The Operationalization of Elderly Mobility and Quality of Life: A Systematic Review

Razieman MOHD YUSOFF [a], Yong Adilah SHAMSUL HARUMAIN [b], Suhana KOTING[c]

[a,b] *Faculty of Built Environment, University Malaya, 50603 Kuala Lumpur, Malaysia*
[c] *Faculty of Engineering, University Malaya, 50603 Kuala Lumpur, Malaysia*
[a] *E-mail: 17217691@siswa.um.edu.my*
[b] *E-mail: adilah_shamsul@um.edu.my*
[c] *E-mail: suhana_koting@um.edu.my*

Abstract: This systematic review article focuses on the elderly mobility based on quality-of-life premise. Generally, three main themes were found throughout the review process involving elderly mobility, namely ideas for future research, challenges faced by elderly and inclusivity environment for elderly. The methodology applied for this type of review was based on past systemic literature review flow and Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) was adopted. This method includes identification, screening, eligibility, and inclusion phases. The review included all type of research field with relevant criteria of research published in the past ten years in two electronic databases (Web of Science and Scopus) to maintain relevancy and precise. Twenty-three papers selected is discussed and found geroscience has potential to be explored in future and has been featured in medical and psychological studies. Finally, recommendations were presented for the reference of future scholars.

Keywords: Systematic Review, Elderly, Mobility, Quality of Life, Transport

1. INTRODUCTION

Elderly can be defined as in the age group of 65 years old and above and consists of thirteen percent of total population of Malaysia for 2020 (Department of Statistics Malaysia, 2020). Meanwhile, 8.5 percent of the world population consists of elderly from the same age group and it is estimated by 2050, this statistic will reach 17 percent (Morelli, Barello, Mayan, & Graffigna, 2019). Japan is estimated to experience growth in the proportion of people older than 80 years (Elokla & Hirai, 2015) while China has experience the growing ageing society phase in late 2000 with 10.46% of total population, approximately 130 million elderly aged 60 (Qian & WenDao, 2012).

The terms coined for people aged 60 years and above depends on the field of research involved. It differs from one country to another, some might call them elderly, older people, ageing society, or golden citizens, depends on the contextual understanding of each situation, be it in medical practice (Elokla & Hirai, 2015), sheltered housing research (Corneliusson et al., 2019), home care service efficacy (King, Parsons, Robinson, & Jorgensen, 2012) or suicide risk research (Liao, Wu, Liu, Chou, & Rong, 2018).

This scenario shows the growing amount of elderly population is definitely not going to slow down and indirectly addressing the alarming needs of elderly in achieving mobility in their lives.

The motivation of this study picks up from the gap addressed in (Musselwhite, 2018),

(Abbas & Saruwono, 2010) and (Saporito et al., 2019) which highlighted the need in understanding the well-being of elderly; who often associated with the terms "hypermobile society". This term is coined from a group of people who depend on mobility in order to stay connected to communities, friends and family as well as accessibilities to shops and services. Among other issues are lack of freedom, physical dependence to carry out routine activities, occupation reduction, self-isolation and sleep deprivation.

Higher life expectancy leads to growing mobility needs for elderly and most countries suffered appreciable number of seniors with transport needs. This has resulted those who belongs in this age group were neglected in transportation planning policies and indirectly affecting national growth and quality of life (Busari et al., 2019). Life expectancy rate is seemingly progressing well and growing positively worldwide, thanks to the advancement of medical and standards of living (Shrestha, Millonig, Hounsell, & Mcdonald, 2017).

Another related issue regarding elderly is mobility impairment. Mobility impairment is common in older adults and negatively influences the quality of life. Mobility level may change rapidly following surgery or hospitalization in the elderly (Saporito et al., 2019). The aftermath of this situation can be proven by Lee and Choi (2020) which found older adults' mobility had a positive impact on their life satisfaction. After controlling for older adults' mobility, social participation was positively associated with life satisfaction regardless of the place of residence.

Abbas and Saruwono (2010) addressed elderly exclusion gap and suggested efforts in ensuring the environment to be more barrier-free and more inclusive towards the creation of a healthier ageing environment, golden enough for our beloved golden citizens. The importance of addressing ageing population is also mentioned in National Transport Policy 2019-2030 by Ministry of Transport (2019). The government of Malaysia clearly wanted accessible and sustainable transport solution to meet the need for elderly mobility.

Based on the issues related to elderly found in previous literatures, this warrants the need for a systemic review to be done in order to extract the essence listed by researchers in any field related to elderly studies. Systematic review according to (Shaffril, Krauss, & Samsuddin, 2018) stated it offers transparent article retrieving procedure, a more prominent wider research area, control of research bias through significant objectives and ability to produce quality evidence with more significant results. Thus, the objective of this study is to operationalize elderly issues in the context of mobility and quality of life for this age group.

2. MATERIALS AND METHOD

This section explains three main sub-sections, PRISMA, resources, and systematic review process. These sub-sections outlined the process taken to extract literature from two reliable database and ways of handling data into a complete body of work.

2.1 Preferred Reporting Items for Systemic Reviews and Meta-Analyses *(*PRISMA*)*

Preferred Reporting Items for Systemic Reviews and Meta-Analyses (PRISMA) is a published standard to conduct a systemic review (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). In general, standards of publication are required to guide authors with related and necessary information that enable them to evaluate and examine the quality and rigor of a review (Shaffril et al., 2018). This method was applied throughout this study to ensure extensive database of scientific literature in each time can be carried out based on the context of this study, elderly mobility, and its association with quality of life.

2.2 Resources

Two main databases with high reliability rate, Scopus and Web of Science were chosen specifically for this systemic review due to factors of robustness and wide coverage of research fields. Furthermore, both database were known for its validity and reliability (Shaffril et al., 2018). Both databases contributed more than 1.5 million results in for "elderly" keyword starting from 2010 to 2020 and this shows the potential in elderly issues to be dragged into the spotlight. This study chose ten years of past literature as a given timeline by replicating (Idso & Idso, 1994) and (Short, Black, Smith, Wetterneck, & Wells, 2012) and it is sufficient period of time in ensuring elderly issues are present and latest.

2.3 Systemic review process

In this stage, the review process involved three phases, namely identification, screening, and eligibility.

2.3.1 Identification

The systematic review process in selecting several relevant articles for the present study includes three main stages. First stage is the identification of keywords, followed by the process of searching for related and similar terms based on the thesaurus, dictionaries, encyclopedia, and past research. Then, search strings of the said similar terms on Scopus and Web of Science were developed in December 2020 (refer Table 1) after every relevant keyword managed to be decided. As a result, the research work managed to nab a total of 2 million results from both databases.

Table 1. The search strings.

Database	Search string
Scopus	CALL ("elderly") OR ("older people") OR ("senior citizen") OR ("ageing") OR ("aging") OR ("warga emas") OR ("orang tua")
World of Science	TITLE-ABS-KEY ("elderly") OR "older people" OR "senior citizen" OR "ageing" OR "aging" OR "warga emas" OR "orang tua"

2.3.2 Screening

After identification phase, this phase focuses on removing duplicate article and specifically chose database from 2010 to 2020 only to exclude irrelevant articles. The inclusion and exclusion criteria are explained (refer Table 2) to maintain relevancy in the last ten years. This study chose ten years of past literature as a given timeline by replicating (Idso & Idso, 1994) and (Short et al., 2012) and it is sufficient period of time in ensuring elderly issues are present and latest.

Table 2. The inclusion and exclusion criteria.

Criterion	Eligibility	Exclusion
Literature type	Article, review, book chapter, conference paper, business articles.	Other than Article, review, book chapter, conference paper, business articles.
Language	English and Malay	Non-English & Non-Malay
Timeline	Between 2010 and 2020	< 2010
Subject area	Medicine, social sciences, multidisciplinary, psychology, arts & humanities, business, management & accounting and undefined.	Other than medicine, social sciences, multidisciplinary, psychology, arts & humanities, business, management & accounting and undefined.
Narrowed subject area	Quality of life, mobility, travel behavior	Other than quality of life, mobility and travel behavior

2.3.3 Eligibility

After screening phase is done, the total eligible articles were 607. Main content of these articles was examined thoroughly based on PRISMA 2009 checklist (Moher et al., 2009) to ensure they met the inclusion criteria and fit to be resumed as research interest for this study.

Table 3. PRISMA 2009 Checklists

PRISMA 2009 Checklist items			
1	Title	15	Risk of bias across studies
2	Structured summary	16	Additional analyses
3	Rationale	17	Study selection
4	Objectives	18	Study characteristics
5	Protocol and registration	19	Risk of bias within studies
6	Eligibility criteria	20	Results of individual studies
7	Information sources	21	Synthesis of results
8	Search	22	Risk of bias across studies
9	Study selection	23	Additional analysis
10	Data collection process	24	Summary of evidence
11	Data items	25	Limitations
12	Risk of bias in individual studies	26	Conclusions
13	Summary measures	27	Funding
14	Synthesis of results		

The twenty-seven-checklists was utilized to streamline 607 related articles from various fields such as medicine, social sciences, multidisciplinary, psychology, arts & humanities, business, management & accounting and undefined items. Finally, a total of twenty-three remaining articles is chosen as the result after criterion of quality of life, mobility, and travel behavior were determined as a filtering application (see Fig. 1).

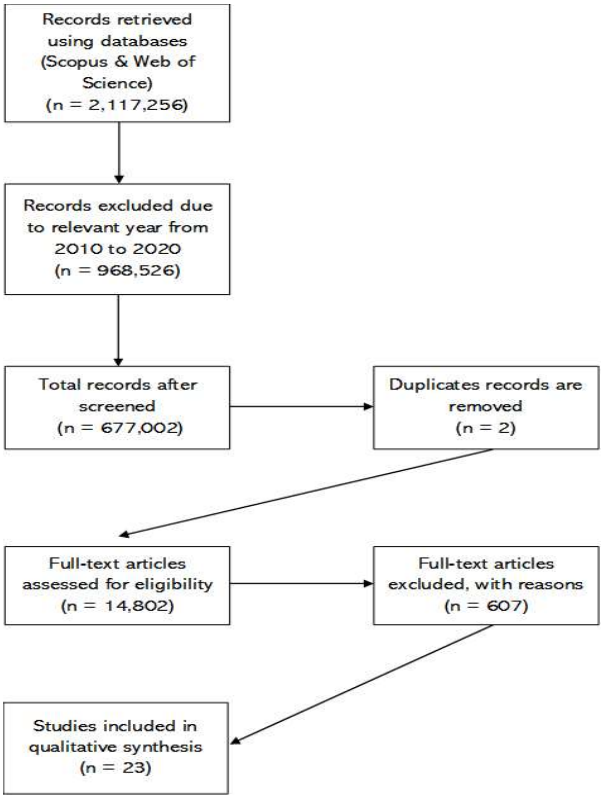

Figure 1. Flow diagram of the study

3. RESULTS

3.1 General Findings

Based on the systematic literature review done on the final twenty-three articles, it was found that three glaring main themes shines throughout review process, which in line with the objective of this study; to operationalize elderly issues related to mobility and quality of life. These themes were grouped based on mobility and quality of life contextual understanding (refer to Table 4) and extracted into opportunities for future research, challenges faced by elderly and age-friendliness environment discussion.

Table 4. The main themes.

Authors	Future research	Elderly challenges	Age-friendliness environment
Seals, Justice, and LaRocca (2016)	✔		✔
Elokla and Hirai (2015)	✔		✔
Musselwhite (2018)	✔	✔	
Corneliusson et al. (2019)	✔		✔
Bernoth et al. (2016)	✔		
Lattman, Friman, and Olsson (2016)	✔		
Liao et al. (2018)	✔		
Abbas and Saruwono (2010)		✔	✔
Vanderlinden, Boen, and van Uffelen (2020)		✔	
Larsson et al. (2019)		✔	
Saporito et al. (2019)		✔	
Tournier, Dommes, and Cavallo (2016)		✔	
Gish, Vrkljan, Grenier, and Van Miltenburg (2017)		✔	
Lombardi, Horrey, and Courtney (2017)			✔
Frost et al. (2018)			✔
Byles, Leigh, Vo, Forder, and Curryer (2015)			✔
Tse, Lai, Lui, Kwong, and Yeung (2016)			✔
Tran, Nguyen, and Vu (2018)			✔
Gibney, Zhang, and Brennan (2020)			✔
Lee and Choi (2020)			✔
Shrestha et al. (2017)	✔	✔	✔
Busari et al. (2019)	✔	✔	✔
Qian and WenDao (2012)	✔	✔	✔

3.2 Main Findings

Based on the twenty-three final articles were finalized (refer Figure 2), it was found that Australia has the highest studies conducted with three articles while Malaysia, Taiwan, Canada, United States of America, and Great Britain follow suit with two articles each.

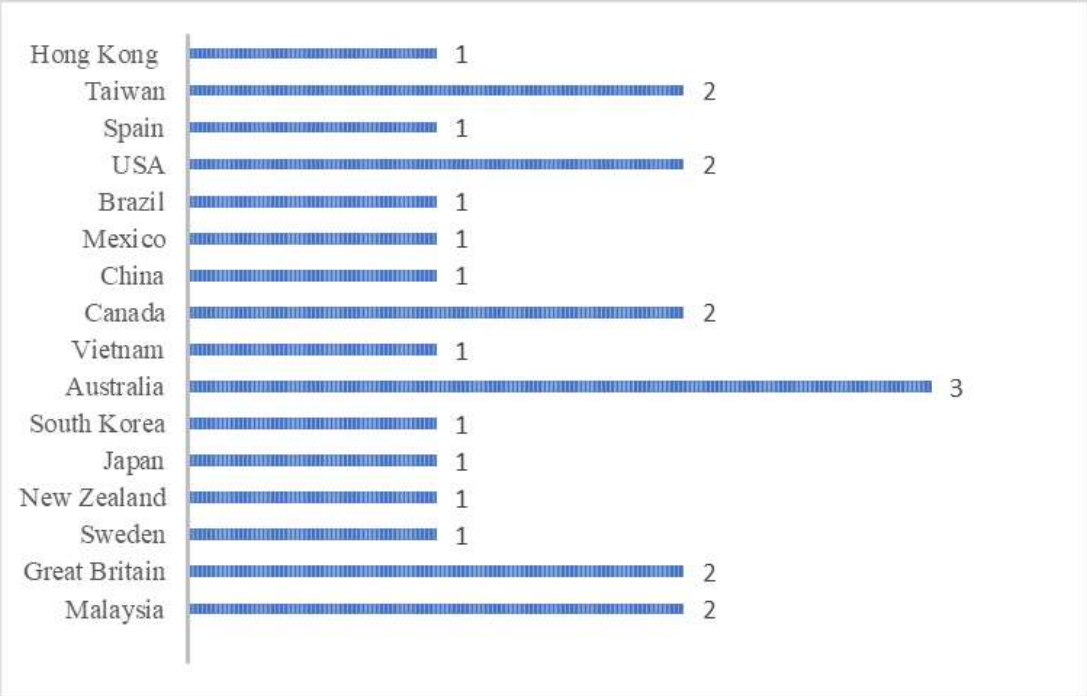

Figure 2. Countries where the studies were based on.

3.2.1 Ideas for future research

A deep dive into the context for elderly has found a trend established in recent years about biological ageing research, widely known as geroscience. The terms coined from research focusing on health span extension (Seals et al., 2016). In discussing the extension of health span for elderly, Elokla and Hirai (2015) linked mobility with elderly in maintaining their independence, as it determine the ability of a person to move safely from one place to another. The same study also suggested rapid growth in the proportion of elderly above 80 years should be taken into serious consideration to ensure their mobility is guaranteed.

In the same medical vein, Musselwhite (2018) believes being mobile is linked to quality of life. Three main motivation for elderly mobility needs to achieve quality of life are utility; a need to move from point A to point B, psychosocial (effects independence, identity and role) and aesthetic needs (for own sake). However, this study found discussion on sheltered housing (Corneliusson et al., 2019) and restoration home care (King et al., 2012) in regards of elderly research. The former found elderly who lived in sheltered housing had lower self-reported health compared to those who were ageing in place while the latter found restorative home care service is beneficial towards elderly.

The review for this study also found further elaboration on the benefits of restorative home care services in Bernoth et al. (2016). The study found seven important factors in determining elderly mental health: namely, functionality/independence, prevention, confidence, connection, the approach, care plans, and the role of the community support workers (CSWs).

Another theme found to have potential to be explored empirically is perceived accessibility among elderly (Lattman et al., 2016). It was found that quality, feeling safe and

frequency of travel are important predictors of perceived accessibility for elderly. Apart from that, suicide rate among elderly is a great premise to explore as the elderly are at a greater risk of suicide than other age groups (Liao et al., 2018).

3.2.2 Challenges and obstacles for elderly.

This study found healthy ageing is associated with elderly and amongst the challenges faced by the nation is in ensuring those older people undergo healthy ageing, by providing proper care and facilities that cater to their special needs as they aged (Abbas & Saruwono, 2010). Failing to fulfil these needs will cause lack of freedom, physical dependence to carry out routine activities, occupation reduction, isolation, and difficulty to sleep.

Additionally, elderly-based research was found to be often associated with medical-related issues such as sleep deprivation. One in two older adults report sleep problems, which not only cause fatigue, but also negatively affect general functioning, activities of daily living, and physical and mental health (Vanderlinden et al., 2020). Sarcopenia, on the other hand is a medical term coined for loss of muscle mass and function in the elderly. Sarcopenia resulted among elderly in terms of reduces mobility, diminishes quality of life, and can lead to fall-related injuries, which require costly hospitalization and extended rehabilitation (Larsson et al., 2019).

Another obstacle faced by elderly is mobility impairment and it is common in older adults and negatively influences the quality of life. This kind of impairment resulted in mobility level, which may change rapidly following surgery or hospitalization in the elderly (Saporito et al., 2019). On the contrary, the same age group also refers to hypermobile society where high levels of mobility are needed in order to stay connected to communities, friends and family and to access shops and services (Musselwhite, 2018).

On a different note, this study found elderly pedestrians exhibit declining walking skills, with a walking speed decrease, less stable balance, less efficient wayfinding strategies, and a greater number of unsafe road crossing behaviors. These difficulties are linked to age-related changes in sensorial, cognitive, physical, and self-perception abilities. It is now known that visual impairment, physical frailty, and attention deficits have a major negative impact on older pedestrians' safety and mobility (Tournier et al., 2016).

As a result, there is an alternative available for elderly who prefer to drive to maintain mobility in their lives. Known as Advanced Vehicle Technology (AVT), age-related changes are not a primary reason for why older adults seek out AVTs, but they still perceived and experienced AVTs to counteract age-related changes in driving performance based upon changes they felt occurring within the body. Older drivers also described AVTs as generating a sense of comfort behind-the-wheel. Comfort with this technology was equated with convenience, ease of use, and increased feelings of safety (Gish et al., 2017).

Therefore, there is a need to identify possible rooms of improvement for the well-being of those older people (Abbas & Saruwono, 2010). Assessment of well-being, also referred as quality of life can be done through ability to drive to fulfil travel needs which indirectly affects depression rate and health related problem (Musselwhite, 2018).

3.2.3 Creating inclusivity and age-friendliness environment for elderly.

After identification of ideas and challenges, this study found an alarming need to address research gaps proposed in the previous studies. Among the knowledge gaps found is the need to help older adults "age in place" in terms of accessibility, mobility, quality of life and safety (Lombardi et al., 2017). Elokla and Hirai (2015) suggested the importance of promoting functional capacity of elderly, which helps in the aspect of health sustainability and improvement of social care systems as well as enhancing quality of life.

Frost et al. (2018) encourage future researchers to focus on increasing motivation on independence and facilitate older people to continue carrying out behaviors that improve their well-being, as well as provide information, motivation, psychological support and practical support (Frost et al., 2018). Positive mental health and life space helps in boosting elderly to maintain independence and social networks, which will result elderly to successfully age in place within their community (Byles et al., 2015).

Another outstanding finding discovered during this review is growing interest on geroscience. Seals et al. (2016) highlighted to meet the demands created by rapid population ageing, a new emphasis in physiological geroscience is needed, which will require the collaborative, interdisciplinary efforts of investigators working throughout the translational research continuum from basic science to public health. In the same medical vein, it is important to explore the relationship between pain, frailty and psychological parameters in order to devise patient-centered interventions, with regards of the high prevalence of pain among older adults and the reversibility of frailty (Tse et al., 2016).

Discussion on elderly's well-being includes transport environment to be more inclusive and barrier-free to encourage formation of a more healthy ageing environment (Abbas & Saruwono, 2010), the importance of forming mobile society to minimize the risk or inequality (Tran et al., 2018), the relationship between the age-friendliness (safety, services, and walkability) of urban environments and multiple aspects of psychosocial wellbeing for older adults in Ireland (Gibney et al., 2020). Corneliusson et al. (2019) suggested further longitudinal comparative studies are needed to explore the impact residence in sheltered housing has on resident health and well-being.

Another emerging need on elderly issues are whether older adults' mobility had a positive impact on their life satisfaction. This can be seen after controlling for older adults' mobility, social participation was positively associated with life satisfaction regardless of the place of residence (Lee & Choi, 2020). Musselwhite (2018) believes transport provision beyond the car neglects psychosocial needs of mobility and sporadically meets practical and aesthetic needs depending upon the wider social context.

4. DISCUSSION

The trends in elderly mobility studies show tendency towards the aspect of medical and psychological studies (Saporito et al., 2019), (Seals et al., 2016), (Bernoth et al., 2016), (Liao et al., 2018), and (Byles et al., 2015). Geroscience seems to be a potential topic for future research to explore as it highlights the aspects of biological ageing research and elderly mobility can be extract out from the field to comprehend travel behavior pattern among older people. Ministry of Transport (2019) in Malaysia listed ageing population as one of the transportation trends need to be address and highly regards in ensuring holistic approach for inclusiveness. This can be seen as a way forward for transportation industry to fully utilized potential of understanding elderly needs for mobility to achieve their travel goals.

Failure to fulfil travel needs for elderly will result in mobility impairment and subsequently influences quality of life for them. This study echoed the same sentiment by Musselwhite (2018) on this matter and warrants future research to look into the aspect of quality of life based on World Health Organization's Quality of Life (QoL) (Hasanah & Razali, 1999; Iqbal et al., 2020; World Health Organization, 1999). Factors such as physical health, psychological, level of independence, social relations, environment, and personal beliefs should be considered as a theoretical basis for future research.

A framework developed to encourage active ageing based on three pillars; health, participation and security (World Health Organization, 2002). In order to measure quality of life among elderly, a worldwide standard of measurement needs to be adopted based on a

survey instrument done on quality of life. World Health Organization (1999) defines quality of life (QoL) as individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. Originally, QoL is presented in Maslov (1954) and derived from hierarchy of human needs to be rudimentary, objective and subjective need-based approaches.

Quality of life has also been measured through the context of indoor and outdoor spaces in two neighbourhood (Omar, Omar, & Othman, 2017). Indoor spaces were found to be favourable amongst youth where social interaction happened in cyberspace while interaction in outdoor spaces were usually chose by much older person. On the other hand, Mohd, Abdul Latiff, and Senadjki (2019) found significant relationship between traveling and quality of life among elderly.

Apart from that, the operationalization of elderly mobility can be seen through research on provision of restorative home and sheltered housing in (Corneliusson et al., 2019), (King et al., 2012), (Bernoth et al., 2016) which suggested positive mental health and life space helps in boosting elderly to maintain independence and social networks. As a result, elderly will be able to perform their daily travel needs to fulfil their goals and subsequently affects the growth of public transport needs.

5. CONCLUSION

The recent literature on elderly mobility and the aspect of quality of life reflects on the basic comprehension in provision towards this age group, which are exposed to various issues such as psychological limitations, physical in capabilities and social boundaries. Based on the three main themes found throughout this whole literature search, elderly is often being neglected in terms of social inclusion, policy consideration and financial needs. However, based on the current trends of research done shows elderly needs are no longer a foreign issue but has became a center of discussion. The growing amount of ageing society in the coming years has also made people realized that planning for future also means planning for elderly mobility as well as it highly correlates with their quality of life.

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APPENDICES

SLR Paper on Elderly / Older people etc.

Sources : ① Scopus & ② Web of Science

① Scopus

- enter "advanced search"
- TITLE-ABS-KEY ("elderly" OR "older people" OR "senior citizen" OR "AGEING" OR "AGING" OR "wage earners" OR "aging fun")
- 1,625,712 results.
- filter by YEAR from 2010 to 2020
- 968,526 results
- filter by SUBJECT AREA. from 28 to 7
  - ⓐ Medicine (566,753)
  - ⓑ Social Sciences (44,289)
  - ⓒ Multidisciplinary (36,645)
  - ⓓ Psychology (28,942)
  - ⓔ Arts & Humanities (11,510)
  - ⓕ Business, Management & Accounting (5,335)
  - ⓖ undefined (220)
- 645,524 results.
- filter DOCUMENT TYPE
  - ⓐ Article (539,147)
  - ⓑ Review (46,503)
  - ⓒ Book Chapter (12,594)
  - ⓓ Conference paper (11,454)
  - ⓔ Business Article (6)
- 609,204 results
- filter PUBLICATION STAGE to final
- 603,856 results
- filter "s.w.v.f" - QoL
- 13,959 results
- filter "s.w.v.f" - mobility
- 13,209 results
- filter travel behaviour
- 543 results.

② Web of Science

- enter "advanced search"
- CALL ("elderly") OR ("older people") OR ("senior citizen") OR ("AGEING") OR ("AGING") OR ("wage earners") OR ("aging fun")
- 491,544 results
- refined ~~into~~ from 100 categories into 5 categories
  - ⓐ psychiatry (14,794)
  - ⓑ physiology (8,219)
  - ⓒ behavioral sciences (3,162)
  - ⓓ social sciences interdisciplinary (2
  - ⓔ social work (2,740)
- 31,478 results
- refined document types from 20 to 6
  - ⓐ Article (23,992)
  - ⓑ Review (2,687)
  - ⓒ Proceedings paper (1,913)
  - ⓓ Book chapter (498)
  - ⓔ discussion (3)
  - ⓕ Abstract of published items
- 29,797 results
- refined Publication years from 2010 to 200
- 16,435 results
- refined "search within results for" - QoL
- 1,595 results.
- refined "s.w.v.f" - mobility
- 64 results

FINAL : 23 papers included