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Classification and citation analysis of the 100 top-cited articles on nurse resilience using chord diagrams

A bibliometric analysis

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Abstract

Background: Studies of most-cited articles have been frequently conducted on various topics and in various medical fields. To date, no study has examined the characteristics of articles associated with theme classifications and research achievements of article entities related to nursing resilience. This study aims to graphically depict the characteristics of the 100 top-cited articles addressing nurse resilience (T100NurseR), diagram the relationship between articles and author collaborations according to themes extracted from article keywords, and examine whether article keywords are correlated with article citations.

Methods: T100NurseR publications were retrieved from the Web of Science (WoS) core collection on October 13, 2022. Themes associated with articles were explored using coword analysis in WoS keywords plus. The document category, journal ranking based on impact factor, authorship, and L-index and Y-index were used to analyze the dominant entities. To report the themes of T100NurseR and their research achievements in comparison to article entities and verify the hypothesis that keyword mean citation can be used to predict article citations, 5 visualizations were applied, including network diagrams, chord diagrams, dot plots, Kano diagrams, and radar plots.

Results: Citations per article averaged 61.96 (range, 25–514). There were 5 themes identified in T100NurseR, including Parses theory, nurse resilience, conflict management, nursing identity, and emotional intelligence. For countries, institutes, departments, and authors in comparison of category, journal impact factor, authorship, and L-index scores, Australia (129.80), the University of Western Sydney (23.12), Nursing (87.17), and Kim Foster (23.76) are the dominant entities. The weighted number of citations according to Keywords Plus in WoS is significantly correlated with article citations (Pearson $R = 0.94$; $P = .001$).

Conclusion: We present diagrams to guide evidence-based clinical decision-making in nurse resilience based on the characteristics of the T100NurseR articles. Article citations can be predicted using weighted keywords. Future bibliographical studies may apply the 5 visualizations to relevant studies, not being solely restricted to T100NurseR.

Abbreviations: CJAL = category, journal impact factor, authorship, and L-index, DS = descriptive statistics, RA = research achievement, RD = research domain, SNA = social network analysis, T100NurseR = 100 top-cited articles addressing nurse resilience, WoS = Web of Science.

Keywords: bibliometric, chord diagram, citation analysis, Kano diagram, nurse resilience, Web of Science

1. Introduction

There is a high rate of mental health distress reported by nurses in many countries, and 93% report feeling overwhelmed as a result of the pandemic.[1] Healthcare professionals, especially nurses, are experiencing higher levels of trauma, anxiety, and burnout in many regions of the world. There is evidence that resilience training, as well as its associated positive effects, is associated with a reduction in burnout risks among health workers.[2] Research literature[3] has demonstrated that resilience training reduces the risk of burnout among health workers who face workplace problems. The ability of a nurse to develop resilience not only facilitates their recovery but also serves as a motivational tool for their colleagues. World Health Organization's European policy framework for health and

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The datasets generated during and/or analyzed during the current study are publicly available.

All data were downloaded from WoS.

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Key points

1. We identify the most significant contributions in this area by analyzing the most-cited papers on the topic of nurse resilience, which is a critical issue for the healthcare profession and contributes to individual, organizational, and patient safety.
2. Five themes in 100 top-cited articles were identified. A large number of publications are published in the *Journal of Advanced Nursing*, as well as the highest citations and impact factors for nursing resilience issues.
3. For managers, researchers, and educators, the findings provide important information about nursing resilience that should be explored in more depth in the future.

well-being[4] emphasizes "resilience,", particularly in light of the global pandemic COVID-19.

1.1. A comprehensive understanding of nurse resilience is needed

The ability to adapt positively to adversity or trauma is defined as resilience.[5] Resilience plays a crucial role in nurses' emotional work when dealing with patients' illnesses and deaths.[6] Nurses who lack resilience may burn out or even quit their jobs.[7] Building resilience in individuals and organizations has been shown to reduce the stress associated with working environments.[8]

Nurses who are resilient are more likely to contribute to positive organizational and nursing care outcomes in addition to high work performance, high job satisfaction, high workforce sustainability, high patient care quality, high well-being, and low burnout.[2,3] By understanding nurses' resilience, it may be possible to enhance these positive effects. There has, however, not yet been published a comprehensive guide to Nurse resilience by means of bibliometric analysis.

1.2. Literature reviews of nurse resilience

The concept of resilience refers to the ability to recover from stress and adversity.[5] An individual may either increase their ability to cope with stress or escape from a dilemma in response to interference such as a stressor or adversity, according to Richardson.[9] The resilience process includes dealing with a stressor, fighting or fleeing, and the results of coping with stress.[10] A number of researchers have found that resilience is negatively correlated with burnout and turnover intentions,[11,12] while resilience is positively correlated with personal achievement.[13]

A low quality of work-life will result in new graduate nurses experiencing higher levels of emotional exhaustion, which will exacerbate turnover intentions.[14] Resilient individuals can recover from difficult situations and lower their levels of burnout, thereby reducing turnover intentions.[15–18] As a result of multiple sources of support and improvements in personal accomplishment, resilience is increased and burnout is reduced, resulting in a decrease in turnover intentions.[18]

Both internal and external factors will influence turnover intentions during the transition from nursing students to registered nurses. It is, therefore, necessary to conduct a broad bibliometric analysis to explore the knowledge and understanding of details related to nurser resilience for newcomers in the nursing profession. Therefore, research students will be able to utilize the bibliometric analysis technique on their new topics of nursing in the future.

1.3. Analyses of themes and trends using bibliometrics

In recent years, bibliometric methods have been widely used to analyze books and articles and assess the impact of research.[19] This type of analysis is intended to identify countries, organizations, and authors who have made significant contributions to science.[20] In light of their topics, study designs, and levels of evidence-based medicine, highly cited articles may influence clinical practice and further research.[21,22] A large number of citations usually indicates that researchers are interested in using the sources cited in their own research. By analyzing the state and development trends of previous studies, bibliometric analysis can provide ideas and directions for future research.[23]

1.4. Research questions conceived in this study

Healthcare specialists have used citation rank analysis to determine the most influential papers in their field, which include biological markers of diseases,[24–26] mental health,[27,28] medical education,[29,30] and machine learning in cancer research.[31,32] In the field of nurses' resilience, no studies have been conducted to identify the most influential papers, particularly using both approaches: analyzing prominent entities with a glance view and examining article keywords (i.e., Keywords Plus in Web of Science, WoS: Clarivate Analytics in Philadelphia, PA) for predicting article citations.

1.5. Three hypotheses proposed to this study

In this study, 100 top-cited articles addressing nurse resilience (T100NurseR for short) were analyzed through a systematic search strategy to confirm 3 proposed hypotheses: the characteristics of T100NurseR can be displayed with visual representations, the themes of T100NurseR can be classified and assigned using chord diagrams, and keyword mean citations can be used to predict article citations in terms of Keyword Plus in WoS.

1.6. Study aims

Using bibliometric analysis, this study aims were to verify the 3 proposed hypotheses mentioned in the previous section.

2. Methods

2.1. Data sources.

We searched the WoS core collection for terms such as (TS="nurse" and TS="resilience or TI="nurse" and TI="resilience or AB="nurse" and AB="resilience)," years since 2000, and Article or Review Article in WoS research subjects. On October 13, 2022, a total of 100 top-cited articles (denoted by T100NurseR) were obtained. The study data are included at the link[33] and deposited in Supplemental Digital Content S1, Supplemental Digital Content, http://links.lww.com/MD/I610.

As this study did not involve the examination or treatment of patients or review of patient records, it was exempt from review and approval by our research ethics committee.

2.2. Five approaches used in this study

2.2.1. Descriptive statistics (DS) Two tables were tabulated to report publications in countries and journals over the years, with counts, citations, and mean citations (=impact factor = IF).

2.2.2. Theme classifications by keywords in T100NurseR. To extract the key components in clusters as themes (or leaders) in keywords, coword analysis was performed by using social

network analysis (SNA).[34,35] Using equation 1,[36] themes were assigned to each article.

$$\text{Theme} = At[\max_{0\le x\le 1}\sum_{i=1}^{L}\sum_{j=1}^{n}(\text{m} < \underset{k\in F}{-m+1})] \quad (1)$$

L represents the number of keywords in article i. n corresponds to the number of keywords denoted by keyword k that belong to the subject category defined by SNA (i.e., the keywords that occur in the same cluster). Through equation 1, the theme is redirected to the maximal number of keywords (m) involved in the cluster.

In the next step, themes were assigned to country-based author collaboration networks using equation 2.[37]

$$Theme_{\eta} = \max_{r\ in\ j}(\sum_{n=1}^{N}\sum_{l=1,a\in D,a\in r}^{L}\sum_{j=1,\ t\in c}^{J} term_{\eta}(count < -count + 1/L)) \quad (2)$$

L represents the number of terms (e.g., names of countries or institutes in this study) in an article. To record the summed counts, a contingent table with clusters in row (r) and themes in column (j) was constructed. Through equation 1,[36] the term was matched with the cluster number corresponding to the theme defined in an article (e.g., the article belongs to a theme). Using equation 2,[37] the total weighted scores were summed, and a maximum likelihood selection was made.

The themes mapped for each of the T100NurserR articles and country-based author collaborations using their Keywords Plus in WoS were represented through chord diagrams.[36,38–40]

2.2.3. Research achievements (RAs) of 8 article entities in T100NurseR. Based on the CJAL score[41] as determined by the category, journal impact factor, and authorship (CJA) score[42] and the L-index[43] via Eqs. 3 to 5, a 4-quadrant plot[41] was employed to present the dominant entities.

$$CJA\ score = \sum_{i=1}^{n} C_i \times J_i \times A_i \quad (3)$$

$$CJAL\ score = \sum_{i=1}^{n} C_i \times J_i \times A_i \times L - index_i \quad (4)$$

$$\text{L} - \text{index} = \text{round}(\log(\frac{Citation}{A_n \times Age} + 1), 0), \quad >= 1 \quad (5)$$

There are 3 factors that contribute to the CJA score for a published article: the category (C; e.g., review, original article, case report, etc), the journal "quality" (J; e.g., journal impact factor, JIF, or ranking of the journal) and the authorship order (A). By multiplying each of these 3 aspects as well as the L-index[42] (Equation 5), the CJAL score is calculated. Original research articles are rated higher by CJA than other manuscript types; co-first authors (denoted RP and FP to compute the Y-index RP + FP[44,45]) are rated higher than other collaborators; for quality assessment, the journal uses the JIF or Science Citation Index (SCI)/Social Sciences Citation Index (SSCI) journal rankings[42] for SCI/SSCI-indexed papers. Since SCI/SSCI journal rankings are based on JIF, domain-specific rankings are usually not significantly different from those based on JIF.[41,42]

A radar plot displaying entities with CJAL scores is shown.[41] There are 2 types of radar plots used to display the top 10 elements in each entity, including countries, institutes, departments, and authors by 2 factors (RP and FP) on the coordinates.[44,45] CJAL scores were used to size bubbles, as well as journals, themes, WoS categories, and article themes. As a result, a glance comparison of the RAs of the top 10 members of each entity can be made using the 4-quadrant radar plot.

2.2.4. T100NurseR shown on a dot plot. Based on normalized citations for each article, the T100NurseR[33] since 2000 is represented on the dot plot (namely, the impact beam plot[46]) using citation percentiles (i.e., using the MSExcel function percentrank; Microsoft Corporation, Redmond, WA).

2.2.5. Citation weights used for predicting article citations. Based on previous studies,[47–50] citation weights were calculated for Keywords Plus in the WoS core collection. Based on the weighted mean citations, a Kano diagram was developed to predict article citations.[41–53]

To determine the predictive power between weighted keywords and original article citations(e.g., dented by x and y, respectively), the correlation coefficient (r) defined as the degree of relation between 2 variables was referred to Equation 6.[54] A correlation coefficient (r) t value was calculated using the formula (=r[48–50]).

$$r = \frac{\text{n}(\sum xy - (\sum x)(\sum y)}{[\sum x^2 - (\sum x)^2][\sum y^2 - (\sum y)^2]} \quad (6)$$

where, n = Number of values or elements, $\sum x$ = sum of 1st values list, $\sum y$ = sum of 2nd values list, $\sum xy$ = sum of the product of 1st and 2nd values, $\sum x^2$ = sum of squares of 1st values, $\sum y^2$ = sum of squares of 2nd values.

2.3. Creating dashboards on Google Maps

By using MedCalc statistical software, version 9.5.0.0 (MedCalc, NY), a prediction equation was developed. We set the significance level at Type I error (0.05).

Graphs were drawn using author-made modules in Excel (Microsoft Corporation). We created HTML pages that were used to display Google Maps (Google LLC, Mountain View, CA). The relevant CJAL scores for each member can be displayed on dashboards on Google Maps. Supplementary Digital Content S2, Supplemental Digital Content, http://links.lww.com/MD/I611 contains the method used to draw the visualizations for this study.

3. Results

3.1. DS

Distributions of articles across countries and journals over years in T100NurseR are shown in Tables 1 and 2. We can see that the majority of articles in T100NurserR are from Australia (33%), followed by the US (24%) and the UK (7%). The articles with the highest mean citation were observed in New Zealand (=100), Sweden (=86.6), and the US (=75.4).

The 3 journals dominate T100NurseR, including *Nurse Educ. Today*, J. *Adv. Nurs.*, and *J. Nurs. Manag.*, with 14, 11, and 9 higher publications, respectively, as shown in Table 2.

3.2. Theme classifications by keywords in T100NurseR

There were 9 themes identified in T100NurseR, including Parses theory, Nurse resilience, conflict management, nursing identity, emotional intelligence, positive psychology, adaptability, organizational behavior, and effective teamwork, as shown at the top of Figure 1. Themes were successfully assigned to each article using equation 1 (Fig. 1). Themes were also assigned to each country-based collaboration network using equation 2 (Fig. 2).

3.3. RAs of 8 article entities in T100NurseR

The RAs of 8 article entities in T100NurseR are displayed in Figure 3 using the CJAL score[41] and Y-index.[44,45] For countries, institutes, departments, and authors in comparison of CJAL scores,

Table 1

Distribution of publications for countries of origin over years in T100NurseR.

Country	2005–2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	n	Ci	IF
ASIA				2	2		4	7	1	2		18	743	41.3
China				1			2	2	1			6	332	55.3
Singapore				1			1	2				4	143	35.7
Hong Kong								1		1		2	80	40.0
Israel					1		1					2	60	30.0
South Korea					1			1				2	65	32.5
India										1		1	39	39.0
Turkey								1				1	24	24.0
EUROPE	4	1			1	4	1	3	3	3	2	22	1012	46.0
UK	1	1			1	1		1		2		7	258	36.8
Spain						1	1	2			1	5	245	49.0
Sweden	3											3	260	86.6
Belgium									1	1		2	73	36.5
Finland						1						1	31	31.0
Greece									1			1	29	29.0
Ireland						1						1	31	31.0
Italy											1	1	59	59.0
Norway									1			1	26	26.0
N. AMERICA	2	2		4	4	2	5	3	1		3	26	1901	73.1
US	2	2		4	2	2	5	3	1		3	24	1810	75.4
Canada					2							2	91	45.5
OCEANIA	12	1	2	1	1	5	2	4	2	4		34	2740	80.6
Australia	12	1	2	1	1	5	2	4	1	4		33	2640	80.0
New Zealand									1			1	100	100
n	18	4	2	7	8	11	12	17	7	9	5	100	6396	63.9

Ci = citation; IF = impact factor, Ci/n = mean citation, T100NurseR = 100 top-cited articles addressing nurse resilience.

Table 2

Distribution of publications for top 10 journals over years in T100NurseR.

Journal	05–11	12	13	14	15	16	17	18	19	20	21	n	Ci	IF
Nurse Educ. Today	1	2		1		3	2	3	1	1		14	994	71
J. Adv. Nurs.	4	1			2	1	1	1			1	11	1145	104.09
J. Nurs. Manag.				2		2	1		2		2	9	698	77.56
Int. J. Ment. Health Nurs.	2						1	1	1	3		8	404	50.5
Int. J. Nurs. Stud.	2	1					1		1			5	624	124.8
Am. J. Crit. Care				1	2		1					4	460	115
Nurse Educ. Pract.								1	1	2		4	144	36
J. Clin. Nurs.					1			1	1			3	180	60
AACN Adv. Crit. Care							1				1	2	60	30
Collegian			1			1						2	59	29.5
Subtotal	9	0	1	3	3	4	4	10	0	3	1	38	1628	1273
n	18	4	2	7	8	11	12	17	7	9	5	100	6396	63.96

Ci = citation; IF = impact factor, Ci/n = mean citation , T100NurseR = 100 top-cited articles addressing nurse resilience.

Australia (129.80), the University of Western Sydney (23.12), Nursing (87.17), and Kim Foster (23.76) are the dominant entities (Fig. 3). Note that bubbles are sized by the CJAL and colored by quadrant. The bubble locations are based on the Y-index using RP and FP[44,45] coordinated on the 4-quadrant radar plot.[41]

Similarly, for journals, publication years, subject categories, and article themes in comparison of impact factors (=IF = mean citation), *Int. J. Nurs. Stud.* (125.0), 2009 (108.5), oncology (80.0), and nurse resilience (66.7) ranked at the top (Fig. 4).

3.4. T100NurseR shown on a dot plot

Figure 5 shows a dot plot developed for the T100NurseR, where red dots represent the theme of nurse resilience (Fig. 5). We encourage readers to scan the QR code, click on the dot of interest, and read the abstract of the article on the PubMed website by scanning the QR code. For instance, when the ultimate rightmost dot is clicked, 3 highly cited articles[55–57] appear immediately, with article citations of 514, 261, and 257, respectively.

3.5. Citation weights used for predicting article citations

There was a significant correlation between the number of article citations and the number of weighted keywords ($F = 686.045$, $P < .0001$), as shown in Figure 6. The prediction linear equation is expressed as $y = -70.8769 + 2.1080 \times$ weights (x) of keywords. All 100 articles were located within the 1-dimensional zone in the Kano diagram (Pearson $R = 0.94$, $df = 98$, $t = 26.19$, $P < .0001$).

3.6. Online dashboards shown on Google Maps

All the QR codes in the graphs are linked to the dashboards.[58–65] Readers are suggested to examine the displayed dashboards on Google Maps.

4. Discussion

4.1. Principal findings

We found that citations per article averaged 61.96 (range, 25–514). There were 9 themes identified in T100NurseR,

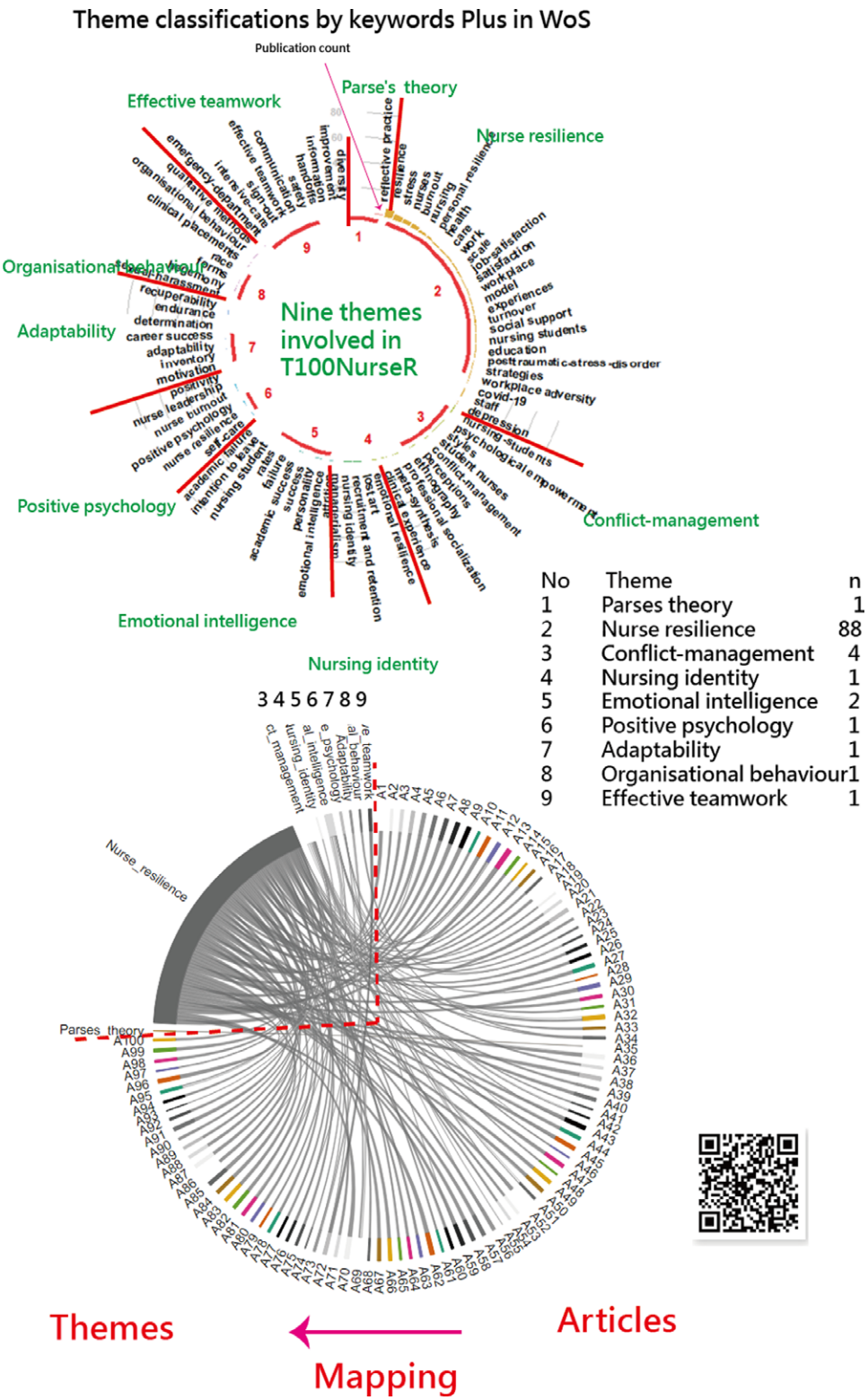

Figure 1. Cluster analysis of T100NurseR articles by keywords corresponding to articles. T100NurseR = 100 top-cited articles addressing nurse resilience.

including Parses theory, Nurse resilience, conflict management, nursing identity, emotional intelligence, positive psychology, adaptability, organizational behavior, and effective teamwork. For countries, institutes, departments, and authors in comparison of CJAL scores, Australia (129.80), the University of Western Sydney (23.12), Nursing (87.17), and Kim Foster (23.76) are the dominant entities. The weighted number of citations according to keywords plus in WoS is significantly correlated with article citation frequency (Pearson r, 0.94; P = .001).

Accordingly, the 3 hypotheses were confirmed: the characteristics of T100NurseR can be displayed with visual representations, the themes of T100NurseR can be classified and assigned using chord diagrams, and keyword mean citations can be used to predict article citations in terms of Keyword Plus in WoS.

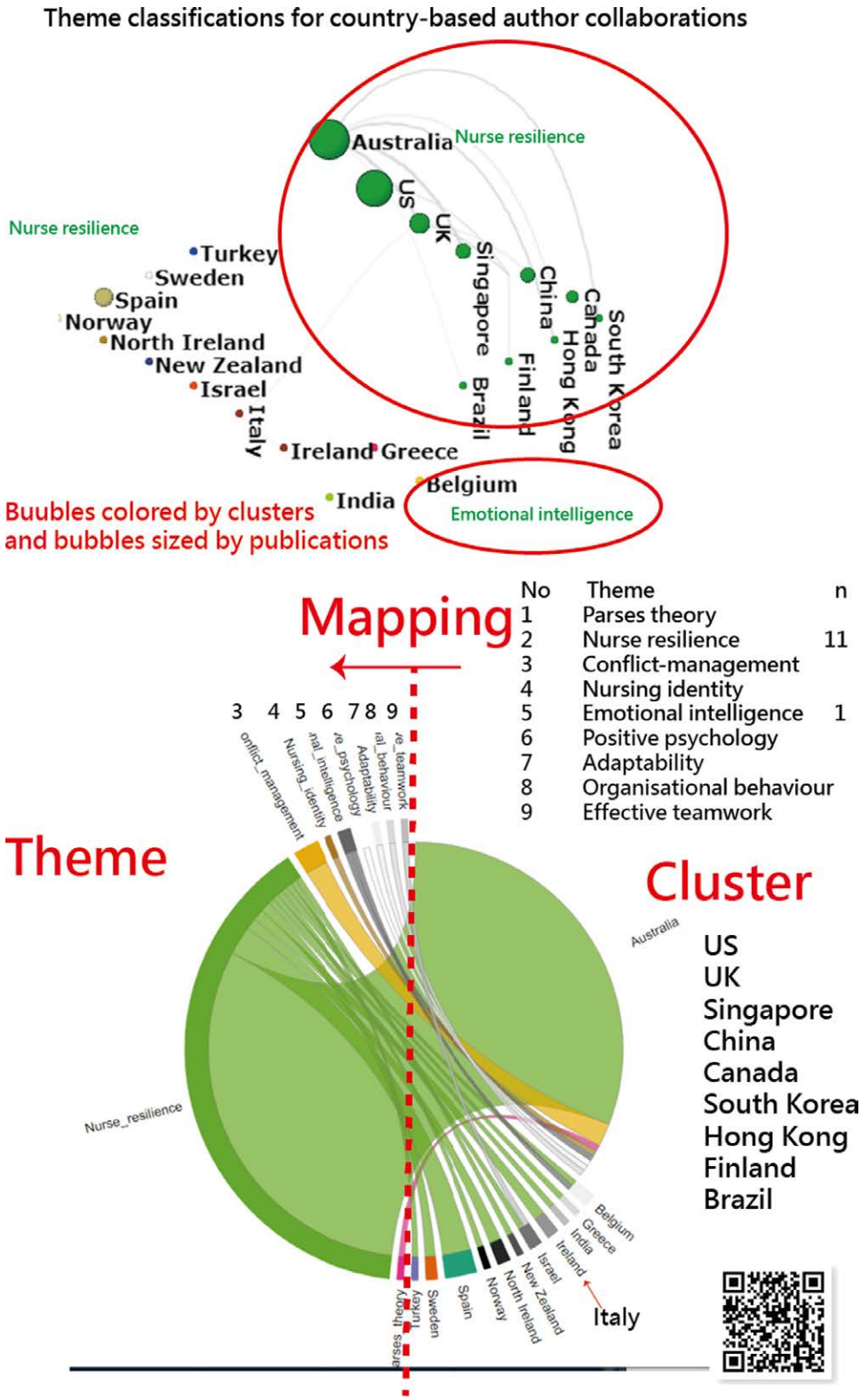

Figure 2. Cluster analysis of country-based author collaborations matching themes.

4.2. Chord diagrams used to present the relationship between themes and clusters

Typically, 100 top-cited articles are visualized using 3 categories of information: DS, research domain (RD), and RA.[47–50,66] Citation prediction has been applied by some researchers[47–50] to predict article citations based on the mean citations of article keywords, but the visual presentation is not comparable to the Kano diagram,[51–53] which presents a unidimensional feature from the left-bottom corner to the top-right corner.

Moreover, many articles include many tables and graphs in bibliometrics without utilizing radar plots and chord diagrams to condense information that is of interest to readers, as we did in Figures 1 and 2, especially using the dot plot in Figure 5 to display all those T100NurseR articles on a dashboard and save

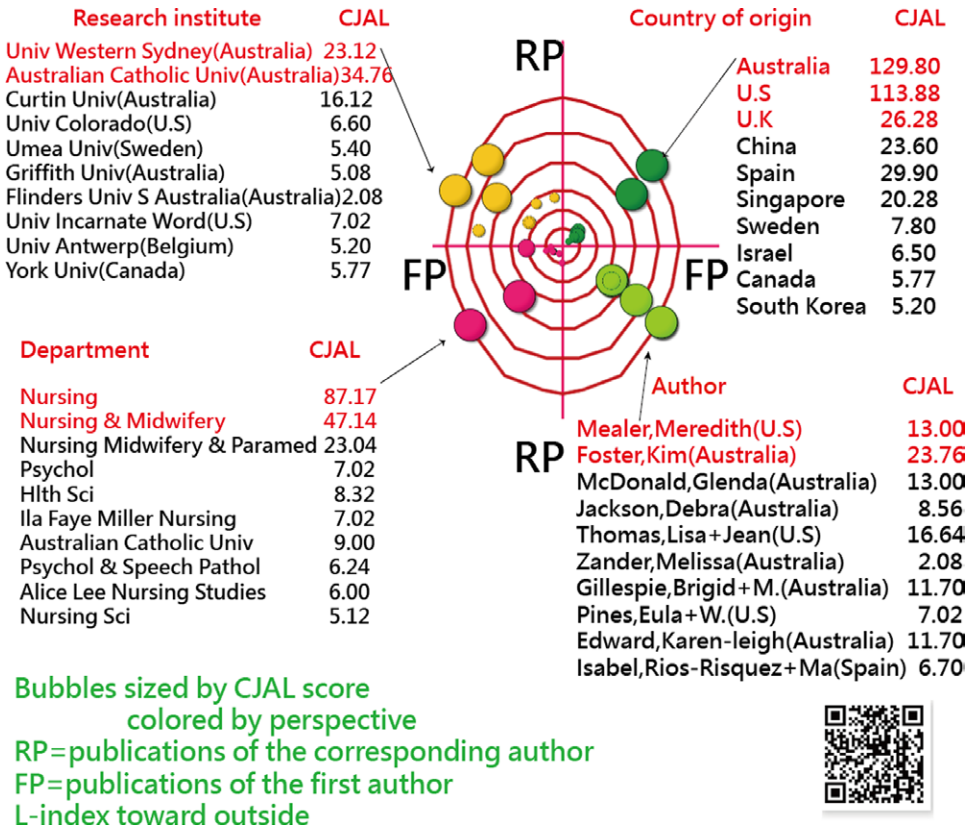

Figure 3. RAs measured by the CJAL score for each element in entities. CJAL = , RAs = research achievements.

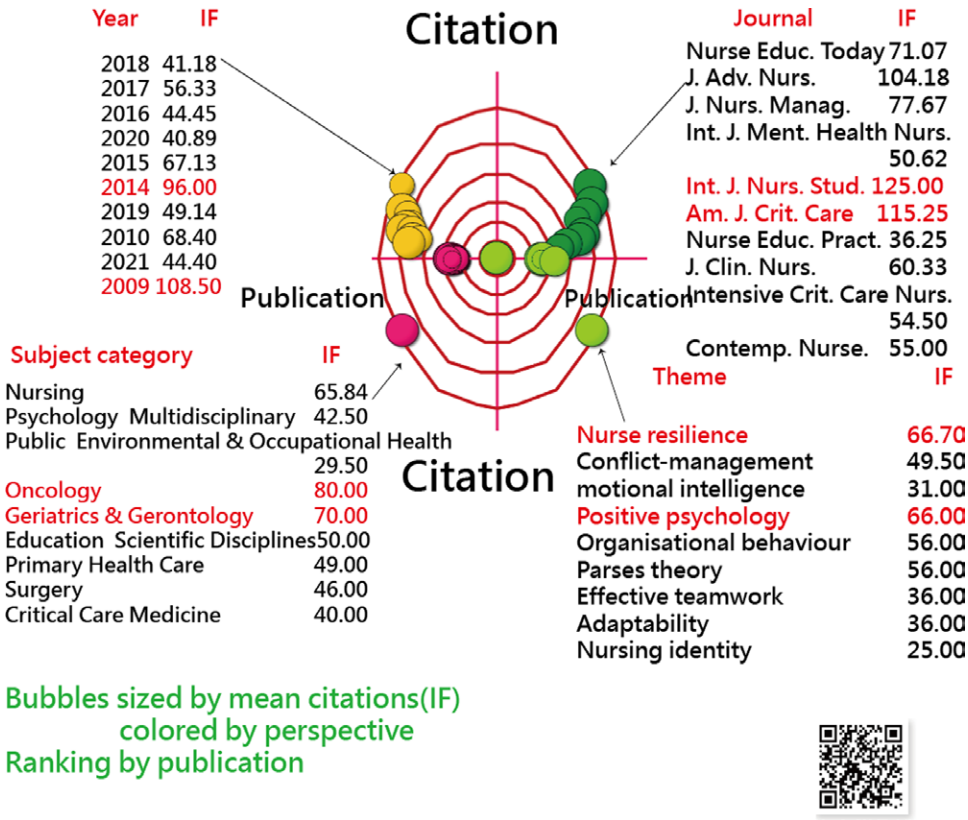

Figure 4. Mena citations in comparison for each element in entities.

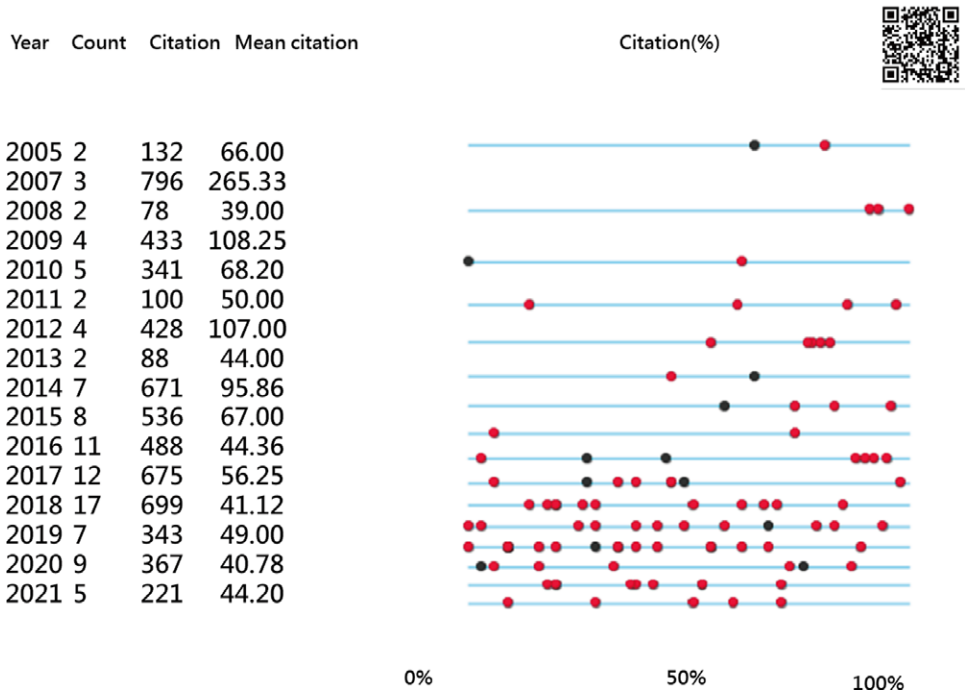

Figure 5. T100NurseR articles shown on a dot plot (note. red dot means the theme of nurse resilience). T100NurseR = 100 top-cited articles addressing nurse resilience.

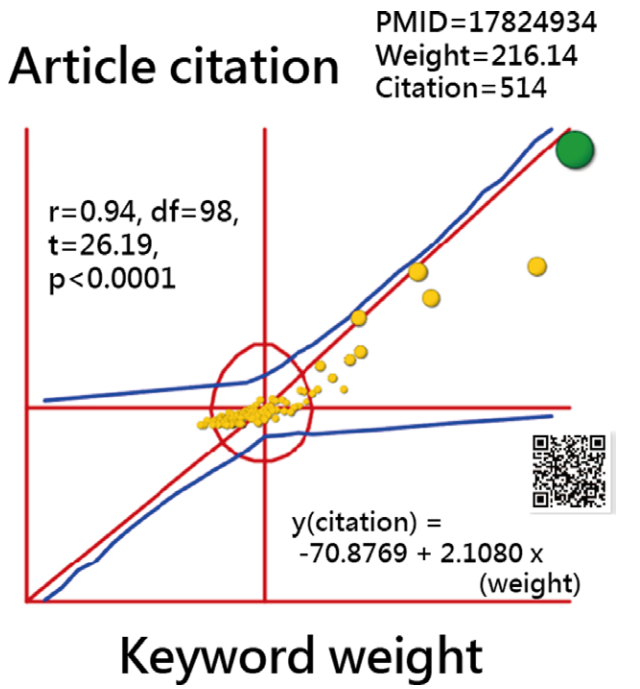

Figure 6. Weighted Keywords Plus to predict article citations, as shown in the Kano diagram (note. $R = 0.94$, df = 98, $t = 26.19$, $P < .0001$) based on T100NurseR articles (n = 31). T100NurseR = 100 top-cited articles addressing nurse resilience.

space compared to those with 100 and 50 articles listed in their studies[67,68] or 42 tables and graphs in an article.[69]

To visualize dynamics related to contraceptive use and to apply data, chord diagrams[36,38–40] were used. A dashboard (such as those shown in Figs. 1 and 2[58,59]) provides an easy method of visualizing the relationship between themes and clusters. The chord diagrams provide a clear understanding of the relationship between 2 or more entities (for example, the themes and clusters in Figs. 1 and 2), which is uncommon in previous bibliographical studies.[47–50,66] The R code for reproducing the chord diagram is provided in Supplemental Digital Content S2, Supplemental Digital Content, http://links.lww.com/MD/I611.

4.3. CJAL score used to evaluate RAs for entities with T100NurseR

To calculate the CJAL score, 4 factors must be considered: the subject category, the journal impact factor, the authorship position on the article byline, and the article citations. Traditional evaluations of RAs have been based on bibliometric metrics (e.g., h-index,[70] g-index,[71] x-index,[72] hx-index,[73] author impact factor,[74] Y-index,[44,45] and hT-index[75,76]). The use of these metrics has a number of disadvantages, such as assuming that all coauthors contributed equally to an article, regardless of the type of document or impact factor of the journal. When evaluating the RA beyond those bibliometric metrics, the CJAL score[41] bridges the gap between publications and citations.

The CJAL score has not yet been used by WoS to identify any studies related to nurser resilience. This study represents the first attempt to use bibliometric analysis in the field of nurser resilience. In contrast to traditional bibliometrics, the dashboard-style 4-quadrant radar plots depicted in Figures 3 and 4 provide a summary of 8 important entities. This is the first time that a unique and modern approach has been used in the literature. In the future, bibliometric analysis may be advanced in this manner.

According to the CJAL score,[41] Australia dominates the T100NurseR articles. In contrast to many traditional bibliometric studies, this study computes publications based on both the first and corresponding authors, rather than just the first author. Based on this study, Australia (129.80), the University of Western Sydney (23.12), Nursing (87.17), and Kim Foster (23.76) were identified as the most influential entities with higher CJAL scores. Accordingly, the CJAL score should be used in bibliometric research to measure RAs, particularly when using a radar plot to summarize information.

The traditional bibliographical study with DS, RD, and RA provided us with a clear understanding of what differentiates a discipline or field (or topic) from others and provided insight for researchers. There were, however, 2 main concerns that were frequently overlooked. In such instances, a simplified visualization of all relevant entities (as shown in Figs. 3 and 4) is lacking, and an analysis of future citation patterns (i.e., citation prediction) using a Kano diagram is not available.

4.4. Top 3 most-cited articles

The article[55] entitled Personal resilience as a strategy for surviving and thriving in the face of workplace adversity was cited 514 times, authored by Jackson (Australia) et al, and published in *J Adv Nurs* (2007). The authors found that nursing workplace adversity is associated with excessive workloads, lack of autonomy, bullying, violence, and organizational issues such as restructuring. Nurses can improve their resilience by participating in resilience-building programs and seeking mentorship outside of their immediate working environments.

The second highly cited article[56] entitled Burnout and Resilience Among Nurses Practising in High-Intensity Settings was cited 261 times, authored by Rushton (US) et al, and published in *Am J Crit Care* (2015). A cross-sectional survey was used to assess the experiences of 114 nurses in 6 high-intensity units to determine factors involved in burnout, moral distress, and resilience. The results show that moral distress was a significant predictor of all 3 aspects of burnout, and resilience protected nurses from emotional exhaustion and contributed to personal accomplishment. The findings teach participants strategies and practices for renewal, including mindfulness practices and personal resilience plans.

The third highly cited article[57] entitled the importance of teaching and learning resilience in health disciplines was cited 257 times, authored by McAllister (US) et al, and published in *Nurse Educ Today* (2009). This paper discusses resilience and the application of resilience research to nursing education. This suggests that resilience should be taught in clinical experience courses, internships, work-integrated learning, and other work experience courses.

4.5. Implications and possible changes outlined in this study

According to this study, oncology had the highest impact factor, followed by geriatrics and gerontology, and nurses' resilience and positive psychology were emphasized. Oncology and geriatrics were the 2 jobs with the greatest risk of burnout among nurses.[77] Nurses suffering from compassion fatigue or burnout are unable to provide quality care to themselves or to their patients. As a result, nurses would benefit from resilience training to overcome the dilemma.[55,56]

According to T100NurserR, evidence-based resilience programs include mindfulness, relaxation, psychoeducation, emotional regulation, cognitive strategies, problem-solving, and strengthening internal and external resources. Nurses should be assessed regularly for their ability to cope with stress, and continuous education programs should be designed based on their individual needs.

Researchers need to continually assess and revise the effectiveness of resilience strategies in relation to different populations and situations, although resilience-related strategies were moderately effective in this study. As such, there are several implications that can be given to newcomer research students who can understand that nurses are in need of resilience training to overcome the dilemma[55,56] and these types of nurse resilience studies are easily replicated by following the procedures outlined in Supplemental Digital Content S2, Supplemental Digital Content, http://links.lww.com/MD/I611, such as the CJAL score, the chord diagram combined with SNA, the 4-quadrant radar plot, the Kano diagram, as explained below:

First, CJAL scores[41] are superior to biometric indices (such as the h-/g-/x-/Y-/hT-/hx-index[44,45,70–76]) because they take into account more aspects of an article's quality and quantity.

Second, with the chord diagram, we were able to quickly illustrate entity relationships, something that is easily accomplished in the Rstudio package (RStudio, PBC, Boston, MA) (see Figs. 1 and 2 and Supplemental Digital Content S2, Supplemental Digital Content, http://links.lww.com/MD/I611).

The third feature is the use of a 4-quadrant radar plot,[41] which provides readers with a visual representation of 4 perspectives in article entities at a glance, which is particularly useful when assessing RAs using the CJAL score rather than the Y-index using a single 1-quadrant radar plot, as is commonly used.[44,45]

It may also be useful in future bibliometric analyses to utilize the Kano diagram[51] for identifying the trajectory of 2 variables and predicting article citations based on keywords, as it does not limit bibliometric analysis to DS, RD, and RA, as most traditional bibliographical studies do.

SNA provides an objective method of categorizing themes compared to manual methods used in previous studies.[66] There is evidence that the classification method is valid and should be recommended to future researchers, particularly when combined with the chord diagram,[36,38–40] which illustrates the relationship between themes and clusters. For drawing the chord diagram, Supplemental Digital Content S2, Supplemental Digital Content, http://links.lww.com/MD/I611 contains R codes.

4.6. Limitations and suggestions

Further research is needed to examine a number of issues. The first concern is that the Rstudio package used for drawing the chord diagram is not unique and cannot be replaced. Other software packages can also be used to draw them.

The dashboards in this study are displayed using Google Maps. As Google Maps requires a paid project key, these installments are not free. Therefore, other authors may find it difficult to reproduce the usage within a short period of time.

Third, calculating the CJAL score requires a substantial amount of computation. In the future, this technology will require dedicated software.

Fourth, it has been recommended that the radar plot and CJAL score be combined to simplify article spaces in comparison with other traditional bibliographical studies that contain many tables and graphs (e.g., the one with 42 tables and graphs).[69] However, the RAs are determined by other factors that must also be considered when drawing radar plots in the future.

Fifth, the study results were presented using 5 typical visualizations, including Kano diagrams, radar plots, dot plots, chord diagrams, and network plots. A variety of visual representations of bibliometric analysis are common. In future studies, it is recommended that more appropriate visual displays be used to facilitate the reader's understanding of the study features.

Finally, although the T100NurserR articles were primarily retrieved from WoS, the results were different for articles retrieved from other databases (such as Google Scholar, Scopus, or PubMed). Future studies should extract T100NurseR from a greater number of bibliometric databases.

4.7. Conclusions

Using chord diagrams with a demonstration of theme classification, a breakthrough was achieved by analyzing T100NurseR network characteristics. Using Keywords Plus, it is possible to identify article themes and predict T100NurseR citations. In future studies, a 4-quadrant radar plot along with the CJAL score should be applied to 100 top-cited articles instead of focusing only on nurse resilience.

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Author contributions

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