Association of Social Networks with Health-Related Quality of Life and Physical Functioning in Community Dwelling Elderly Women – A Pilot Study

Rajna K.M[1], Samuel S E[2], Haripriya S[3], Krishna Muraleedharan[4]

[1]Lecturer, [2]Prof& Principal, The Oxford College of Physiotherapy, Bangalore, India. Rajiv Gandhi University of Health Sciences, Karnataka, [3]Associate Prof., Laxmi Memorial College of Physiotherapy, Mangaluru, Karnataka, India. India. Rajiv Gandhi University of Health Sciences, Karnataka, [4] Lecturer, The Oxford College of Physiotherapy, Bangalore, India.Rajiv Gandhi University of Health Sciences, Karnataka

Abstract

Background: Social network is the web of relationships that surrounds an individual, social isolation occur when social network breaks down, stronger and closer social ties represent social resources in times of need, reduce a sense of isolation, and increase the mental and physical function. A considerable amount of evidence has consistently demonstrated the benefit of social networking for health, emotional and physical well-being. The purpose of this study is to find out the relationship of social network with quality of life, health and physical functioning.

Objective of The Study: To estimate the relationship between social networks with health-related quality of life and physical functioning.

Methodology: In this cross sectional Pilot study,30 women aged 65 years and older who were selected conveniently and assessed using Lubben social network scale-6(LSNS-6) for social network participation, WHO General Health Questionnaire for Health related quality of life (WHOQOL-BREF), Timed Up and Go (TUG) test for mobility and Functional Reach Test (FRT) for balance.

Result: Pearson's correlation coefficient was calculated between the parameters, a very highly significant positive correlation was found between Social Networks (LSNS-6) and WHOQOL-BREF 4 Domains ($p<0.001$). Among 4 domains Domain-1 and Domain-4 correlation were having very strong positive correlation with a correlation coefficient $r= 0.900$, $r= 0.863$ respectively and Domain-2 ($r= 0.700$), Domain-3 ($r= 0.600$) were having strong correlation. Along with that there exists a highly significant moderate positive correlation of LSNS-6 with balance ($p=.012$, $r= .452$) and a very highly significant strong negative correlation with mobility ($p= 0.000$, $r= -0.630$).

Conclusion: The study showed that in elderly, health related quality of life is associated with better social networks. Analysis of relationship between social networks with balance and mobility showed better the social networks higher the balance and mobility.

Key Words: *Social networks, Health related quality of life, Physical functioning, Balance, Mobility.*

Background and Need of the Study

Ageing is a process of becoming older; it affects everyone in society in one way or the other. Globally, the elderly population constitutes about 12 percent of the total population of 7.3 billion. In India too, the size and percentage of elderly population has been increasing in recent years and this trend is likely to continue in the coming decades. The elderly

population has increased from 77 million in 2001 to 104 million in 2011.by 2050; the elderly population is likely to increase by three times to reach around 300 million. The relatively young India of today will turn into a rapidly greying society in the coming decades[1].

The social networks are the web of relationships that surrounds an individual[2]. Furthermore, stronger and closer social ties represent social resources in times of need, reduce a sense of isolation, and increase the mental and physical functioning of older adults[2,3,4,5]. Social network size declines with ageing, in particular for the oldest old[6]. Larger social networks have a protective influence on cognitive function among elderly women aged 75 years and older[7]. On the other hand, small social networks are known to be associated with negative outcomes such as poor health and well-being[8,9,10]. This is also true for some older adults, where smaller social networks are found to be a risk factor for depressive symptoms[10], more loneliness[11], worse cognition and higher dementia incidence[7].

World Health Organization (WHO) Quality of Life group defines QOL as ‘‘individuals’ perceptions of their position in life in the context of the culture and value systems in which they live and in reference to their goals, expectations, standards, and concerns” [12]. Increasing age is associated with an increased risk of chronic disease, functional decline and hospitalization[13,14]. Such disadvantages may influence both the ability to maintain a social network and the possible positive health effects attached to it. However, maintenance of physical independence, health and a good quality of life (Q0L) for the older population are considered important public health goals[15].This is also a political goal and is even seen as a legal right[16,17]. Furthermore, the QOL is an important concern in healthcare departments involving elderly people and can provide a clinical outcome measure of healthcare[18,19,20].

Physical function is the capacity of an individual to perform the physical activities of daily living, and includes motor function and control, physical fitness and habitual physical activity[21]. Physical functioning includes mobility, balance and muscle strength, which are key factors in preserving a high level of functioning in later years, and concerns the physiological capacity necessary for a person to perform daily tasks safely and independently with vigour and alertness[22,23,24,25]. However, the ageing process tends to reduce mobility, balance and muscle strength, and thus results in difficulties in performing the activities of daily living and normal functioning of elderly people[26,27].

A large proportion of people lives alone and has small social networks and low participation in social activities, making them more susceptible to feelings of loneliness. Evidence has documented that loneliness in old age appears to be an important risk factor of being inactive and worse health, including morbidity and mortality, depression, lower levels of self-rated physical health, and hypertension as well as cardiovascular disease, diabetes, and migraine. An elderly-friendly supportive environment to promote healthy aging include providing opportunities for the elderly to participate in social engagement, improving the living environment, and promoting age diversity in the work environment[28]. An important goal for politicians and public health stakeholders, and for older people, is to decrease the period of disability at the end of life by delaying its onset[29]. At present, more women than men survive to an advanced age, and older women face more physical limitations and disabilities than men of the same [30,31]. It is therefore important to study the importance of social networking for older women. Identifying and addressing possible associations between the social network, health related quality of life and physical functioning may enhance our understanding of such associations, which in turn may not only help us to tailor care more specifically to fit individuals’ needs and preferences, but also help

to improve the quality of healthcare and its outcome[32].

Hence the aim of the study was to find the relationship between social networks with health related quality of life and physical functioning in community dwelling elderly women.

Materials and Methods

A cross sectional pilot Study was carried out in a period of 12 months from March 2019 to March 2020. The study was done in elderly women aged 65 years and above residing in Mangaluru city and bordering areas.

Participants who are willing to take part in the study were screened for inclusion and exclusion criteria, i.e., participant should be Independently mobile without any Psychiatric disorders, debilitating chronic diseases that required restricted amounts of activity for safety reasons, Recent surgeries, Auditory or visual challenge, Acute neurological illness like stroke and Parkinson's disease. After seeking their written consent, and the subjects falling within the inclusion criteria were recruited for the study. A sample size of 30 was estimated for Pilot Study. Purposive sampling method was used to include the participants in the study.

Ethical clearance was obtained from the ethics committee of A J Institute of Medical Sciences, Mangaluru. The subjects participating in the study were given patient information sheet containing the study details, the informed consent were obtained from the subjects prior to the study.

OUTCOME MEASURES

Lubben Social Network Scale (LSNS-6)

Social networks assessment Lubben Social Network Scale (LSNS-6) was used. The LSNS-6 includes 6 items which measure the size of active and intimate networks of family and friends with whom they could talk to or call for help. [33].

WHOQOL-BREF

Health related quality of life was measured using WHOQOL-BREF questionnaire; it is a shorter version of widely used QOL assessment instrument comprises of 26 items in the domains of physical health, psychological health, social relationships and environment[34].

Timed Up and Go (TUG)

Mobility was assessed using Timed Up and Go (TUG) test. The TUG test measures the time taken by a person to rise from a chair, walk 3 m quickly but safely, turn and walk back to the chair, and sit down. A customary walking aid was used if necessary. A chair of approximately 46cm in height, with arm-rests, was placed to face a marker 3 m away[35].

Functional Reach Test(FRT)

To assess balance, the Functional Reach Test was used which measure the maximum distance (cm) subjects could reach the arms forward from a standing position while maintaining a fixed base of support. The better score out of two attempts was recorded, with higher values indicating better balance[36].

PROCEDURE

The initial assessment of medical history, physical therapy assessment, medical record screening was done. Brief introductions about the procedures were explained to all the subjects. Each participant will be given the questionnaire to fill up and asked to perform the test for mobility and balance. The interview method was used if required; any doubts about the questionnaire and tests were cleared by the principal investigator. The outcomes were measured as the same day with a gap of 10 minute in between the scales. The score were recorded on a recording sheet and entered into an excel worksheet on the same day.

Result

A total of 30 women with a mean age of 71.03±7.07 years participated in the study. The mean and standard deviation of the outcome measures were LSNS-6 questionnaire 15.40±5.48, WHOQOL-BREF Domain-115.20±4.26, Domain-2 14.10±2.55, Domain-37.20±1.35, Domain-415.70±4.29, TUG 14.73±2.77, and FRT 19.00±4.63.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS AND OUTCOME MEASURE SCORE

Descriptive Statistics

	Mean± Std. Deviation
Age	71.03±7.073
LSNS-6	15.40±5.481
WHOQOL-BREF Domain1	15.20±4.262
WHOQOL-BREF Domain 2	14.10±2.550
WHOQOL-BREF Domain 3	7.200±1.349
WHOQOL-BREF Domain 4	15.70±4.292
TUG	14.73±2.77
FRT	19.00±4.638

There was a very highly significant positive correlation present between Social Networks (LSNS-6) and WHOQOL-BREF ($p<0.001$). Among 4 the four domains, Domain-1 and Domain-4 correlation were having very strong positive correlation with a correlation coefficient r= 0.900, r= 0.863 respectively. Domain-2 (r= 0.700), Domain-3 (r= 0.600) were having strong correlation.

TABLE 2: THE CORRELATION BETWEEN SOCIAL NETWORKS AND WHOQOL-BREF 4

		Domain-1	**Domain-2**	**Domain-3**	**Domain-4**
LSNS-6	Pearson Correlation	.900	.700	.600	.863
	Sig. (2 Tailed)	.000	.000	.000	.000
	N	30	30	30	.30

DOMAINS

On Karl Pearson Correlation test, a statistically significant moderate positive co-relation (r =0.452, p=0.01) was estimated between Social Networks (LSNS-6) and balance (FRT score)−

TABLE 3: CORRELATION BETWEEN SOCIAL NETWORKS AND BALANCE

		FRT
LSNS-6	Pearson Correlation	.452
	Sig. (2-tailed)	.012
	N	30

Karl Pearson correlation was done to estimate the relationship between Social Networks (LSNS-6) and mobility (TUG score).It was found that there is a very highly significant strong negative correlation was present between these variables (r = -0.63, p=.00).

TABLE 4: CORRELATION BETWEEN SOCIAL NETWORKS AND MOBILIY.

		TUG
LSNS-6	Pearson Correlation	-.630
	Sig. (2-tailed)	.000
	N	30

Discussion

The study investigated the association of social networks with health-related quality of life and physical function of mobility and balance in community dwelling elderly women aged 65 years and above. The study was carried out among urban population of selected district in Southern India.

The demographic shift within the human population identified worldwide over the last decades. Whereas birth rates are drastically decreasing in industrialized countries, life expectancy is increasing and the mortality rate is declining. Reasons for this demographic shift are a suspended or total lack of desire to have children among the younger generation on the one hand, improved health care and increased hygiene standards and health education on the other hand[33]. In India the percentage of greying society is increasing along with the world population[1]. However, it is desirable to not only reach an old age but also achieve healthy ageing ideally with a high quality of life, where physical functioning and social networks play central roles[33].Substantial evidence accumulated suggest that social relationships are important for mental and physical well-being across the lifespan. The celebration of Individualism, autonomy, addressing of physical and material needs more importantly than the social need forgetting the biological fact that we are fundamentally a social species and our nature is to recognize, interact, and form relationships with conspecifics[37]. Evidence suggests that women live to an increased age compared to men[32]. Considering these factors our study was to find the association of social networks with health-related quality of life and physical functioning in community dwelling elderly women.

Our results suggest that reduced social network features a negative impact on the health related quality of life in community dwelling elderly women. We studied the association of social networks with 4 domains (physical, psychological, social and environmental) of quality of life. A decreased social connections and thus lack the health promoting influences of social others, reduced social network size and quality will end up in the feeling of loneliness, depressive symptoms, less motivation to participate in physical activity etc. In our study also we've found a robust correlation between social networks and each domain of quality of life[38]. In humans, deficits in social relationships like social isolation or low social support cancause chronic activation of immune, neuroendocrine, and metabolic systems that dwell the pathways, leading to cardiovascular, neoplastic,

and other common aging-related diseases40. Similar associations were found in the previous studies too. Bergland et al 2015 suggest that close social relationships, participating in social networks will leads to better quality of life[32]. Similarly, a study done by Martin Niedermeier et al generally confirmed a positive relationship between physical functioning and QOL[33].

Our results showed a reduced physical functioning with reduced social networks. The mechanisms underlying the association between social activity and disability are unknown. Social activity may reinforce the neural networks and musculoskeletal function required to maintain functional dependence in the face of declining physiologic reserve capacity in later life, in what may be a case of "use it or lose it" with regard to function. Indeed, previous work has shown that social activity is associated with a slower rate of decline in motor function[39]. Psychosocial perspective, social activity may reinforce meaningful social roles, thereby providing a sense of value and belonging and more active participation in physical activities this will leads to improved physical functioning and quality of life in its various domains. Gerontologists have long recognized that older person's . Who has higher levels of daily activity and larger social networks have less disability in later life. This relation between the variables that is social networks and physical functioning is applicable in either direction too. Our study result is also in line with the previous studies. A study done by Yang Claire Yang et al. 2015 found that particular network and support characteristics may have unique influences on health. They found that the links between social embedded and better physical functioning, as well as lower clinically significant disease risks[39]. Study done by Bryan D. James also concluded that socially active older adults tend to be more physically active with better physical functioning characteristics[40].

Our study included participants who stayed alone, who stayed with family, widows, divorcees etc. The majority of the participant's education qualifications were also different. Our study population included only elderly women aged 65 and above, being vulnerable population with a low educational level, they were ignorant of the need to express their problems and was afraid to answer many questions because of the fear of being abandoned. But from the available data and the interview method used to collect the data, we found that elderly women experience lack of social support due to fast competent growing society, poor attention given to the to the elderly population from the family they belongs to, loss of spouse, loss of friends and unable to reach close friends due to physical challenges. Along with that family members give more concentration to the physical and materialistic needs of the elderly. Family being the basic primary social support system the social support is disturbed in the primary level when above mentions things happens. So this eventually progress to the feeling of loneliness, depression and associated health related complications and disability. The participants who lost their spouse were more vulnerable to the fear of death it leads to making them less active and withdraw from the family and friend circle and which further leads to the feeling of loneliness. Age related physical challenges appeared to prevent participation in social activities and social networks. Our study and the previous studies show the relationship in either direction between the variables too.

Even though our study has its own limitations the results shows a strong relationship between social networks with health related quality of life and physical functioning in elderly women. The relation between the variables in either direction was also profound in our study and the past literature. Social network characteristics can include the network size, the connection between members of the network, and therefore the frequency of contact between network

members. Social activity also referred to as social participation or engagement which includes meeting friends, attending events or functions, volunteering or participating in occupational duties or group recreational activities. Social support, often divided into emotional, instrumental, and informational. Social support refers to a person's perception of the availability of help or support from others in their social network.

Finding relationship of social networks with health related quality of life and physical functioning has several implications. Social networks and activity represent structural aspects of social relationships, while social support represents functional aspects of social relationships[41]. This sense of attachment to family, friends, and community may provide a strong motivation to take care of functional performance in later life. Reduced social networks size and quality leads to loneliness and depressive symptoms; it has been already established that loneliness is further associated with adverse health outcomes, including mortality, morbidity, depression, poor sleep, systolic hypertension, heart disease etc.[38]. Good social networks in elderly, apart from making them lonely, the associated improved perceived quality of life could lessen the effects of age related decline in functioning.

Educating elderly on the need of social networks and its health promotion effects may be considered in the light of findings of this study. As physical therapists, we aim to promote healthy ageing lessening the impact of disease and disability associated with ageing. We can better their physical functional status; cognitive status and emotional status health promoting therapeutic exercises in group. Engaging in group exercise among community dwelling elderly will give them an opportunity to interact with people facing similar challenges and be emotionally strong by sharing and caring each other: along with the functional improvement by doing exercise. In addition, being one among the primary health care providers, we may also educate and encourage social workers or community agencies on the need for social interaction in elderly; and for consideration of social programs such as group meals, senior centre activities, and volunteerism, which may ameliorate and reduce the impairments associated with reduced social networks[42]. Better Social networks in elderly could contribute to achieve healthy ageing, by creating physically and mentally strong active elderly population with a better perceived quality of life.

Limitations

Our study was done in community dwelling elderly women aged 65 and above, the educational, cultural, family backgrounds were different among the participants and this makes it difficult to generalise data even though the population of study and the study setting were clearly defined. The sample size of the study was also small. The LSNS-6 which was used to assess the social networks only focus on the size of the social networks, it does not give a close look up towards the quality of social networks and other aspects of it. It also appeared that participants needed prompting to open up and answer the questions. Using culturally validated questionnaire could also help participants to express themselves more accurately.

Further studies may be undertaken with a larger sample more exclusively defined population since different cultural educational and family backgrounds could possibly affect the social network participation and quality of it.

Conclusion

The study concluded that in elderly, higher health related quality of life is associated with better social networks. Analysis of relationship between social networks with balance and mobility showed that better the social networks higher the balance and mobility.

Conflict of Interest: None

Source of Funding: Self

References

1. Bhatnagar VG. Caring for our elders: Early response India Ageing Report. Report of UN Population Fund India. The Wire. 2017;20(6).
2. Berkman LF, Glass T. Social integration, social networks, social support, and health. In: Berkman LF, Kawachi I, editors. Social epidemiology. New York: Oxford University Press; 2000. p. 137–73.
3. McPherson M, Smith-Lovin L, Brashears ME. Social isolation in America: changes in core discussion networks over two decades. Am Sociol Rev. 2006;71:353–75.
4. Park NS, Jang Y, Lee BS, Haley WE, Chiriboga DA. The mediating role of loneliness in the relation between social engagement and depressive symptoms among older Korean Americans: do men and women differ? J Gerontol B PsycholSciSoc Sci. 2013;68:193–201.
5. Shaw BA. Anticipated support from neighbors and physical functioning during later life. Res Aging. 2005;27:503– 25.
6. Broese van Groenou M, Jacobs M, Zwart-Olde I, Deeg DJ. Mixed care networks of community-dwelling older adults with physical health impairments in the Netherlands. Health Soc Care Community. 2015. [Epub ahead of print]. doi: 10.1111/hsc.12199.
7. Crooks VC, Lubben J, Petitti DB, Little D, Chiu V. Social network, cognitive function, and dementia incidence among elderly women. Am J Public Health. 2008;98:1221–7.
8. Cohen S, Janicki-Deverts D. Can we improve our physical health by altering our social networks? PerspectPsychol Sci. 2009;4:375–8.
9. Jetten J, Haslam C, Haslam SA, Branscombe NR. The social cure. Sci Am Mind. 2009;20:26–33.
10. Iyer A, Jetten J, Tsivrikos D, Postmes T, Haslam SA. The more (and the more compatible) the merrier: multiple group memberships and identity compatibility as predictors of adjustment after life transitions. Br J Soc Psychol. 2009;48:707–33.
11. Dykstra PA, Van Tilburg TG, deJongGierveld J. Changes in older adult loneliness: results from a seven-year longitudinal study. Res Aging. 2005;27:725–47.
12. WHOQOL Group. The World Health Organization Quality of Life Assessment (WHOQOL): development and general psychometric properties. SocSci Med. 1998;46:1569–85.
13. English KL, Paddon-Jones D. Protecting muscle mass and function in older adults during bed rest. CurrOpinClinNutrMetab Care. 2010;13:34–9.
14. Kortebein P. Rehabilitation for hospital-associated deconditioning. Am J Phys Med Rehabil. 2009;88:66–77.
15. Gill TM, Gahbauer EA, Murphy TE, Han L, Allore HG. Risk factors and precipitants of long-term disability in community mobility: a cohort study of older persons. Ann Intern Med. 2012;156:131–40.
16. Pitchai P, Dedhia HB, Bhandari N, Krishnan D, D'Souza NR, Bellara JM. Prevalence, risk factors, circumstances for falls and level of functional independence among geriatric population-A descriptive study. Indian journal of public health. 2019 Jan 1;63(1):21.
17. World Health Organization. Good health adds life to years: Global brief for World Health Day 2012. World Health Organization; 2012.
18. Bowling A. Measuring disease: a review of disease-specific quality of life measurement

scales. Buckingham: Open University Press; 2001.

19. Mitchell R, Imperial E, Zhuo D, Lu Y, Watts G, Kelleher P, et al. A cross-cultural assessment of perceived health problems in the elderly. DisabilRehabil. 1992;14:133–5.
20. Wahl AK, Hanestad BR. Ma ˚ling avlivskvalitetikliniskpraksis: eninnføring. Bergen: Fagbokforlaget; 2004.
21. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee I-M, et al. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011;43:1334–59.
22. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public Health Rep. 1985;100:126–31.
23. Rikli RE, Jones CJ. Senior fitness test manual. Champaign, IL: Human Kinetics; 2012.
24. Warburton DER, Nicol CW, Bredin SSD. Prescribing exercise as preventive therapy. CMAJ. 2006; 174:961–74.
25. Rikli RE, Jones CJ. Development and validation of criterion referenced clinically relevant fitness standards for maintaining physical independence in later years. Gerontologist. 2013; 53:255–67.
26. Chodzko-Zajko WJ. Exercise and physical activity for older adults. The Academy Papers. Kinesiol Rev (Champaign). 2014; 3:101–6.
27. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. Circulation. 2007; 116:1094–105.
28. Liu J, Rozelle S, Xu Q, Yu N, Zhou T. Social Engagement and Elderly Health in China: Evidence from the China Health and Retirement Longitudinal Survey (CHARLS). International journal of environmental research and public health. 2019 Jan;16(2):278.
29. Landi F, Liperoti R, Russo A, Capoluongo E, Barillaro C, Pahor M, et al. Disability, more than multimorbidity, was predictive of mortality among older persons aged 80 years and older. J ClinEpidemiol. 2010;63:752–9.
30. Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. Lancet. 2009;374:1196–208.
31. von Strauss E, Agu¨ero-Torres H, Ka ˚reholt I, Winblad B, Fratiglioni L. Women are more disabled in basic activities of daily living than men only in very advanced ages: a study on disability, morbidity, and mortality from the Kungsholmen Project. J ClinEpidemiol. 2003;56:669–77.
32. Bergland A, Meaas I, Debesay J, Brovold T, Jacobsen EL, Antypas K, Bye A. Associations of social networks with quality of life, health and physical functioning. European Journal of Physiotherapy. 2016 Apr 2;18(2):78-88.
33. Niedermeier M, Herzog S, Kopp-Wilfling P, Burtscher M, Kopp M. Is the Effect of Physical Activity on Quality of Life in Older Adults Mediated by Social Support?. Gerontology. 2019 Feb 13:1-8.
34. Xiao Q, Wu M, Zeng T. Social support networks in Chinese older adults: health outcomes and health related behaviors: a path analysis. Aging & mental health. 2019 Jan 28:1-9.
35. Chang Q, Sha F, Chan CH, Yip PS. Validation of an abbreviated version of the Lubben Social Network Scale ("LSNS-6") and its associations with suicidality among older adults in China. PloS one. 2018 Aug 2;13(8):e0201612.

36. Ohaeri JU, Awadalla AW. The reliability and validity of the short version of the WHO Quality of Life Instrument in an Arab general population. Annals of Saudi medicine. 2009 Mar;29(2):98.

37. Cacioppo JT, Cacioppo S. Social relationships and health: The toxic effects of perceived social isolation. Social and personality psychology compass. 2014 Feb;8(2):58-72.

38. Hawkley LC, Thisted RA, Cacioppo JT. Loneliness predicts reduced physical activity: cross-sectional & longitudinal analyses. Health Psychology. 2009 May;28(3):354.

39. Yang YC, Boen C, Gerken K, Li T, Schorpp K, Harris KM. Social relationships and physiological determinants of longevity across the human life span. Proceedings of the National Academy of Sciences. 2016 Jan 19;113(3):578-83.

40. James BD, Boyle PA, Buchman AS, Bennett DA. Relation of late-life social activity with incident disability among community-dwelling older adults. Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences. 2011 Apr 1;66(4):467-73.

41. Kelly ME, Duff H, Kelly S, Power JE, Brennan S, Lawlor BA, Loughrey DG. The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: a systematic review. Systematic reviews. 2017 Dec 1;6(1):259.

42. Perissinotto CM, Cenzer IS, Covinsky KE. Loneliness in older persons: a predictor of functional decline and death. Archives of internal medicine. 2012 Jul 23;172(14):1078-84.