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Use of Assistive Walking for Elderly from Viewpoint of Bibliometric Trend Analysis and Systematic Studies Study

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Abstract

This study describes a journey study regarding parents using various types of tools to help walk especially canes that last in the range of 50 years time. A systematic study was conducted with an interesting document study from Scopus to see the dynamics and trends of ongoing research take place. Withdrawal document conducted with method enter keywords related to canes, elderly, assistive technology. Study data through graphics describe trend-growing research from 1973 to 2022. Based on the amount of published journal in the period time between 1973 and 2022 shows Journal of Aging and Mental Health occupy the position top in amount issue then followed by the journal International Psychogeriatrics and the journal Archives of Physical Medicine and Rehabilitation. In contrast, a big amount of citations obtained shows the Journal Archives of Physical Medicine and Rehabilitation's most popular study followed by the Journal of the American Geriatrics Society and the British Journal of Psychiatry. Research studies in this area show a trend increase from 1973 to 2022 where in 2015 it reached the amount publications highest while in 2016 to 2021 experienced a little decline. Based on the study results study in a period time for 50 years could estimate the gap research that can take to get novelty research in a set plan study in the future.

Keywords
Assistive Technology, Cane, Elderly, and Bibliometric Analysis

1. Introduction

United Nations (2019) predicts that in 2060 it will happen enhancement the world population of advanced people age where are people with age more than 60 years old by 23.0% and 80.7% of the condition demographic will live in an income country low and medium. Besides some countries experience a spike in growth population aged old like Japan where growth is estimated to exceed all other countries. This showed that in a country Japan has proportion highest inhabitant carry-on age where more than 20% of people aged over 65 years (Elokla & Hirai 2015). The aging demographic presenting challenge to policy mainly in developed and developing countries that have major health policies and programs. The global increase in the number of adults more old has contributed to the increasing prevalence of inability activity life daily activities (activities of daily living, ADL), generally defined as experiencing difficulty in Duty care self like sleep, eating, bathing, and dressing. Seniors with ADL defects are at risk of losing their ability to live independently in society, resulting in enhancement Requests for service health, use House decrepit, and use tool help mobility and support care long term (Fong, 2021). The mobility of people is very important for increasing the quality of life for humans. With mobility, man could do activities productive and valuable for self alone as well as in Public surroundings. With walking time mobility somebody could be disturbed with increased age, pathology disease, factor genetics, susceptibility, disorders physiological and sensory, and barriers environment another impact on increasing risk drop mobility (Elokla and Hirai 2015). Understanding how mobility decline is very important for finding methods for promoting mobility at age-old (Merja.et.al. 2010).

Parents' ability to experience drop with increasing age that can cause a happening accident like fall is increasing problem in the world, which leads to various types of non-fatal and fatal injuries or even death. According to the CDC, the population of elderly has increased decade last, and a third of people aged 65 years experience incident falls every year (Tsai, et.al. 2014). Reason falls on parents influenced by factors intrinsic and extrinsic to self elderly that. Intrinsic factor is originating factor from self somebody whereas factor extrinsic is factors caused by the environment.

Disturbance like disease, cognitive, disorder behavior cause inability to guard balance is called factor intrinsic (Almeida 2012). Changes that occur in parents in activity daily happening drop style walk and change balance body when to do mobility. Decreasing ability causes parents often experience falls at currently do mobility every day. Reaction body, strength muscle, style walk, and duration time walk everything slump along increase age and cause inability for avoiding fall. Assistive technology can help the elderly avoid falling so a very playful role is important for guard stability, mobility, and a balanced body When doing activities every day. Besides assistive technology could influence the condition of psychic parents in thing independence, mobility self, and trust self in activity every day. There is various type of tool that help the mobility of the elderly age including cane, crutches, walkers, chair wheels, exoskeletons, and tools that help walk many others _ used by the elderly in form activity life every day. Assistive walking has the goal for reduce the possibility of falls and raise the balance body when walking. Tools _ like sticks and tools help Street others take notes to impact high on upgrade mobility and balance walking parents and patients _ with disturbance mobility specifically (Bateni, and Maki 2005).

2. Literature Review

Overview literature done with taking research data through the Scopus database, you can give description study systematic study related tool help walk for advanced people age. Journal study from scopus data give description level popularity journal the in period time not enough over 50 years cover gathering journal as following : Clinical and laboratory measures of postural balance in an elderly population (Berg et.al.1992) , Psychometric comparisons of the timed up and go, one-leg stand, functional reach, and tinetti balance measures in community-dwelling older people (Lin et.al. 2004) , Camberwell Assessment of Need for the Elderly (CANE) development, validity and reliability (Reynolds et.al. 2000), PAMM - a robotic aid to the elderly for mobility assistance and monitoring: a 'helping hand' for the elderly (Dubowsky Steven, et.al , 2000), The needs of older people with dementia in residential care (Hancock GA, et.al, 2006), Gait and balance disorders in older adults (Salzman B.2011) , What do community-dwelling people with dementia need (Roest et.al. 2009) , Robotic personal aids for mobility and monitoring for the elderly (Spenko et.al. 2006) , Human-walking-intention-based motion control of an omnidirectional-type cane robot (Wakita K., Huang et.al. 2013) , Ambulatory devices for chronic gait disorders in the elderly (Hook FW et.al. 2003). Whereas name frequent popular journals quoted in citation every year include Archives of Physical Medicine and Rehabilitation, Journal of the American Geriatrics Society, British Journal of Psychiatry, Proceedings - IEEE International Conference on Robotics and Automation, Environmental Health Perspectives, International Journal of Geriatric Psychiatry.

This paper arranged with destination gives analysis comprehensive charts and bibliometrics related with use tool help walk for parents where tool help the could give description level balance, strength and difficulty in use tool help walk that. Analysis using tables and graphs gives a description of the number of papers produced and the number of citations made to the paper in the range of 50 years time more. Besides could give a description of research trends during the period time. Then next with analysis data with VOSviewer software that uses the Scopus database to give a description study study tool helps walk for people aged carry on during not enough over 50 years in range time 1973 to 2022. Processing results describe the use of the device soft VOSviewer in analyzing and displaying research data to help map bibliometric by graphics. VOSviewer is designed to describe the connection network of authors, keywords, citations, and co-occurrence. A mapping analysis study related to assistive walking for the elderly based on the selected keywords could evaluate and identify theme research that becomes point emphasis in discussion and could give description map research that can be done at a later time come.

3. Methods

The stages of the literature review are done in two-step that is pull data from source scopus.com and then the data processing using excel and VOSviewer. Steps in the literature review are done in the order as follows: identify influential research, identify the study latest the field of assistive technology, and provide an outlook about the interest study moment this and direct future research so that can determine the research gap for setting state of the art from planned research. The stages in the literature review with steps are as follows: (see Table 1 following this).

Table 1. The order of the steps taken in the method Literature Review.

Order	Description of Taking Steps Document andProcessing
1	Go to the scopus.com site
2	Search within article title, abstract, keywords input keywords “ canes ” and “elderly”
3	Click search , 503 documents appear

4	Enter document type , select article, review
5	Enter source type select journal
6	Enter language select english
7	Enter the subject area choose engineering, environmental science, computer science, decision science, mathematics, material science, medicine, multidisciplinary, psychology, nursing, health profession
8	Result after refined to 168 documents
9	Download select all and export csv
10	Enter export document settings , select citation information, bibliographical information, abstract and keywords, other information
11	Enter select export type select CSV,only the first 2,000 documents ago save file
12	Download with select export refine then save file
12	Open the CSV file and convert it to EXCEL
13	Clean up excel data
14	To do EXCEL data processing with click insert select pivot table
15	Using a pivot table for get table data and diagrams
16	Next with data processing through VOSviewer
17	Data processing with VOSviewer for get graphic analysis in the form of network linkage of co-authorship, co-occurrence , citation, bibliographic couply and co-citation
18	Result data storage VOS Viewer processing in PNG format
19	Done

From the table, one could explain there are 19 steps in doing a literature review with source documents from scopus.com. this stage started with entering the scopus.com site and then entering keywords in the seeker document until appearing the documents we specify. Then filter documents (refine) to get documents that have been our limit in accordance needs theme article. Next stage document we download and save it in CSV file format. The next step converts the CSV document to EXCEL format for processing more continued. Then next with data processing using a pivot table in excel to get data in the form of tables and diagrams as desired. The next step is to do an analysis graphic using the VOSviewer software to get connection-related networks with co-authorship, co-occurrence, citation, bibliographic couply, and co-citation.

4. Results and Discussion

4.1. Article Number Growth and Trend Analysis

The amount of generated articles each year in publication annual related to theme study tool help walk for parents (assistive walking for elderly) from 1973 to 2022 is shown in Figure 2. This Figure shows the growing number of papers in the range of 50 years time shape trend increase (trend). The total number of published articles reach its peak highest amounted to 42 papers in 2015. The growth data for this paper was obtained from the Scopus database in June 2022 which shows trend enhancement with slope $y = 0.8476x – 6.2706$. In 2022 obtained total number of papers produced a total of 502 articles showing descriptions that interest studies regarding tool help walk for people carry on show rapid growth and development (Figure 1 and Figure 2).

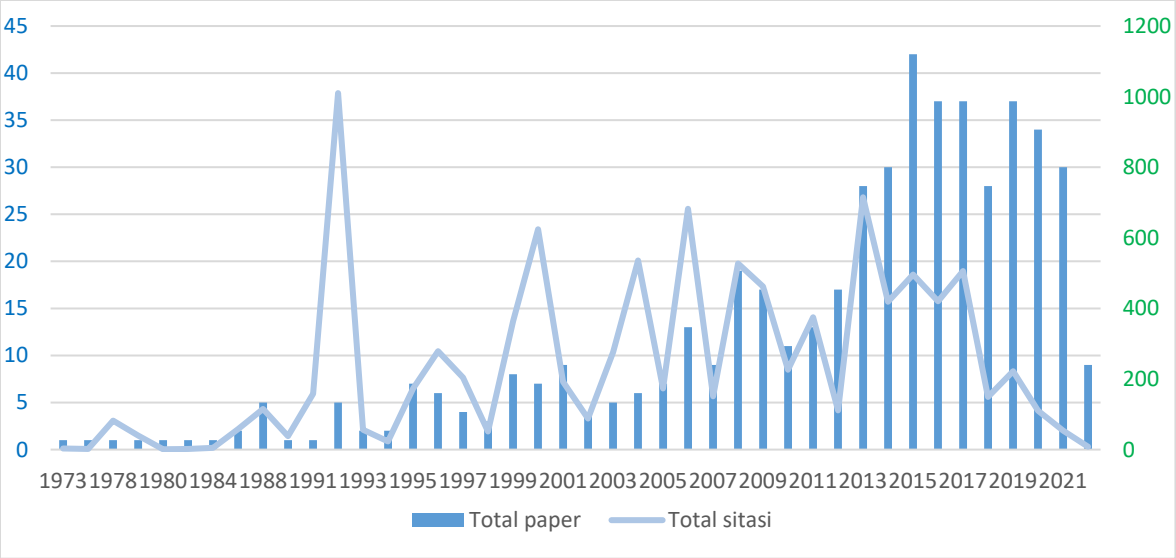

Figure 1. Graphics Connection Among Number of Papers and Number of Citations.

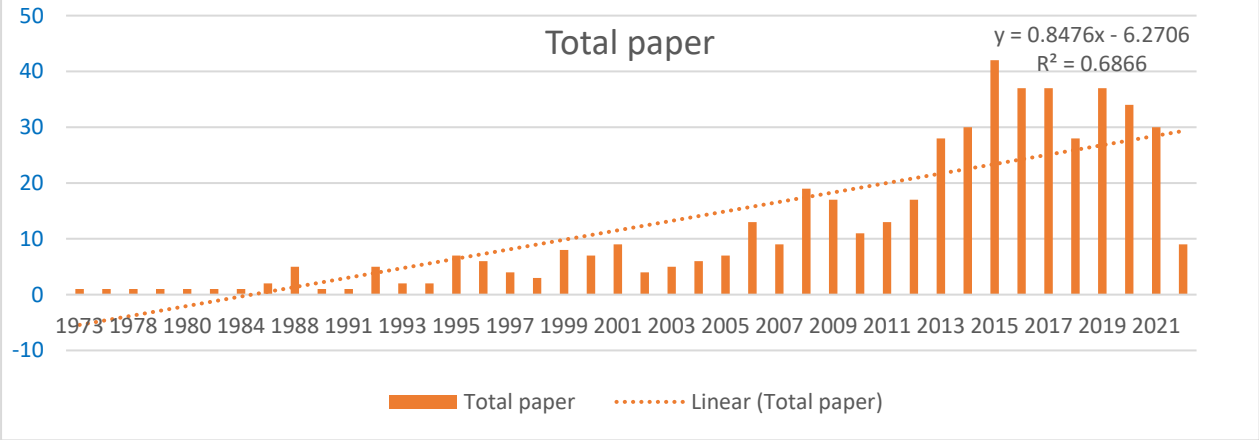

Figure 2. Number of Articles Per Page Years and Increasing Growth Trends

4.2. Search for 20 Papers in Popular Journal Criteria

Based on Table 2 shows as many as 20 popular journals that have published papers the most in range time from 1973 to 2022. This table serves range time in six periods in produce article journal with a period first stretched from 1973 to 1996, a period both 1997-2002, and period final from 2021 to 2022. Based on five sequences the most in produce article journal leading cover Aging Ment. Health (11), Int. Psychogeriatr. (9), Arch. Phys. Med. Rehab . (8), BMC Geriatric. (6), and Rigakuryoho Kagaku (6), who together accounted for 45.54% of the total publication selected (Table 2 and Figure 3).

Table 2. List of 20 Journal Popular from 1973 to 2022 .

Journal name	1973-1996	1997-2002	2003-2008	2009-2014	2015-2020	2021-2022	Total
Aging Ment. Health	0	1	2	5	3	0	11
int. Psychogeriatr .	0	1	2	4	2	0	9
arch. Phys. Med. Rehab .	1	2	1	0	4	0	8
BMC Geriatrics .	0	0	0	2	3	1	6

Rigakuryoho Kagaku	0	0	0	5	1	0	6
J. Gerontol . Ser	0	1	0	1	4	0	6
Clin. orthoped . relative . res.	2	2	0	0	2	0	6
O'clock. geriatric . soc.	0	0	2	1	2	0	5
P.Conf Rob Autom	0	2	0	1	2	0	5
Human Inter.Com .	0	0	0	4	1	0	5
int. sym. Micro-Nano	0	0	0	3	2	0	5
orthoped . Traumatol	0	0	0	0	4	0	4
arch. Gerontol . geriatric .	0	0	0	3	1	0	4
J. Affective Disord .	0	0	0	1	3	0	4
Am. Fam. Phys.	0	1	1	2	0	0	4
J. Arthroplasty	0	0	0	3	1	0	4
jpn . J. Geriatrics .	1	2	1	0	0	0	4
J. Alzheimer's Dis.	0	0	0	0	4	0	4
O'clock. Med. director. Assoc.	0	0	0	0	3	0	3
Age Aging	0	0	2	0	1	0	3
TOTAL	4	12	11	35	43	1	106

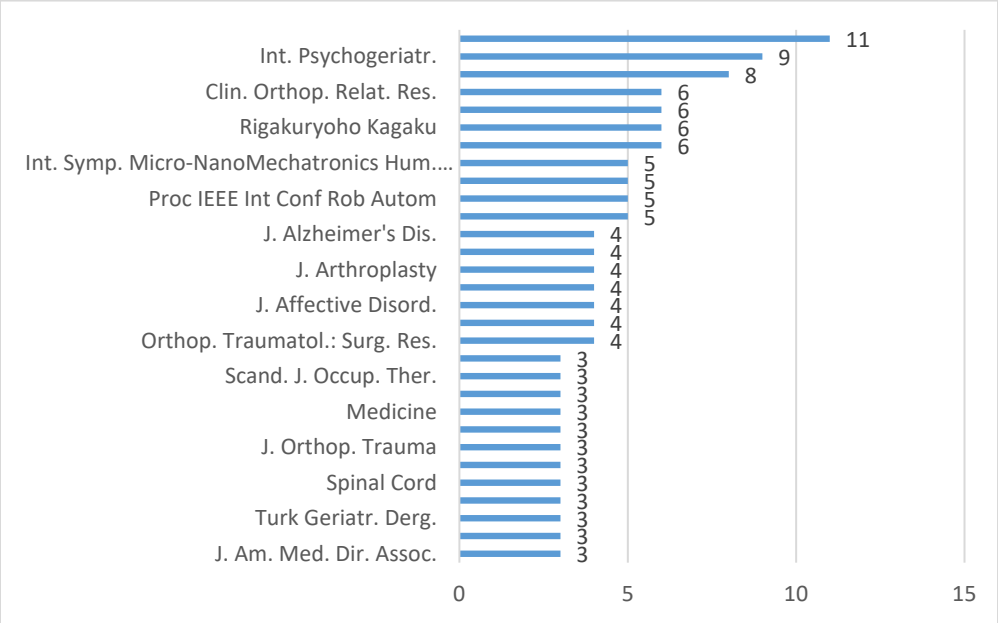

Figure 3. Order Rank Journal International in Paper Publications

4.3. Search for 30 Popular Papers by The Number of Citations

Table 3 shows the 30 most frequent articles quoted from 1973 to 2022. Publications cited with position rank top is Berg KO et.al. (1992), which was published in the journal Archives of Physical Medicine and Rehabilitation with 927 quotes or 31 citations per year (C/Y). Publications second most quoted is Lin M.R et.al. (2004), which was loaded in the journal Journal of the American Geriatrics Society with 367 citations and a C/Y score of 20 per year. The most quoted with order third is an article with the author Reynolds T et al. (2000), with 222 total citations or 10 quotes per year (score 10 C/Y), order next that is author Dubowsky Steven et.al.(2000) with a total of 218 citations or C /Y score of 10. Order fifth with author CanÃ§ado JED (2006) with name journal Environmental Health Perspectives with a total of 213 citations or 13 citations per year. Thereby order writers in the big five groups most popular with indicator the total number of citations and the number of citations each year.

Table 3. List of 30 Journals Popular Based on Amount Citation from 1973 to 2022.

Rank	Author	Year	Journal name	Total Cited	Cited/ year
1	Berg KO, Maki BE, Williams JI, Holliday PJ, Wood-Dauphinee SL	1992	Archives of Physical Medicine and Rehabilitation	927	31
2	Lin M.-R., Hwang H.-F., Hu M.-H., Wu H.-DI, Wang Y.-W., Huang F.-C.	2004	Journal of the American Geriatrics Society	367	20
3	Reynolds T., Thornicroft G., Abas M., Woods B., Hoe J., Leese M., Orrell M.	2000	British Journal of Psychiatry	222	10
4	Dubowsky Steven, Genot Frank, Godding Sara, Kozono Hisamitsu, Skwersky Adam, Yu Haoyong , Yu Long Shen	2000	Proceedings - IEEE International Conference on Robotics and Automation	218	10
5	CanÃ§ado JED, Saldiva PHN, Pereira LAA, Lara LBLS, Artaxo P., Martinelli LA, Arbex MA, Zanobetti A., Braga ALF	2006	Environmental Health Perspectives	213	13
6	Hancock GA, Woods B., Challis D., Orell M.	2006	International Journal of Geriatric Psychiatry	176	11
7	Salzman B.	2011	American Family Physician	169	15
8	Van Der Roest HG, Meiland FJM, Comijs HC, Derksen E., Jansen APD, Van Hout HPJ, Jonker C., DrÃ¶es R.-M.	2009	International Psychogeriatrics	159	12
9	Scott RD, Cobb AG, McQueary FG, Thornhill TS	1991	Clinical Orthopedics and Related Research	158	5
10	Spenko M., Yu H., Dubowsky S.	2006	IEEE Transactions on Neural Systems and Rehabilitation Engineering	154	10
11	Rosenberg DE, Huang DL, Simonovich SD, Belza B.	2013	Gerontologist	149	17
12	Brander VA, Malhotra S., Jet J., Heinemann AW, Stulberg SD	1997	Clinical Orthopedics and Related Research	141	6
13	Wakita K., Huang J., Di P., Sekiyama K., Fukuda T.	2013	IEEE/ASME Transactions on Mechatronics	136	15
14	Kuan T.-S., Tsou J.-Y., Su F.-C.	1999	Archives of Physical Medicine and Rehabilitation	126	5
15	Sanders R., Vaupel ZM, Erdoan M., Downes K.	2014	Journal of Orthopedic Trauma	108	14
16	Krych AJ, Reardon PJ, Johnson NR, Mohan R., Peter L., Levy BA, Stuart MJ	2017	Knee Surgery, Sports Traumatology, Arthroscopy	107	21
17	Miranda-Castillo C., Woods B., Orrell M.	2013	BMC Health Services Research	106	12
18	Mahoney JE, Palta M., Johnson J., Jalaluddin M., Gray S., Park S., Sager M.	2000	Archives of Internal Medicine	102	5
19	Van Hook FW, Demonbreun D., Weiss BD	2003	American Family Physician	102	5
20	Petrie H., Johnson V., Strothotte T., Raab A., Fritz S., Michel R.	1996	Journal of Navigation	98	4
21	Stevens JA, Thomas K., Teh L., Greenspan AI	2009	Journal of the American Geriatrics Society	96	7
22	Walters K., Iliffe S., Orrell M.	2001	Family Practice	84	4
23	Mahoney JE, Sager MA, Jalaluddin M.	1999	Journals of Gerontology - Series A Biological Sciences and Medical Sciences	83	4
24	Gell NM, Wallace RB, Lacroix AZ, Mroz TM, Patel KV	2015	Journal of the American Geriatrics Society	83	12
25	Waller JA	1978	Accident Analysis and Prevention	82	2
26	Jensen MP, Hoffman AJ, Stoelb BL, Abresch RT, Carter GT, McDonald CM	2008	Archives of Physical Medicine and Rehabilitation	79	6
27	Sorock GS Labiner DM	1992	American Journal of Epidemiology	79	3
28	Fisher SR, Kuo Y.-F., Sharma G., Raji MA, Kumar A., Goodwin JS, Ostir GV, Ottenbacher KJ	2013	Journals of Gerontology - Series A Biological Sciences and Medical Sciences	75	8
29	Levy RN, Levy CM, Snyder J., Digiovanni J.	1995	Clinical Orthopedics and Related Research	74	3
30	Orrell M., Hancock GA, Liyanage KCG, Woods B., Challis D., Hoe J.	2008	International Psychogeriatrics	72	5

4.4. Co-Authorship Graphic Display Analysis

This analysis explains appearance graphics in the form of network co-authorship connectedness, co-occurrence, citation, bibliographic couply, and co-citation. Software VOSviewer illustrates appearance graphics (visualization) of the Scopus database input in comma-separated values (CSV) format. Mapping by graphic shown through picture 4 which shows network writer with the others. Determination of data with co-authorship-author choice via Input data with minimum parameter number of an author a total of 10 documents for each author. outside data processing generated via VOSviewer Analysis show four researchers productive namely Orrell M., Woods B, Rymaszewska J, and Mazurek J. Prolific paper writers Rymaszewska related with Mazurek, Suwalska, Droes, Deeg. Whereas network other writers namely Hopper, Marques, Jelly, Bieber, Irving, and Zanetti each other related one each other. Another writer is Orrel though not many confiscated the paper he is a writer in the most productive order with a total of 9 papers in the Journal International Psychogeriatrics with a total of 74 citations. Writer Orrell in touch with other writers is Woods, Hancock, Challis, and Fernades. Likewise, Hancock though not enter the order in an amount of the resulting paper but is a writer of popular order with total citations as many as 176 entered in the top 6 writers with total citations highest. With so, can be said that Orrell M., Woods B, Rymaszewska J, and Mazurek J. are writers sufficiently popular in the field of this.

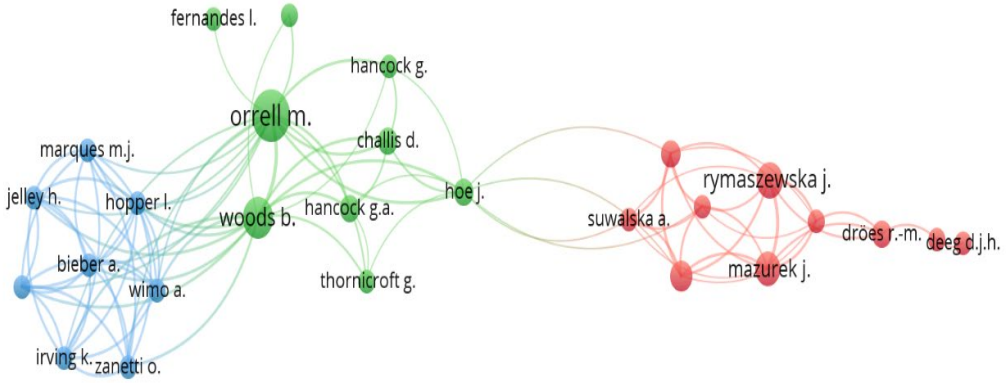

Figure 4. Visualization Graphic Network Writer Based on Total Document.

4.5. Author's Keywords Graphic Display Analysis

Keywords analyzed with the use VOSviewer show keyword relationship with other keywords that make up the network between keywords. In VOSviewer keywords are shared by the keyword author and keywords index. Keywords writer created by the author in system journals and keywords index generated by the Scopus database system. Determination of data with a choice of co-authorship- keyword via Input data with minimum parameter number of an author of 10 documents each author. On view, the graphic in Figure 5 shows the connection between keywords from the author of the paper that formed something network. Size The circle in each cluster represents amount articles captured by keywords main and cluster are depicted with the colors yellow, blue, green, red, and orange. Figure 6 presents a keyword visual report with the percentage of most appearance tall that is elderly, need assessment, rehabilitation, cane, and dementia. Keyword elderly occupies position top in a cluster with 31 keywords or 10 %, need assessment occupies position two with 26 total number of keywords or 8%, while rehabilitation and can get 24 and 22 keyword count or 7% in pie chart cluster, keyword dementia get 19 keywords in the cluster or 6% in a pie chart.

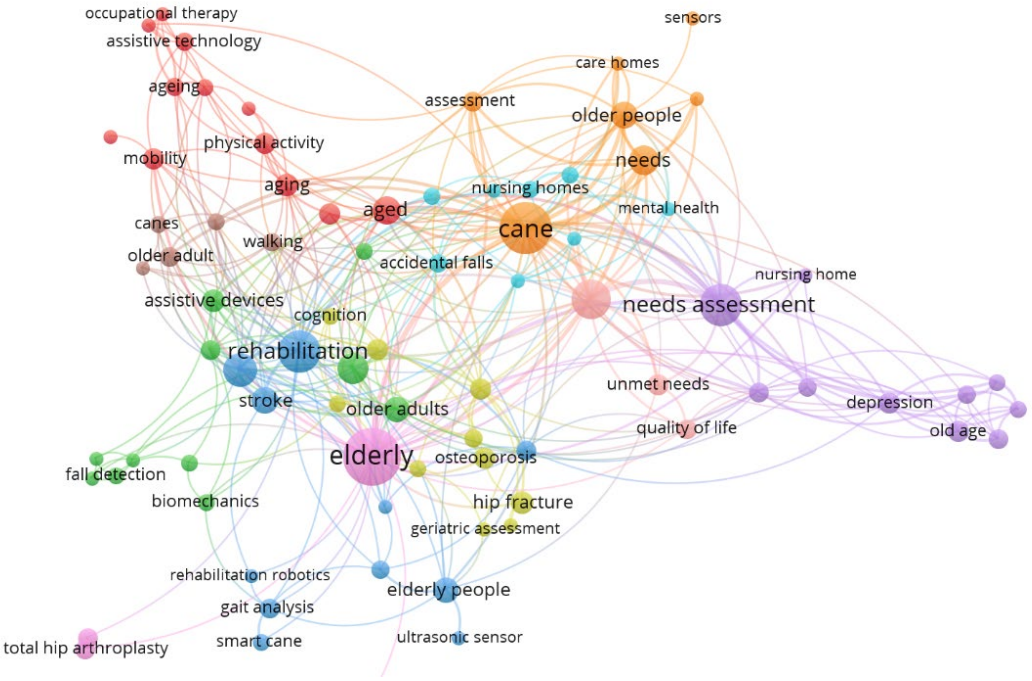

Figure 5. Author's Keyword Based on Total Paper Documents

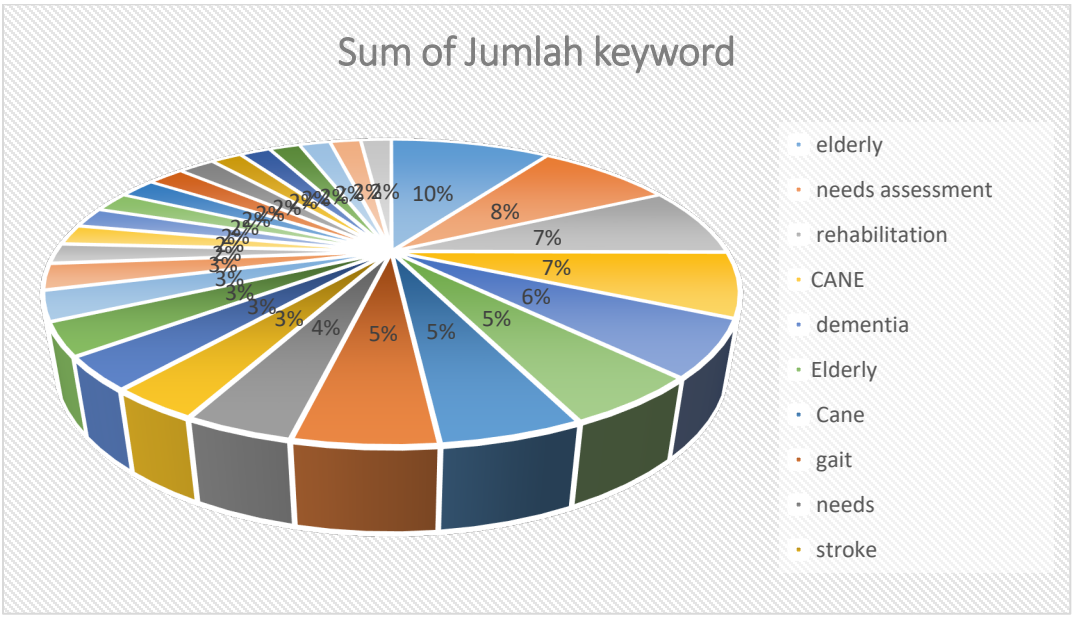

Figure 6. Quantity Author Keyword Percentage in VOSviewer Analysis

6. Conclusion

This paper serves as an analysis of bibliometric publications from 1973 to the year 2022 and presents an outlook on issues of technology tools to help walking (assistive technology) for the elderly (elderly), people in need of special (disabled), and rehabilitation process. This analysis shows that the paper with the most total publications is Aging Ment. Health with a total publication of 11 papers later followed by Int. Psychogeriatr . with a total of 9 papers and Arch publications. Phys. Med. Rehab . d with a total publication of 8 papers. Amount publications of papers in the range from 1973 to 2022 of 506 papers with publication the most in 2015 which resulted in the publication of a total

of 42 papers. While the total amount of citations on the range time is as much as 10186 citations where the number of citations the most occur in 1992 with a total of 1010 citations.

Based on data processing through VOSviewer obtained four incoming researchers in order researcher productive namely Orrell M., Woods B, Rymaszewska J, and Mazurek J. Meanwhile appearance graphic keyword serve percentage the most frequent occurrence of keywords used researcher namely elderly 10%, need assessment 8%, rehabilitation 7%, cane 7% and dementia 6%.

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