, none of them were statistically indistinguishable from another. This was also supported by the finding that the five-factor and second-order models fit the data better than the single-factor model.

External Convergent Validity

The relationships between the BCFQoL scale and external convergent validity measures were then investigated. As expected, all BCFQoL scores correlated positively and significantly with all FOS-R scores and the NEILS life situation questions, while higher BCFQoL scores were negatively and significantly correlated with DASS scores (Table 4).

Correlations between BCFQoL and FOS-R total, FOS-R four and FOS-R five met the a priori criterion for convergent validity, while correlations between BCFQoL and FOS-R one to three generally either met or were approaching the a priori criterion of $r = .40$. The only correlation below $r = .30$ was that between FOS-R one and BCFQoL emotional wellbeing. There was good evidence of external convergent validity between BCFQoL and NEILS life situation questions, with all correlations meeting the a priori criterion except the correlation between NEILS future situation and BCFQoL disability-related support.

There was less evidence for convergent validity of BCFQoL and DASS scores, with correlations between these variables ranging from $r = -.16$ to $-.38$. Generally, the strength of the correlations of all BCFQoL scores except disability-related support with DASS scores were approaching but did not meet the a priori threshold for convergent validity, with $r \leq -.30$. Exceptions to this were BCFQoL parenting and DASS anxiety and BCFQoL physical and material wellbeing and DASS anxiety. None of the correlations between BCFQoL disability-related support and DASS approached the criterion for convergent validity.

External Discriminant Validity

The correlations between all BCFQoL scores and the external divergent validity question, NEILS optimism, were significant but of low magnitude, meeting the a priori threshold for discriminant validity in terms of strength of correlation.

Internal Substantive Discriminant Validity

Although there was evidence for internal statistical discriminant validity, there was less evidence for internal substantive discriminant validity of the five dimensions (see Table 4). Generally, the strength of the correlations between individual BCFQoL dimensions and each validity measure were similar to that of the correlations between total BCFQoL score and each validity measure. The differences between the correlations of total BCFQoL score with validity measures and BCFQoL dimensions one to four with validity measures ranged from $r = .00$ to $r = .09$, with the exception of the correlations between BCFQoL family interaction and FOS-R total and accessing services and activities in the community, which differed by $r = .12$ and $.13$. Therefore, only two of these correlations met the a priori criteria for internal substantive discriminant validity. Disability-related support tended to show lower correlations with all validity measures than did the other dimensions, with absolute differences ranging from $r = .01$ to $r = .18$.

[Insert Table 4 here.]

Discussion

The present study sought to confirm the factor structure of the BCFQoL scale for the context of Singapore, as well as to investigate evidence for internal and external convergent and discriminant validity of the BCFQoL scale and its five dimensions. The structure reported by Hoffman et al. (2006), and supported cross-culturally (Balcells-Balcells et al., 2011; S. J. Chiu et

al., 2017; Verdugo et al., 2005) was again supported in our context. Evidence was found for internal statistical convergent and discriminant validity amongst the BCFQoL dimensions. Generally, BCFQoL scores correlated significantly and in the expected direction with family outcomes (FOS-R), psychological distress (DASS) and life situation (NEILS life situation questions), providing some initial evidence for external convergent validity. Additionally, correlations between BCFQoL scores and the NEILS optimism question were of low magnitude, providing evidence for external discriminant validity. However, there was little evidence for substantive internal discriminant validity, with all individual dimensions tending to demonstrate a correlation of similar magnitude with validity measures. The exception to this was the BCFQoL disability-related support dimension, which tended to demonstrate lower correlations across the board.

With regard to factor structure and internal convergent validity of the BCFQoL, previous research had provided conflicting findings regarding the fit of a second-order BCFQoL model and recommended this model be further investigated (C. Y. Chiu et al., 2017; Rivard et al., 2017). The current results support Rivard et al.'s (2017) contention that although the second-order BCFQoL model demonstrated significantly worse fit to the data than the first-order model, its overall fit was acceptable and therefore the general FQoL factor may still be useful. Although the higher-order model demonstrated statistically significantly worse fit according to the chi-square difference, there was no change in other fit indicators and results of the external convergent and internal substantive discriminant validity analyses indicate that the general FQoL factor is useful.

In the current study, the disability-related support factor had a substantially lower loading on the higher-order FQoL factor than the other four dimensions. C. Y. Chiu et al. (2017)

investigated the validity of the BCFQoL scale excluding the disability-related support items and reported that the BCFQoL is a valid measure when these items are excluded. Results from the present study also support this. However, although disability-related support was somewhat separable from other dimensions, it continued to demonstrate a substantial relationship with these other dimensions and is substantively meaningful in assessing FQoL of families with a member with disability. For this reason, it would be recommended that this dimension remain a part of this scale.

Correlations between the BCFQoL dimensions and validity measures were in the expected directions, and generally met or approached the a priori criterion for evidence of convergent validity. The strength of these correlations was weaker than expected, however the current results provided some initial exploratory evidence for external convergent validity of the BCFQoL measure in Singapore. As expected, optimism showed a weak correlation with BCFQoL, although significant. Again, this provided some initial exploratory evidence for external discriminant validity.

Statistically, there was evidence of internal discriminant validity of the individual BCFQoL dimensions, as indicated by the Wald tests and the superior fit of the multi-factor models when compared to a single-factor model. However, substantively there was less evidence for internal discriminant validity of the dimensions. The strength of the relationships between each individual BCFQoL dimension and the validity measures was very similar across all dimensions with the exception of disability-related support. One interpretation is that this could indicate a halo effect and suggests there may be limited practical utility in measuring these dimensions separately.

However, although there was little evidence for substantive internal discriminant validity of the BCFQoL dimensions with the variables considered in this study, the methods used to create the scale should be considered. This scale was created based on consideration of qualitative data concerning the different aspects of FQoL (Poston et al., 2003) and data regarding family members' perceptions of the importance of different FQoL elements (Park et al., 2003). This would suggest that the different BCFQoL dimensions could be meaningful in some way that the current study was unable to disentangle with the measures used, or the time at which they were administered. For example, although FQoL can be used to measure outcomes of early intervention, all measures in this study were completed at entry to early intervention as a baseline measure of family functioning. It is therefore possible that the relationships between BCFQoL and family outcomes, psychological distress and life situation may differ when measured after service provision. Additionally, the fifth dimension of the BCFQoL scale is focused on disability-related supports. At entry to early intervention families may have had limited opportunities to determine their satisfaction with disability-related supports.

Potential limitations of this study include the fact that the large majority of respondents to the BCFQoL scale were mothers, and therefore the responses may not be representative of the family. Although this is not unusual for studies concerning the BCFQoL (e.g. C. Y. Chiu et al., 2017; S. J. Chiu et al., 2017; Hoffman et al., 2006), it has previously been raised as a potential issue in FQoL research (e.g. X. Hu et al., 2011). However, Wang et al. (2006) reported little difference between mothers' and fathers' responses to this scale. Secondly, although the majority of respondents completed the measures in English, there were some respondents who completed the survey in other languages (Mandarin, Malay or Tamil). Unfortunately, the effect of this could not be investigated in the current study. Finally, the group of children with disabilities in the

present study represented a wide range of different levels of functioning. It may be that the disability-related support dimension would be more highly related to family outcomes, psychological distress and life situation for those families with a member with a more severe disability. There is evidence that severity of disability influences FQoL (X. Hu et al., 2012; Wang et al., 2004). However, further consideration of this issue was beyond the scope of the present study.

The results reported here provide evidence that the BCFQoL scale is a psychometrically valid measure of FQoL in the Singapore context. There is some doubt regarding the usefulness of the individual BCFQoL dimensions in differentially predicting outcomes, with little evidence of internal substantive discriminant validity in terms of the relationships between BCFQoL dimensions and validity measures considered in the present study. Despite this, the five BCFQoL dimensions were found to be statistically distinguishable, and consideration of the development process of this measure indicates that the dimensions may still be practically meaningful. However, current understanding of the substantive discriminant validity of the BCFQoL dimensions cross-culturally may benefit from further qualitative studies of FQoL in other cultures, including in Singapore. Finally, the results provide initial evidence for the convergent validity of this measure in Singapore, finding significant relationships between the BCFQoL dimensions and family outcomes, psychological distress and life situation. These findings demonstrate that this measure can be validly used in research exploring the impacts, antecedents and outcomes of FQoL in Singapore.

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Table 1

Descriptive statistics for BCFQoL items

Item	M (SD)	Skew	Kurtosis	% Very Dissatisfied	% Dissatisfied	% Neither	% Satisfied	% Very Satisfied	FQoL dimension
1.	4.05 (.82)	-1.17	2.20	1	5	9	58	27	FI
2.	3.82 (.77)	-0.90	1.52	1	5	19	62	14	Parent
3.	3.70 (.91)	-0.81	0.70	3	8	22	52	15	EWB
4.	3.53 (.92)	-0.67	0.59	4	7	33	45	11	EWB
5.	3.65 (.90)	-0.62	0.18	2	10	24	50	14	Parent
6.	3.68 (1.03)	-0.76	0.20	4	9	21	45	20	PMWB
7.	3.72 (.96)	-0.93	0.85	4	7	20	51	18	FI
8.	3.87 (.78)	-0.78	1.34	1	4	20	58	18	Parent
9.	3.72 (.86)	-0.68	0.63	2	7	25	52	15	EWB
10.	3.74 (.94)	-0.88	0.85	3	7	21	51	18	FI
11.	3.78 (.91)	-1.00	1.26	3	6	18	55	17	FI
12.	3.99 (.90)	-1.07	1.60	3	3	17	48	30	FI
13.	3.42 (.97)	-0.48	0.06	5	10	35	39	11	EWB
14.	3.83 (.83)	-0.97	1.70	2	4	19	58	17	Parent
15.	4.01 (.80)	-1.08	2.25	2	3	14	56	25	PMWB
16.	3.76 (.88)	-0.66	0.38	1	8	22	51	18	PMWB
17.	3.72 (.86)	-0.70	0.82	2	6	26	51	15	Parent
18.	3.87 (.80)	-0.81	1.40	1	4	21	56	18	FI
19.	3.76 (.82)	-0.80	1.14	2	5	23	55	15	Parent
20.	3.65 (.94)	-0.65	0.29	3	9	25	47	16	PMWB
21.	4.16 (.70)	-0.85	2.07	1	1	11	56	31	PMWB
22.	3.64 (.81)	-0.49	0.95	2	3	36	47	12	DRS
23.	3.65 (.80)	-0.19	0.17	1	4	38	43	14	DRS
24.	3.61 (.80)	-0.30	0.47	1	4	38	44	12	DRS
25.	3.75 (.79)	-0.54	1.06	2	2	32	50	15	DRS

Note. $N = 307$. Range 1-5. BCFQoL = Beach Center Family Quality of Life; FI = Family Interaction; Parent = Parenting; EWB = Emotional Wellbeing; PMWB = Physical and Material wellbeing; DRS = Disability-Related Support

Table 2

Confirmatory factor analysis fit indices

	S-B χ^2 (df)	<i>p</i>	SCF	CFI	TLI	RMSEA	SRMR	Cronbach's α
Whole Scale								
One Factor	1127.05 (275)	< .001	1.57	.76	.74	.10	.08	.96
Five Factors	544.09 (265)	< .001	1.58	.92	.91	.06	.06	
Second-Order	572.47 (270)	< .001	1.57	.92	.91	.06	.06	
Second-Order Ind. 1-4	426.20 (185)	< .001	1.65	.91	.90	.07	.05	
Individual Dimensions								
1. FI	14.68 (9)	.100	1.88	.99	.99	.05	.02	.91
2. Parent	20.67 (9)	.014	1.83	.98	.97	.07	.03	.89
3. EWB	2.28 (2)	.321	2.63	1.00	1.00	.02	.02	.78
4. PMWB	0.97 (5)	.965	2.07	1.00	1.00	.00	.01	.84
5. DRS	8.90 (2)	.012	2.33	.99	.97	.11	.02	.93

Note. $N = 307$. FI = Family Interaction; Parent = Parenting; EWB = Emotional Wellbeing; PMWB = Physical and Material wellbeing; DRS = Disability-Related Support; S-B = Santorra-Bentler; SCF = Scaling correction factor; CFI = Comparative fit index; TLI = Tucker Lewis index; RMSEA = Root mean square error of approximation; SRMR = Standardized root mean residual.

Table 3

Standardised factor loadings for second-order model

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	General FQoL
Family Interaction						.91
Item 1	.66					
Item 7	.74					
Item 10	.85					
Item 11	.91					
Item 12	.85					
Item 18	.75					
Parenting						1.00
Item 2		.72				
Item 5		.71				
Item 8		.79				
Item 14		.82				
Item 17		.73				
Item 19		.76				
Emotional Wellbeing						.97
Item 3			.81			
Item 4			.70			
Item 9			.60			
Item 13			.65			
Physical and Material wellbeing						.85
Item 6				.58		
Item 15				.83		
Item 16				.78		
Item 20				.68		
Item 21				.72		
Disability-Related Support						.62
Item 22					.87	
Item 23					.95	
Item 24					.88	
Item 25					.80	

Table 4

Correlations between BCFQoL and NEILS questions, DASS and FOS-R

	Total FQoL	Family Interaction	Parenting	Emotional Wellbeing	Physical and Material wellbeing	Disability- Related Support	<i>N</i>
Future Situation	.45***	.41***	.40***	.40***	.40***	.33***	292
Optimism	.18**	.19***	.14*	.13*	.18**	.17**	306
Current Situation	.63***	.55***	.60***	.59***	.56***	.45***	299
DASS: Depression	-.39***	-.38***	-.35***	-.38***	-.34***	-.23***	298
DASS: Anxiety	-.31***	-.32***	-.26***	-.30***	-.28***	-.16*	299
DASS: Stress	-.36***	-.34***	-.31***	-.36***	-.31***	-.23***	300
DASS: Total	-.38***	-.37***	-.33***	-.38***	-.32***	-.22***	294
FOS-R 1: Understanding child's strengths, abilities and special needs	.37***	.32***	.36***	.28***	.30***	.33***	307
FOS-R2: Knowing rights and advocating for child	.45***	.37***	.41***	.42***	.38***	.39***	305
FOS-R 3: Helping child develop and learn	.40***	.33***	.39***	.33***	.31***	.35***	305
FOS-R 4: Support systems	.61***	.51***	.56***	.61***	.53***	.43***	300
FOS-R 5: Accessing services and activities in the community	.53***	.40***	.45***	.44***	.58***	.42***	301
FOS-R Total	.62***	.50***	.57***	.55***	.56***	.51***	293

Note. *** $p < .001$; ** $p < .01$; * $p < .05$. Spearman correlations are reported for correlations between FQoL and NEILS questions (Future Situation, Optimism, Current Situation). BCFQoL = Beach Center Family Quality of Life; NEILS = National Early Intervention Longitudinal Study; DASS = Depression, Anxiety and Stress Scale; FOS-R = Family Outcomes Survey – Revised.