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Naveed, Muhammad Asif and Anwar, Mumtaz Ali, "Evidence on Psychometric Properties of Scales Assessing Information Related Anxieties: A Systematic Review" (2021). *Library Philosophy and Practice (e-journal)*. 4470.

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Evidence on Psychometric Properties of Scales Assessing Information Related Anxieties: A Systematic Review

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Abstract

This systematic review examined the evidence of psychometric properties of scales available in studies reporting surveys measuring information related anxieties such as library anxiety, information seeking anxiety, and information anxiety. A systematic search in four databases such as Web of Science, Scopus, LISA, and LISTA was carried out using the keywords 'library anxiety', 'information anxiety', 'information seeking anxiety', and 'information seeking' AND 'anxiety'. This review included those studies reporting the use of any scale measuring information related anxiety published in the English language and included all type of documents (e.g. journal articles, conference papers, book chapters, theses/dissertations, research reports). The screening process resulted in 45 studies meeting the eligibility criterion. The extracted data included author names, year of publication, type of scale used, scale title, background, type of construct assessed, number of items in the scale, scale origin, studies reporting use, studies contributing psychometric information, scale availability, and psychometric properties reported. The results indicated nine instruments assessing information-related anxieties. The classical test theory was applied for eight instruments. No psychometric properties were reported for a single instrument. Most psychometric instruments were developed in the United States. Face/Content validity through experts, construct validity through exploratory and confirmatory factor analysis, and internal consistency reliability through Cronbach alpha was the most commonly used psychometric analysis. None of these studies applied the Rasch model of modern item response theory for psychometric examination. This review has serious implications on the inferences drawn by the practitioners and researchers based on the earlier assessment of information related anxieties. It suggests the development of standards for not only designing new psychometric tests but also for the use and reporting of such tests. This study contributes to the existing research on information-related anxieties by systematic reviewing the evidence of psychometric properties as no such study available so far.

Keywords: Library anxiety, Information seeking anxiety, Information anxiety, Psychometrics; Reliability, Validity, Scales.

Introduction

Measurement of anxiety associated with information-related tasks has been an essential area of research for information professionals especially those engaged in the provision of information and research services. Several researchers addressed this construct differently with variation in focus. This research area, resultantly, it went through several transitions and represented with

multiple tags such as library anxiety, information seeking anxiety, and information anxiety (Erfanmanesh, Abrizah & Karim 2012; Mellon, 1986, Naveed, 2016, 2017; Naveed & Anwar, 2019, 2020; Wurman, 1989). These distinct but inter-related concepts were explained by Naveed and Anwar (2019) with help of a nested model representing information anxiety as the general and broader concept while nesting information seeking anxiety as its sub-set and library anxiety as a further sub-set. These research topics captured the interest of researchers from different fields and several scales have been developed with a varied focus to measure information related anxieties quantitatively through self-assessment methods. A perusal of published literature resulted in nine self-rating anxiety scales developed mainly in academic settings especially for all levels of college and university students (Anwar, Al-Qallaf, Al-Kandari, & Al-Ansari, 2012; Bostick, 1992; Erfanmanesh, Abrizah & Karim 2012; Van Kampen, 2004). There was only a single scale that was used by only a few researchers in the context of the workplace (Allison, 2006, 2008; Girard, 2005).

Although the usage of self-assessment methods to assess information related anxieties can be debated for their advantages and disadvantages as experts have challenged the results accuracy derived through self-rating methods. The underlying philosophy behind this criticism is that individuals with low skills overstate their abilities without having an empirical basis for their judgment (Rosman, Mayer, & Krampen, 2015). Despite this criticism on self-assessment method, it has a special diagnostic value and continuously been deployed in the existing literature (Anwar, Al-Kandari & Al-Qallaf, 2004; Bostick, 1992; Doris, Provata, & Vraimaki, 2017; Erfanmanesh, Abrizah & Karim 2012; Naveed & Ameen, 2017a, 2017b; Rahimi, & Bayat, 2015; Song, Zhang, & Clarke, 2014; Van Kampen, 2004). The positive outcome of publishing case studies of self-assessment of information anxieties in the professional literature enables information service providers in planning useful directions for need-based information literacy curriculum for anxiety alleviation (Grandy, 2019; Naveed, 2016; Naveed & Ameen, 2016a, 2016b, 2016c).

The intention of research scholars who developed various anxiety scales was to share their experiences and claim that their measurement tests were the best instruments to measure information related anxieties. These researchers invited others to benefit from their efforts and recommended the use of their instruments on different populations having varied geographical locales, contexts, and backgrounds. The quality of such instruments is expressed in terms of their psychometric properties. The exact knowledge of the psychometric characteristics of assessment scales being used is essential as the outcome of scales showing insufficient reliability and validity could not be interpreted correctly. Psychometrics is a science of evaluation for characteristics of psychological tests and its application on assessment tests enables researchers to judge the quality of instruments which can aid researchers and practitioners in selecting a potentially accurate and applicable scale. The underlying theories for the psychometric evaluations included such as classical test theory and the modern item response theory.

Reliability and validity are the fundamental concepts for the classical response theory. Whereas the item response theory models the association between latent traits and responses to test items (Mahmood, 2017a). The reporting of psychometric characteristics of data collection instruments utilized in a particular research study ensures readers about appropriate utilization and interpretation of the scale. It is, therefore, recommended that the psychometric quality should be examined for each time utilization of a measurement scale which will ultimately enhance either its usefulness and credibility or indicated the need for its reconceptualization (Furr, 2011; Mahmood, 2017b). A cross-cultural evaluation of psychometric properties makes the measurement scales as standardized. According to Nunnally and Bernstein (1994), standardized measures have advantages such as objectivity, quantification, communication, economy, and scientific generalization.

A perusal of literature on information related anxieties that this phenomenon was measured mainly through self-assessment methods, a popular subjective method in which individuals report their perceived skill gaps, feelings, emotions, etc. Many case studies on self-assessment reported, but very little has been reported on the evidence of psychometric properties of scales utilized for measurement of anxiety associated with information related tasks. This systematic review aims to collect and review the evidence of the development and use of scales reported in the literature on anxiety associated with information related tasks. This research examined specifically the evidence of psychometric properties of such scales and addressed the following research questions:

1. How many studies reported the utilization of self-assessment scales to measure information related anxiety?
2. Which studies reported information on psychometric properties of scales that they used?
3. What type of psychometric properties were reported in these studies?

Methods and Procedures

The literature on information-related anxieties was scattered in different sources due to its interdisciplinary nature indicating that the citations related to this area needed to be identified from multiple bibliographic databases. A search of four data bases, two generals (e.g. Web of Science and Scopus), and two specialized (e.g. LISTA and LISA), using the following terms: 'library anxiety', 'information anxiety', and 'information seeking anxiety'. Moreover, the term 'information seeking' combining with anxiety using 'AND' was also searched in these four databases. This search was completed in February 2020 resulted in 1609 citations, an encouraging initial sign. The details of the results are indicated in Table 1. The selection of Web of Science and Scopus as general databases was made due to the reason that these bibliographic databases are considered as most comprehensive covering multiple disciplines. Whereas LISTA and LISA were specialized bibliographic databases covering literature in the field of Library Science, Information Sciences, and Information Management. The identified citations were

retrieved and imported to EndNote – the citation management software to deal with a high rate of duplication. These citations were examined one by one to eliminate duplicate and irrelevant citations resulting in 309 unique citations. Besides, the citations from the reference lists of available publications were also identified and accessed using Google Scholar. This process found 80 more citations that were not indexed in the databases searched. Thus, the data set consisting of 389 citations were utilized for analysis and to generate needed statistical reports. It is worth mentioning here that some of these citations were incomplete, lacking vital characteristics that were essential for scientometric analysis. These citations were completed using full-text papers.

Table 1

Number of citations retrieved from various databases

Search Terms	Web of Science	Scopus	LISTA	LISA	Total
“Library Anxiety”	90	141	186	173	590
“Information Anxiety”	26	69	24	26	145
“Information Seeking Anxiety”	06	12	11	06	35
“Information Seeking” AND ‘Anxiety’	319	399	65	56	839
Total	441	621	286	261	1609

Inclusion and exclusion criteria

This review included those studies reporting the use of any scale to measure anxiety associated with information related tasks. No limit for the year of publication was applied for the identification of research studies. Only those studies written in the English language were included. This study included all types of documents such as journal articles, conference papers, book chapters, theses/dissertations, reports for review. However, the documents that reported similar results by the same authors were treated as a single study (e.g. thesis, journal articles, conference papers, and magazine articles). It is worth mentioning here that many studies used self-assessment anxiety scales but did not report any type of information for reliability and validity. All such studies were counted for answering the first question but excluded to answer questions two and three. Studies reporting other than the self-assessment method, literature review, and qualitative nature were excluded from this review.

Study selection and data extraction

Figure 1 presented the four-phase flow diagram explaining the screening process and selection of eligible studies for this review. The screening was done in two stages, title/abstract screening and full-text screening, which resulted in 45 eligible studies included in this systematic review. The extracted data included author names, year of publication, type of scale used, scale title, background, type of construct assessed, number of items in the scale, scale origin, studies

reporting use, studies contributing psychometric information, scale availability, and psychometric properties reported. The common definitions of different types of reliability and validity measures were used by the authors for data extraction and its interpretation. These definitions given in Table 2 were adopted from similar studies in the area of information literacy (Mahmood, 2017a, 2017b).

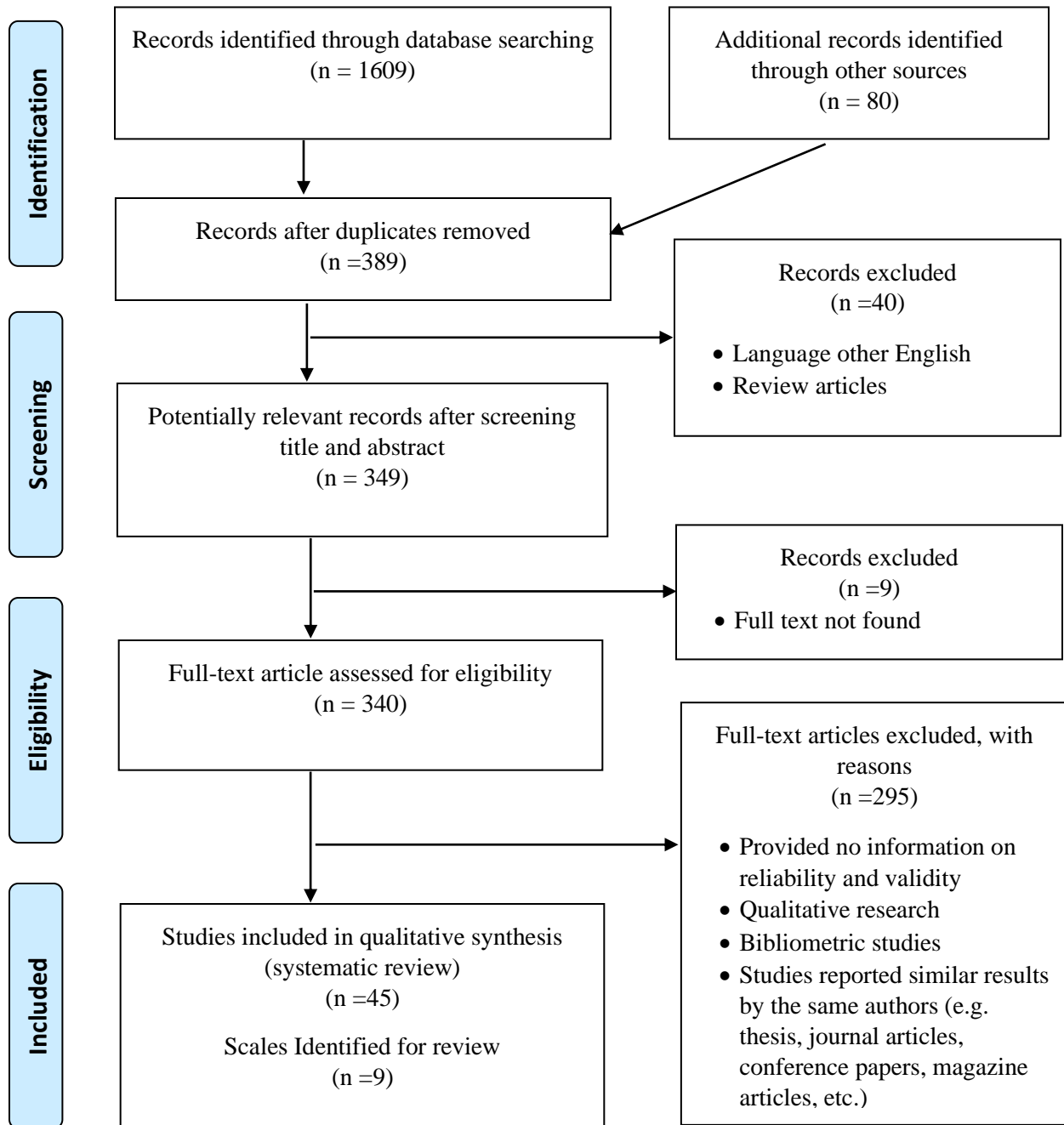


Figure 1. Four-phase flow diagram of the selection procedure for studies

Table 2
Definitions of reliability and validity measures adopted in the review

Psychometric terms	Definition
Internal consistency reliability	How well items reflecting the same construct yield similar results or the degree of inter-relatedness among the items.
Test-retest reliability	The degree to which the same test produces the same results when repeated under the same conditions.
Split-half reliability	Comparing the results of one half of a test with the results from the other half to measure the extent to which all parts of the test contribute equally to what is being measured.
Face validity	The degree to which an instrument accurately represents the skill or characteristic it is designed to measure, according to people's experience and available knowledge.
Content validity	The degree to which the content of an instrument is an adequate <i>reflection</i> of the construct to be measured.
Concurrent validity	The degree to which an instrument produces the same results as another accepted or proven instrument that measures the same variable.
Predictive validity	The degree to which a measure accurately predicts expected outcomes.
Construct validity	The degree to which a test measures the theoretical construct it intends to measure.
Convergent validity	An estimate of the relationship between measures of constructs that are theoretically related.
Criterion validity	The degree to which the scores of an instrument are an adequate <i>reflection</i> of a "gold standard".
Factorial validity	The extent to which factor analysis supports the interrelationship between a set of items on a scale and the domains or the constructs theoretically measured by the scale or subscale structure.
Incremental validity	Determines whether a new psychometric assessment will increase the predictive ability beyond that provided by an existing method of assessment. It seeks to answer if the new test adds much information that might be obtained with simpler, already-existing methods.
Item difficulty	The proportion of examinees who answered the item correctly.
Item response theory	The modern paradigm for the design, analysis, and scoring of tests, questionnaires, and similar instruments measuring abilities, attitudes, or other variables. It does not assume that each item is equally <i>difficult</i> .
Item total correlations	An estimate of the correlation between the individual item score and the overall score of the scale.
Rasch Model	A psychometric model for analyzing categorical data, such as answers to questions on a reading assessment or questionnaire responses, as a function of the trade-off between the respondent's abilities, attitudes, or personality traits and the item difficulty.
Discriminant validity	The extent that measures of constructs that are theoretically unrelated and are independent of one another.

Sources: Adopted from Mahmood (2017a, 2017b)

Results

Overview of studies

A search for literature on information related anxieties in four databases resulted in a total of 1,609 citations. Of these citations, 340 citations were considered relevant after an initial scanning of titles and abstracts. The scanning of full-text paper for these citations resulting in a total of 85 relevant studies meeting eligibility criteria. However, only 45 studies were appeared to report psychometric properties. Most of these studies only reported a measure of internal consistency whereas some studies reported both measures of reliability and validity. There were only a few studies that reported external reliability such as test-retest. The studies reporting either reliability or validity were used for analysis. Table 3 outlined the data extracted from the selected 45 studies that contributed in the reporting of psychometric properties. The year of publication of these studies ranged between 1992 and 2019. Most of these research studies were published in the library and information science journals and several studies were in the journal of other fields such as psychology, management, computer science. These studies were conducted in different geographical locales and backgrounds such as USA, UK, Europe, Canada, Kuwait, Malaysia, China, Pakistan, Bangladesh, India, West Indies, etc.) in the academic contexts especially in universities and colleges using students of all levels form different fields. There were only a few studies that were conducted in the context of workplace context.

Scales for the measurement of information related anxieties

The selected total of 45 research studies reported psychometric information on nine different self-assessment scales assessing information related anxieties. The background and description of these instruments are outlined in Table 3. Out of these nine instruments, four scales were developed in the United States. One each scale was developed in China, Greece, Kuwait, Malaysia, and Poland. It is interesting to note that five instruments such as C-LAS, G-LAS, MLAS, P-LAS, and IAS by Blundell and Lambert (2014) are based on Bostick's LAS. The rest of the three instruments such as AQAK, ISAS, and IAS by Girard were originally developed. The scales differed from each other in the coverage of information related anxieties as seven scale assess specifically the phenomenon of library anxiety and one each measure information seeking anxiety and information anxiety. The library anxiety and information seeking anxiety were assessed in academic settings whereas information anxiety was assessed in the workplace context. All of these instruments were freely available either through study or based on the request from the author. The number of statements in these instruments was ranged from five to fifty-five measured on Likert-type scoring methods.

Bostick's LAS was used in 54 studies with college and university students of different institutions across varied countries. However, some researchers reported LAS as outdated and inadequate for its continued application to measure library anxiety in the digital environment as it was too old and developed when the World Wide Web was in either embryonic or infancy stage

Table 3

Description and psychometric properties of scales assessing information related anxieties

Scale Title	Background	Construct assessed	Origin	Items	No. of studies reporting use	Studies Contributing to Psychometric Information	Availability	Psychometric Properties Reported
LAS (Bostick, 1992)	Original; Developed for all level college and university students; grouped into five sub-dimensions, namely, staff barriers, affective barriers, comfort with the library, barriers with library knowledge, and mechanical barriers.	Library anxiety	USA	43	54	Bostick (1992); Jiao, Onwuegbuzie, and Lichtenstein (1996); Onwuegbuzie and Jiao (1998, 2004); Jerabek, Meyer, and Kordinak (2001); Jiao and Onwuegbuzie (1999, 2000, 2001, 2002, 2003); Jiao, Onwuegbuzie, and Anthony (2002); Veal (2002); Van Scoyoc (2003); Jiao, Onwuegbuzie, and Bostick (2004, 2006); Anwar, Al-Kandari, & Al-Qallaf (2004); Shoham & Mizrachi, (2001, 2004); Weems, Onwuegbuzie, and Collins (2006); Onwuegbuzie & Kathleen M.T. Collins (2006). Lu and Adkins (2013); Janaki and Karim (2014); Karim and Shamsuddin (2014); Karim and Ansari (2013, 2017); Sinnasamy and Karim (2014, 2017); Karim and Ab Rashid (2016); Ahmed and Aziz (2017)	Free on request from the author	Internal consistency reliability; Test-retest reliability; Face and content validity through experts; Construct validity through exploratory factor analysis (EFA) with varimax rotation; Construct validity using the item to total score correlations; Convergent validity; Construct validity through confirmatory factor analysis (CFA)
MLAS (Van Kampen, 2004)	Developed based on LAS for doctoral students; Assess 6 dimensions such as comfort with library, ISP and library anxiety, staff barriers, understanding of library use, comfort with technology, and comfort with the library while being inside	Library anxiety and Info Search Process	USA	54	4	Van Kampen, (2004); Bowers (2010)	Free on request from the author	Internal consistency reliability; Test-retest reliability; Content validity through experts and pilot testing; Construct validity through EFA with varimax rotation; CFA

Table continued . . .

Scale Title	Background	Construct assessed	Origin	Items	No. of studies reporting use	Studies contributing psychometric information	Availability	Psychometric Properties Reported
P-LAS (Swigon, 2011)	Developed based on LAS and MLAS; Comprised of 6-components such as barriers with staff, affective, technology, library knowledge, library comfort, and resource	Library anxiety	Poland	46	2	Swigon (2011)	Free on request from the author	Internal consistency reliability; Construct validity through EFA
C-LAS (Song et al. (2014).	Developed based on 12 statements from LAS and 10 items from MLAS along 16 new items generated from interviews; Comprised of 7-factors as knowledge, regulations, staff, affection, retrieval, comfort, and resources	Library anxiety	China	38	0	Song, Zhang, and Clarke (2014)	Free on request from the author	Internal consistency reliability; Test-retest reliability; Content validity through experts; Construct validity through EFA
G-LAS (Doris, et al 2017)	Developed based on LAS and MLAS; clustered into 8 constructs such as barriers with staff, affective, technology, library knowledge, organization, library services knowledge, library comfort, resources, and rules.	Library anxiety	Greece	32	0	Doris, Provata, and Vraimaki (2017)	Free on request from the author	Internal consistency reliability; Content validity through pre-testing; Convergent validity through CFA; Discriminant validity through AVE
IAS Blundell & Lambert (2014)	Developed based on LAS along with 12 additional items related to information technology anxiety	Info anxiety	USA	55	0	None	Free	Not any

Table continued . . .

Scale Title	Background	Construct assessed	Origin	Items	No. of studies reporting use	Studies contributing psychometric information	Availability	Psychometric Properties Reported
AQAK (Anwar et al, 2012)	Original; Developed for undergraduate students considering the unsuitability of LAS for modern library environment; clustered into 5 factors, namely, library resources, library staff, user knowledge, library environment, and user education.	Library anxiety	Kuwait	40	5	Anwar, Al-Qallaf, Al-Kandari, and Al-Ansari (2012); Jan and Anwar (2018); Jan, Anwar, and Warraich (2016a, 2016b, 2018);	Free on request from the author	Internal consistency reliability; Test-retest reliability; Face and content validity by experts; Construct validity with EFA using varimax rotation
ISAS (Erfanmanesh, et al 2012)	Original; Developed on for postgraduates considering the digital environment including library, web, and human; Clustered into 6 sub-scales such as barriers associated with information resources, computer and internet, library, searching, technology, and topic identification.	Info seeking anxiety	Malaysia	47	9	Erfanmanesh, Abrizah, and Karim (2012, 2014); Aghaei, Soleymani, and Rizi, (2017); Naveed and Amin (2017a, 2017b); Erfanmanesh (2016);	Free	Internal consistency reliability; Construct validity with EFA and varimax rotation; Face and content validity by experts
IAS (Girard, 2005)	Original; Developed based on Wurman's framework; 5-dimensions, namely, understanding information, information overload, knowing information exists, finding information, and accessing information.	Info anxiety	USA	5	3	Girard (2005)	Free	Internal consistency reliability; Face and content validity by experts

(Anwar et al., 2004; Kwon, 2004). The second most used scale was by Erfanmanesh's (2012) ISAS that assesses information seeking anxiety and includes library anxiety as its sub-dimension. This scale was developed for postgraduate students in Malaysia considering the digital information landscape. ISAS has been used in nine studies from Malaysia, Pakistan, and Iran.

Anwar's (2012) AQAK was the third widely used scale that was developed for undergraduate students considering the age and unsuitability of Bostick's LAS in the modern library environment. AQAK has the potential to assess library anxiety used five studies so far. AQAK was the only scale that identified 'User education', for the first time, as a factor in library anxiety. One more scale developed by Girard (2005), namely IAS, is based on Wurman's information anxiety framework. IAS measures the construct of information anxiety which has been used in three studies in the workplace settings from the USA and Canada.

Evidence of psychometric properties of scales

Table 3 outlined the evidence of psychometric properties of scales measuring information related anxieties. The results indicated that the reliability and validity of all the scales were measured following classical test theory (CTT). None of these studies applied for the measurement of psychometric properties using the Rasch model of item response theory (ITC). A large majority of these studies (41) measured reliability using the internal consistency coefficient Cronbach alpha. Several studies (4) reported test-retest reliability. The validity measures used in these studies included content and face validity through experts (8), construct validity either through exploratory factor analysis (EFA) or confirmatory factor analysis (3). The convergent validity was reported for only G-LAS by Doris, et al (2017) and Bostic's (1992) LAS. However, the discriminant validity was reported only for G-LAS. is the only scale which reports convergent and discriminant validity. The other types of validities such as concurrent validity, factorial validity, criterion validity, face validity, incremental validity, and predictive validity were not even reported for a single scale included in this review. However, it is worth noting that only a few studies investigated the psychometric properties of scale they used in their surveys. Only a few studies reported the qualification of experts for content and face validation of scales.

Discussion and conclusions

This systematic review examined the evidence on psychometric properties scales measuring information related anxieties such as library anxiety, information seeking anxiety, and information anxiety. Knowledge of the various forms of psychometric. The results revealed nine scales for which psychometric analysis was carried out and reported in the existing literature. It was also found that these assessment scales were very commonly used but psychometric properties were rarely reported. These results had quite serious implications about the use of quality measures in the design and utilization of these scales among different populations as there were only a limited number of studies examined the psychometric properties of scales, they

used for measurement of information related anxieties. It also poses a serious threat to the credibility of the research results of such evaluations which might lead to the poor quality of decision-making. The reasons for not examining psychometric properties of these tests or reporting such important information in these studies might include the authors' lack of awareness about the scale development process, lack of realization about the significance of reporting psychometric properties, and weaker results towards reliability and validity of the used instruments (Mahmood, 2017a, 2017b). These findings were consistent with systematic reviews of other areas of research such as continuing medical education (Ratanawongsa et al., 2008), urbanicity (Cyril et al., 2013), communication skills (Setyonugroho et al., 2015), and information literacy (Mahmood, 2017a, 2017b) as most of the assessment studies in the above-mentioned research areas did not report information on psychometric characteristics.

The results showed that all the instruments identified in this review were assessed following classical test theory. However, the Rasch model of item response theory failed to capture the attention of scale developers and users in the area of anxiety associated with information related tasks as none of the reviewed studies deployed this modern and superior theory as compared to classical test theory. The item response theory focuses on individual items that compose collectively a scale whereas classical theories emphasize the scale as a whole (DeVellis, 2012). Adequate knowledge of the psychometric characteristics enables researchers and practitioners in selecting an appropriate instrument aligned with their measurement objectives. Such knowledge is contained within several individual studies that one might require for informed decision-making (Vessey, 2014). There was a gap that one could not find such knowledge in a single source providing a list of standardized tests which was filled by this systematic literature review. This review provided an initial choice for researchers and practitioners as one can decide which scale to use or not to use considering one's purpose of assessment.

Considering the significance of acceptable psychometric properties, the researchers and practitioners should consult the statisticians need either for getting training in methods of scale development, psychometric evaluations, and the way to report results or for collaboration in projects to improve the research quality. The use of good-quality measures for assessing information related anxieties need to be promoted not only by the academicians but also by the journal referees and editors by questioning the lack of information on psychometric properties in empirical research. A specialized course for applied statistics in social sciences research might also be included in the curriculum by academicians associated with information education. This research generated useful insights thorough the collection and summation of the evidence of psychometric properties of scales measuring information-related anxieties that are not only useful for policymakers but also for researchers and practitioners. This review contributed to the existing literature on information related anxieties by systematically reviewing the evidence of psychometric properties as no such attempt was made so far in this research area. In limitations, this review was limited to studies written in the English language and there might be other scales

having good quality reported in other languages but missed in this study. Besides, this study did not include the results of psychometrics, populations, and sampling procedures reported by studies included in this review for the avoidance of an unnecessary increase in the size of this paper. Therefore, the readers are encouraged to consult the original research papers for such details.

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