Reliability and validity of the Tilburg Frailty Indicator (TFI) among Chinese community-dwelling older people

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ABSTRACT

Objective: To translate the Tilburg Frailty Indicator (TFI) into Chinese and assess its reliability and validity.

Methods: A sample of 917 community-dwelling older people, aged ≥60 years, in a Chinese city was included between August 2015 and March 2016. Construct validity was assessed using alternative measures corresponding to the TFI items, including self-rated health status (SRH), unintentional weight loss, walking speed, timed-up-and-go tests (TUGT), making telephone calls, grip strength, exhaustion, Short Portable Mental Status Questionnaire (SPMSQ), Geriatric Depression scale (GDS-15), emotional role, Adaptability Partnership Growth Afection and Resolve scale (APGAR) and Social Support Rating Scale (SSRS). Fried's phenotype and frailty index were measured to evaluate criterion validity. Adverse health outcomes (ADL and IADL disability, healthcare utilization, GDS-15, SSRS) were used to assess predictive (concurrent) validity.

Results: The internal consistency reliability was good (Cronbach's α = 0.71). The test-retest reliability was strong (r = 0.88). Kappa coefficients showed agreements between the TFI items and corresponding alternative measures. Alternative measures correlated as expected with the three domains of TFI, with an exclusion that alternative psychological measures had similar correlations with psychological and physical domains of the TFI. The Chinese TFI had excellent criterion validity with the AUCs regarding physical phenotype and frailty index of 0.87 and 0.86, respectively. The predictive (concurrent) validities of the adverse health outcomes and healthcare utilization were acceptable (AUCs: 0.65–0.83).

Conclusions: The Chinese TFI has good validity and reliability as an integral instrument to measure frailty of older people living in the community in China.

1. Introduction

Populations are growing older in countries throughout the world. China has the largest number of an older population (143.86 million in 2015), and has become one of the fastest aging populations in the world (Li, 2015). Frailty is considered to be the most important challenge with population aging (Kinsella & Phillips, 2005), it has a significant influence on social and health care.

Frailty increases the risk of adverse outcomes, including falls, disability, hospitalization, and institutionalization, low quality of life, eventually mortality (Kojima, 2015; Lin et al., 2011; Shamliyan et al., 2013; Vermeulen, Neyens, Van Rossum, Spreeweuenberg, & De Witte, 2011; Wang, Shamliyan, Talley, Ramakrishnan, & Kane, 2013). Thus, to improve the identification and interventions for the adverse outcomes toward frail older people is significant. However, the conceptual and operational definitions of frailty are controversial. The concept of frailty first emerged in the Federal Council on Aging in 1978 (Hogan, MacKnight, & Bergman, 2003). In the process of the development of the concept, there are different opinions about the scope of frailty. On one hand, most of the conceptual and operational definitions of frailty have mainly focused on the physical aspect, but neglected the social and psychological aspects (Gobbens, van Assen, Luijkk, Wijnen-Sponselee, & Schols, 2010a). For instance, Fried's phenotype scale based on the biological model (Fried et al., 2001) only focuses on physical frailty. However, fragmentation of care may result from this kind of purely physical frailty tool. It is less useful for an integrated health-care service for frail elderly (Gobbens, van Assen, Luijkk, Wijnen-Sponselee, & Schols, 2010b). Many researchers favor...
emphasizing the multifactorial nature of the frailty, because the predict-
ability of physical frailty for adverse health outcomes is im-
proved by other factors, such as cognitive impairment (Ávila-Funes
et al., 2009; Rockwood et al., 2006; Rockwood et al., 2005). Frailty
must consider the complex interplay of manifold factors (Markle-
Reid & Browne, 2003; Rolfsone et al., 2006).

Another main dispute is whether the measurements of frailty in-
clude disability and comorbidity. A systematic review showed that
about half the frailty screening instruments included disability or co-
morbidty (Bouillon et al., 2013), especially in the early days
(Sternberg, Schwartz, Karunanithan, Bergman, & Mark Clarfield,
2011). For example, the extant instruments which cover multifactorial
fields such as the Frailty Index (FI) (Rockwood & Mitnitski, 2007) based
on health deficits accumulation, and Groningen Frailty Indicator (GFI)
(Schuurmans, Steverink, Lindenber, Frieswijk, & Slaets, 2004) in-
cluded disability and comorbidity. Nevertheless, frailty, disability and
comorbidity are not synonymous, but rather are distinct clinical entities
(Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Fried et al.,
2001; Gobbens et al., 2010a). Comorbidity is defined as the aggregation
of clinically manifest diseases, different from frailty as the aggregation
of subclinical losses of reserve across multiple physiologic systems
(Fried et al., 2004). Recently many researchers also endorsed disability
in Activities of Daily Living (ADL) as an outcome of frailty, rather than
a component of frailty (Vermeulen et al., 2011).

The Tilburg Frailty Indicator (TFI), a self-reported standardized
questionnaire, has been developed on the basis of an integral con-
ceptual model which describes a relationship between an operational
definition of frailty, life-course determinants, diseases, and adverse
outcomes such as disability, health care use, and death (Gobbens et al.,
2010b). The TFI frailty measure is composed of 15 brief items on
components of frailty excluding disability and comorbidity but invol-
volved three aspects of physical, psychological and social frailty. Ad-
ditionally, the TFI as a self-reported frailty tool can be administered by
flexible ways such as face-to-face interview, mail, or telephone, while
the Fried's phenotype and FI need face-to-face interview due to their
inclusion of objective physical performance measures requiring pro-
fessional expertise. Therefore, the TFI is particularly practical for both
lay persons and professionals.

The original version of the TFI has shown an excellent psychometric
performance in Netherlands' community-dwelling older people (Gobbens,
Luijkkx, Wijnen-Sponselee, & Schols, 2010). Compared with other frailty
instruments, such as the Sherbrooke Postal Questionnaire (SPQ), the
Groningen Frailty Indicator (GFI), and the SHARE-FI, the TFI had su-
ior psychometric properties (Pialoux, Goyard, & Lesourd, 2012). In
addition, the TFI has been translated into multiple languages, such as
Brazilian, Portuguese, German, Italian, Polish, and Danish, and been
widely implemented because of its brevity and simplicity but integration
(Andreassen, Sorenson, Gobbens, Lund, & Aadahl, 2014; Coelho, Santos,
Paul, Gobbens, & Fernandes, 2015; Freitag, Schmidt, & Gobbens, 2015;
Mulasso, Roppolo, Gobbens, & Rabagliaeti, 2015; Santiago, Luz, Mattos,
Gobbens, & van Assen, 2013; Uchmanowicz, Jankowska-Polanska,
Uchmanowicz, Kowalczuk, & Gobbens, 2016). The TFI has been ex-
tensively examined in terms of psychometric properties and has robust
evidence of reliability and validity (Sutton et al., 2016). However, the TFI
has not been used to assess frailty in community-dwelling older people
of China. We translated the TFI into Chinese and examined its psychometric
properties, including the reliability (internal consistency reliability and
test-retest reliability) and validity (construct validity: convergent and
divergent, criterion validity and predictive/concurrent validity), and
identified the feasible cut point for frailty.

2. Methods

2.1. Participants

A sample of 917 older adults aged 60 and older living in the
community was enrolled between August 2015 and March 2016 in the
capital city Jinan of Shandong province in socioeconomic developed
Eastern China. According to the Gross Domestic Product (GDP) of the
nine districts of Jinan City in 2014, three of nine districts within the city
were selected to represent high (Lixia district), moderate (Shizhong
district,) and low economic level (Tianqiao district), respectively. Next,
twelve Community Health Service Centers and five Day Care Centers for
the elderly in the communities were included from a list of centers in
the three districts based on location and size. The elderly living in the
communities were invited to participate in the research. Those unable
to communicate effectively or with severe cognitive impairment
screened by the Short Portable Mental Status Questionnaire (SPMSQ)
(Pfeiffer, 1975) were excluded because of the self-reporting nature of data.
Participants received face-to-face interviews conducted by trained
postgraduate and undergraduate research assistants, and completed the
structured questionnaire and physical performance measurements de-
scribed in the following measures. To determine the test-retest reli-
ability, 103 participants were assessed twice using the TFI within a
10–25 day interval. The study was approved by the Institutional Review
Board of Shandong University, and all participants provided written
informed consent.

2.2. Measures

2.2.1. The TFI

Frailty was assessed by the TFI, a standardized self-reported ques-
tionnaire with 15 items addressing three domains (Gobbens et al.,
2010b). The physical domain consists of eight items corresponding to
physical health, unexplained weight loss, difficulty in walking, balance,
hearing problem, vision problem, and weak strength in hand, and
physical tiredness, ranging from 0 to 8 points. The psychological do-
main consists of four items related to cognition, depressive symptoms,
and coping, ranging from 0 to 4 points. The social domain includes three
items related to living alone, social relations, and social support, ranging
from 0 to 3 points. The total score of the TFI can range from zero to fifteen. A higher score indicates more frailty. The cut-off
for frailty of the original version of the TFI was 5 (Gobbens et al.,
2010b).

We obtained authorization of translation and use of the TFI from the
original author Robbert JJ Gobbens (Gobbens et al., 2010b). The Bri-
slin's (Brislin, 1970) steps for translating were adopted in translation
process. First, forward translation from English into Chinese was car-
ried out by three authors of the study. Second, three Geriatric nursing
experts checked and agreed on a version of the TFI that adapted to
Chinese culture and accurately reflected the original English version
of the TFI. Third, one postgraduate student majoring in translation and
interpreting who was unaware of the original English version of the TFI
completed a back-translation from Chinese to English to establish se-
matic equivalence through comparison. Then, an expert team was
convened for the harmonization process to discuss discrepancies in the
Chinese version until a consensus was reached and the final Chinese
Tilburg Frailty Indicator version was achieved (Appendix in the Sup-
plementary material). A pre-test of 10 older people using cognitive
interviewing was performed to ensure that the elderly could understand
and respond to the translated items in conformity to the intention of the
original TFI, and the results showed a fluent understanding and good
acceptance of each item.

2.2.2. Alternative other measures

Convergent validity and divergent validity are two subtypes of
construct validity. Convergent validity can be established if two similar
constructs correspond with one another, while divergent validity ap-
plies to two dissimilar constructs that are easily differentiated
(Campbell & Fiske, 1959). To examine the convergent and divergent
validity of the Chinese version of the TFI, we selected sound instru-
ments or variables measuring the same constructs as the items from
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