Geliş Tarihi (Received): 21.10.2024 Kabul Tarihi (Accepted): 04.02.2025

Derleme / Review

Physical Activity and Nursing Care in Reducing the Risk of Falls in Elderly Individuals: Current Approaches

Yaşlı Bireylerde Düşme Riskini Azaltmada Fiziksel Aktivite ve Hemşirelik Bakımı: Güncel Yaklaşımlar

Hatice ÖNTÜRK AKYÜZ[1]

Hatice GÜLSOY[2]

[1]Dr. Öğr. Üyesi, Bitlis Eren University - School of Health, Department of Nursing, Bitlis, Türkiye

[2]Dr. Öğr. Üyesi, Alanya Alaaddin Keykubat University, Faculty of Health Science, Department of Nursing, Antalya, Türkiye

Yazışmadan sorumlu yazar: Hatice Öntürk Akyüz; onturk65@hotmail.com

Alıntı (Cite): Öntürk Akyüz H, Gülsoy H. Yaşlı Bireylerde Düşme Riskini Azaltmada Fiziksel Aktivite ve Hemşirelik Bakımı: Güncel Yaklaşımlar. YBH dergisi. 2025; 6 (1): 102-113

Abstract:
Aim: The study was conducted to examine the risk of falling, which is frequently encountered in the aging process, the importance of physical activity against this risk, and the nursing approach.
Methods: The study data were collected by conducting a literature review on Turkish and English articles accessed from electronic databases Medline/PubMed, Turkish Medline, Academic Google, and internet search engines with keywords including "elderly/elderly individual", "virtual reality and nursing", "nursing approach", "fall risk", "physical activity".
Results: Worldwide, 30% of individuals over the age of 65 experience falls each year, and this rate increases to 50% in individuals over the age of 80. Falls cause injuries, functional losses, hospitalizations, and long-term care needs in elderly individuals. Physical activity plays a key role in reducing the risk of falls. Regular exercise reduces the risk of falls by increasing muscle strength and balance. In addition, virtual reality-based balance games and interactive technologies are innovative methods that encourage elderly individuals to participate in physical activity. Nurses should encourage physical activity, create safe environments.
Conclusion: The active roles of nurses in this process are critical to protecting the health of elderly individuals and improving their quality of life.
Key Words: Physical activity; nursing; fall risk; elderly individual; virtual reality.

Özet:
Amaç: Çalışma, yaşlılık sürecinde sıklıkla karşılaşılan düşme riski, bu riske karşı fiziksel aktivitenin önemi ve hemşirelik yaklaşımını incelemek amacıyla yapıldı.
Yöntem: Çalışma verileri, "yaşlı/yaşlı birey", "sanal gerçeklik ve hemşirelik", "hemşirelik yaklaşımı", "düşme riski", "fiziksel aktivite", içeren anahtar kelimelerle, elektronik veri tabanlarından Medline/PubMed, Turkish Medline, Akademik Google ve internet arama motorlarından ulaşılan Türkçe ve İngilizce makaleler üzerinden literatür taraması yapılarak toplandı.
Bulgular: Dünya genelinde 65 yaş ve üstü bireylerin %30'u her yıl düşme yaşamakta, 80 yaş ve üstü bireylerde bu oran %50'ye kadar çıkmaktadır. Düşmeler, yaşlı bireylerde yaralanmalara, fonksiyon kayıplarına, hastane yatışlarına ve uzun süreli bakım ihtiyaçlarına neden olur. Düşme riskini azaltmada fiziksel aktivite kilit bir rol oynar. Düzenli egzersizler, kas gücünü ve dengeyi artırarak düşme riskini azaltır. Ayrıca, sanal gerçeklik tabanlı denge oyunları ve etkileşimli teknolojiler, yaşlı bireylerin fiziksel aktiviteye katılımını teşvik eden yenilikçi yöntemlerdir. Hemşireler, yaşlı bireylerde düşme riskini azaltmak için fiziksel aktiviteyi teşvik etmeli, güvenli çevreler yaratmalıdır.
Sonuç: Hemşirelerin bu süreçteki aktif rolleri, yaşlı bireylerin sağlığını korumak ve yaşam kalitesini artırmak için kritik öneme sahiptir.
Anahtar Kelimeler: Fiziksel aktivite; hemşirelik; düşme riski; yaşlı birey; sanal gerçeklik.

Introduction

Old age is a natural stage of human life and generally includes individuals aged 65 years and older. Falls in the elderly are recognized as a serious health problem worldwide.[1] Falls can cause injuries, functional losses, hospitalizations and long-term care needs in elderly individuals.[1-3] According to the World Health Organization (WHO), falls are the fifth leading cause of death in the elderly. Falls are one of the main causes of serious injuries in elderly people, and bone fractures, especially hip fractures, can cause elderly people to lose their independence and even require long-term inpatient care.[1, 2]

It is reported that approximately 30-35% of individuals over the age of 65 experience falls every year in Europe and 10-15% of these falls result in serious injuries.[3-5] These data clearly demonstrate that falls are an important health problem in elderly individuals. Falls not only affect physical health, but also negatively affect the social and emotional status of older people.[6-9] Fear of falling again, social isolation and mental problems such as depression are among the most common outcomes after falls. Prevention of falls in elderly individuals has a critical importance in terms of maintaining quality of life and reducing the burden on the health system.[3-5, 10]

Physical activity plays a major role in reducing the risk of falls. By increasing muscle strength, improving balance and improving motor skills, physical activity significantly reduces the risk of falls. [11, 12] Regular physical activity increases the functional capacity of older people and contributes to their independence in activities of daily living. The benefits of physical activity are not limited to physical capacity; it also has significant positive effects on psychosocial health.[5, 13] Furthermore, innovative technologies, such as virtual reality-based balance games, have emerged as an important tool to increase older adults' participation in physical activity and prevent falls. These technologies can help older adults to maintain physical activity, especially by providing a fun environment to improve balance.[14-18] The role of nurses in this process focuses on encouraging the participation of older individuals in physical activity, developing strategies to reduce the risk of falls, and keeping individuals in a safe environment. Nurses play a key role by implementing multidisciplinary approaches and individual care plans to reduce the risk of falls in elderly individuals.[1,2]

Fall Statistics and Causes

According to studies conducted worldwide, approximately 30% of individuals aged 65 and over experience a fall every year, and this rate increases to 50% in individuals over 80 years of age.[11] In studies conducted in European countries, it is estimated that approximately 25,000

elderly people die each year due to falls. [14, 16] Hip fractures in particular are one of the most serious problems that elderly people experience after a fall. In 2015, more than 500,000 cases of hip fractures were reported in Europe, and a large proportion of these cases occurred in elderly people as a result of falls. [17-19] Hip fractures lead to functional loss and serious complications in older people, greatly reducing quality of life and increasing the risk of death. In countries such as Germany and the Netherlands. [17, 20]

Comprehensive prevention programs are carried out to reduce the risk of falls in individuals. [21, 22] These programs include strategies such as making the home environments of elderly individuals safe, implementing exercise programs that reduce the risk of falls, and medication management.[3-5, 23]

Countries such as Sweden aim to improve the balance and coordination skills of the elderly by implementing virtual reality-supported exercise programs in elderly care homes.[1, 2] Fall prevention programs in Sweden are based on using virtual reality technology in the rehabilitation processes of elderly individuals to support balance development and enable individuals to remain more active in daily life. [1, 17] Deaths from falls are increasing, especially due to serious injuries such as hip fractures. Statistics show that 30% of fall-related injuries in older people lead to permanent functional loss and dependency. This can lead to the end of independent living and the need for long-term care. [1, 3-6] In addition, the fear of falling again after a fall brings psychosocial problems such as loss of self-confidence, social isolation and depression in elderly individuals.[6-8, 24]

The causes of falls include physiological changes that occur with aging, drug use and environmental factors. Decrease in muscle mass (sarcopenia), decrease in bone density (osteoporosis), neurological disorders, vision loss and balance disorders are the main factors that increase the risk of falls in elderly individuals. [6, 24] Conditions such as sarcopenia and osteoporosis seen in the musculoskeletal system with aging negatively affect balance, limiting the mobility of individuals and increasing the risk of falls. Furthermore, impairments in sensory systems such as neurological disorders and vision loss may cause individuals to be more vulnerable to environmental hazards. [11, 24] In addition, polypharmacy (polypharmacy) in elderly individuals may cause side effects on the central nervous system, such as dizziness, loss of balance and sleepiness. In particular, the use of tranquilizers, antidepressants and sleeping pills is an important factor that increases the risk of falls in older people. [11, 22-24] The side effects of these medications affect the physical coordination of individuals, increasing the likelihood of falls. According to reports by the European Medicines Agency (EMA), approximately 40%

of medicines used in the elderly are substances that affect the central nervous system, and misuse of these drugs is seen as a serious risk factor for falls.[3-5]

In addition, environmental factors are also important factors that increase the risk of falls. Situations such as slippery floors, inappropriate shoes, irregularly placed furniture or poor lighting at home can increase the risk of falls in elderly individuals. [14, 21, 23] Such environmental factors make it difficult for older people to move safely at home or outdoors. One of the important tasks of nurses in this process is to recommend appropriate arrangements to make the environment where older people live safe and minimize environmental risks.[9-13]

Impact of Physical Activity on Health

Regular physical activity has multifaceted positive effects on health in older people. Physical activity strengthens the musculoskeletal system, improves cardiovascular health and supports neurological function. [6, 12, 13]As muscle strength and bone density decline over time in older people, regular exercise helps to prevent these losses. By increasing muscle mass, exercise improves individuals' ability to protect themselves in the event of a fall. Resistance training and balance training are among the strategies that minimize the risk of falls in older people. [8-10] In addition, physical activity helps individuals to be safer during movement by increasing balance and coordination skills.[9-13]

The effects of physical activity on bone health are also very important. Especially in elderly individuals, osteoporosis causes bones to weaken and become brittle. This leads to more frequent hip, wrist and spine fractures after falls. Weight-bearing exercises reduce the risk of osteoporosis and improve bone health by increasing bone mineral density. In a study conducted in Germany, it was reported that the risk of osteoporosis decreased by 30% in elderly individuals who regularly performed weight-bearing exercises and fractures after falls were less common.[3-5]

Effects on Cardiovascular and Respiratory Systems

Physical activity not only improves muscle and bone health, but also the cardiovascular system. Regular aerobic exercise strengthens the heart muscle, improves blood circulation and stabilizes blood pressure. [21, 23, 24] This helps older people to become more resistant to cardiovascular diseases. Strengthening the respiratory muscles and increasing lung capacity improves the respiratory function of older people. [11, 14, 16] Regular aerobic exercises reduce the risk of developing respiratory diseases and prevent problems such as shortness of breath.[14-16]

Effects on Mental Health and Cognitive Functions

Physical activity also plays an important role in improving the mental health and cognitive functioning of older people. Depression and anxiety are common mental health problems in older people. [11-13] Physical activity increases endorphin levels, making individuals feel better about themselves. In addition, exercise strengthens social relationships and prevents social isolation. Participation of elderly individuals in physical activity allows them to gain self-confidence and participate more actively in social life.[9-13]

Physical activity also has positive effects on cognitive functions. Studies show that older individuals who exercise regularly experience cognitive decline more slowly and have a reduced risk of Alzheimer's disease. In a study conducted in Finland in 2018, it was found that the risk of developing Alzheimer's disease decreased by 35% in elderly individuals who engaged in regular physical activity at least three days a week. [11, 22, 23] These findings clearly demonstrate that physical activity has multifaceted effects on both physical and mental health in older adults.[14-16]

The Role of Occupational Therapy

Occupational therapy is an important intervention method to reduce the risk of falls in elderly individuals. Occupational therapists apply special exercises that improve balance, coordination and muscle function so that elderly individuals can continue their activities of daily living independently. [3, 5, 6] They also provide guidance on how to create a safe environment at home and how to use assistive devices correctly. Occupational therapy supports nurses' strategies to promote physical activity and contributes to individuals leading a safe life. [9-13]

Fall Prevention Strategies with Virtual Reality (VR) and Other Technologies

In recent years, virtual reality (VR) and interactive physical activity platforms have been among the innovative strategies to promote physical activity and reduce the risk of falls in older people. [11, 12, 23]VR technology provides an interactive environment that can help older adults overcome the fear of falling and improve their balance skills. Virtual reality-based balance games enable older adults to engage in physical activity in a fun environment and improve their balance and coordination skills in the process. [17, 21, 23] VR technology allows older people in particular to improve their balance and coordination in a way that reduces the risk of falls. This technology allows individuals to exercise safely in a virtual environment and accelerates the process of improving balance while reducing the risks they may face in the real world. [17,18]

This technology is used to strengthen the vestibular system (balance and spatial awareness system) and prevent balance losses in elderly individuals. In a study conducted in the UK, it was found that virtual reality-based balance training programs improved balance and coordination skills, reduced the fear of falling and increased participation in physical activity in older individuals. [6, 17, 22, 23] These programs reduced the risk of falls by 40% in elderly individuals and enabled them to participate in activities of daily living more safely. One of the important advantages of virtual reality technology is that it allows individuals to perform balance exercises in different environments and difficulty levels. [19-21]

This breaks the monotony of physical activity, increases the motivation of older individuals and encourages them to exercise more regularly. Another innovative technology is interactive physical activity platforms. [1, 17, 22, 23] These platforms offer games and exercise programs specifically aimed at improving balance and coordination skills. Interactive balance games help older people strengthen their balance centers and improve their proprioceptive senses. [7, 12, 13] A study in Germany found that older people who participated in interactive balance games reduced their risk of falls by up to 50% and significantly improved their balance abilities. These findings suggest that innovative technologies offer effective strategies to reduce the risk of falls in older adults. [17,18]

By using virtual reality and interactive technologies, nurses can ensure that elderly individuals at high risk of falling are integrated into exercise programs. [17, 18] Thanks to these technologies, elderly individuals can perform balance and coordination exercises in a safe environment and reduce their risk of falling effectively with the guidance of nurses in this process. [17, 22 -25] Using these technologies, nurses can regularly monitor the exercise programs of elderly individuals, prepare customized programs according to individual needs, and evaluate the physical development of elderly individuals.[17,18]

Vitamin D Deficiency and Fall Risk

Another important factor contributing to the risk of falls is vitamin D deficiency. Vitamin D is an essential component that maintains bone health and supports muscle function. [6, 9, 13] Vitamin D deficiency in the elderly increases the likelihood of falls by leading to decreased muscle strength, balance disorders and the risk of osteoporosis. [11] Vitamin D deficiency significantly increases the risk of falls, especially by triggering loss of balance due to muscle weakness. [13-15] According to studies, 50% of individuals over the age of 65 in European countries have vitamin D deficiency and this deficiency leads to an increased risk of falls. [9-13]

Vitamin D is a vitamin that has direct effects on muscle and bone health, and its deficiency in elderly individuals can lead to serious health problems. It increases the risk of osteoporosis, causing bones to weaken and become brittle. [11, 17] This leads to a higher incidence of bone fractures after falls in older people. [1, 12, 23] Older people with vitamin D deficiency have higher rates of muscle weakness and imbalance. In a study conducted in Sweden, it was reported that elderly individuals taking regular vitamin D supplements had a 23% reduced risk of falls and increased muscle strength. [17, 21] Monitoring vitamin D levels and making necessary supplements is an effective strategy to reduce the risk of falls in elderly individuals. [11, 19-21]

Nurses should regularly check the vitamin D levels of elderly individuals and ensure that they are aware of this issue. In addition, they can support bone health by recommending appropriate supplements to individuals with vitamin D deficiency. [11, 17, 23-26] In this process, nurses should also evaluate the general nutritional status of patients, develop strategies to prevent vitamin D deficiency and inform individuals about this issue. [1, 2, 17] Since vitamin D can also be provided through exposure to sunlight and intake through food, nurses should raise awareness of elderly individuals on this issue and ensure that they get enough vitamin D.[9,10,13]

Nutrition Support

Nutrition is an important factor in reducing the risk of falls in older people. A balanced diet that maintains muscle and bone health can help reduce the risk of falls in older people. In particular, a diet rich in protein preserves muscle mass and prevents muscle strength from decreasing, thus preventing balance disorders. [8-12, 13] In addition to strengthening muscle and bone health, paying attention to the diet of older people can increase their energy levels, enabling them to lead a more active life. [16, 24, 27] Nurses help maintain muscle strength and reduce the risk of falls by monitoring the balanced and adequate nutrition of elderly individuals.[9-13]

Adequate intake of protein, calcium and vitamin D by elderly individuals is among the factors that reduce the risk of falls. Calcium is a mineral that is critical for bone health, and calcium deficiency can negatively affect bone density and increase the risk of osteoporosis. [17-21, 22, 27] Calcium and vitamin D supplements support the bone health of older people, reducing the risk of fractures. Nurses should regularly assess the nutritional habits of elderly individuals and develop appropriate strategies to supplement the missing nutrients and refer them to nutritionists. It is also important to monitor the daily fluid intake of older adults, as inadequate fluid intake may contribute to balance disorders and fall risk.[10,13]

Role of Nurses and Preventive Strategies

Nurses play a critical role in reducing the risk of falls in older people and providing a safe living environment. Nurses need to continuously assess the health status of elderly individuals, encourage their participation in physical activity and develop various strategies to ensure that individuals live in a safe environment. [16-18, 23] Regular implementation of physical activity programs helps to maintain muscle strength and balance in elderly individuals. Nurses are responsible for supporting the participation of elderly individuals in physical activity and recommending appropriate exercise programs for them.[22-25, 28]

Nurses should develop individualized care plans and determine strategies that are appropriate for the needs of elderly individuals to reduce the risk of falling [1, 2, 23, 24]. These strategies comprise creating exercise programs that improve the balance and coordination skills of elderly individuals, minimizing environmental risks, and medication management. [17-19] Regular monitoring of drugs side effects, especially management of medications that may increase the risk of falling, are among the primary duties of nurses. [2, 8] To control the side effects of medications that affect the central nervous system and to optimize drug doses are important steps to reduce the risk of falling [19,23]

In addition, nurses should ensure the safety of elderly individuals by identifying environmental hazards. It should be taken into consideration that slippery floors, irregularly placed furniture, or poor lighting at home may increase the risk of falling. [1, 8, 9] Nurses should make the necessary arrangements to create a safe environment in the homes of elderly individuals and take precautions to reduce the risk of falling. In particular, to identify elements that may pose a danger in the living spaces of elderly individuals and to eliminate these elements can significantly reduce the risk of falling. [11, 23, 27-30] Nurses can help create a safe environment at home by informing family members to protect elderly individuals against environmental hazards.[19, 22, 31]

Another important role of nurses is to organize education programs. Ensuring that elderly individuals and their families understand the risks of falling, informing them about the importance of physical activity, and providing guidance on home safety are among the effective strategies for preventing falls. [8-12, 13] In many countries in Europe, these education programs conducted by nurses contribute to the safer lives of elderly individuals. As a result of the training provided under the guidance of nurses within the scope of the "Fall Prevention Program" implemented in Sweden, it was observed that the rate of falls in elderly individuals decreased by 30 percent. [1, 2, 4] These programs help elderly individuals to continue their lives safely by continuously monitoring their health status.[19-21, 29-32] Nurses should also develop

strategies to increase the social participation of elderly individuals. Social isolation is a factor that increases the risk of falls in elderly individuals, because as individuals' mobility decreases, their separation from social life accelerates. Social participation helps individuals feel more active and secure by supporting the sustainability of physical activity. [1, 11, 22, 29-31]

Conclusion

The risk of falls in older people is influenced by both physical frailty and environmental factors. Falls are an important problem that severely reduces quality of life and increases healthcare costs in older people. Physical activity plays a critical role in reducing the risk of falls by increasing muscle strength and improving balance. In addition, virtual reality-based balance games and other innovative technologies offer effective tools to reduce the risk of falls by increasing the participation of older individuals in physical activity.

Nurses should encourage older individuals to participate in physical activity, create a safe living environment and carefully monitor medication use. In addition, nurses should regularly check the vitamin D levels of elderly individuals and provide the necessary supplements. Multidisciplinary approaches such as occupational therapy and nutritional support are also effective methods to reduce the risk of falls. The active role of nurses in this process is vital to improve the quality of life of elderly individuals and minimize the risk of falls. Data from European countries emphasize the importance of both the promotion of physical activity and the use of innovative technologies to reduce the risk of falls in elderly individuals. Nurses should support public health by organizing training programs and developing strategies suitable for elderly individuals.

Conflict of Interests

The authors declare that they have no conflict of interests regarding content of this article.

Source of Institutional and Financial Support

None

Author contributions

Idea/Concept (HÖA, HG), Study design (HÖA, HG), Supervision/Consultancy (HÖA), Data collection (HÖA, HG), Data analysis and data interpretation (HG), Preparation of tables (HÖA), Literature review (HG), Writing the article (HÖA, HG), Final check before submission (HÖA, HG)

Acknowledgments

None

References

1. WHO-https://www.who.int/news-room/fact-sheets/detail/falls. (Erişim Tarihi:24.11.2024).
2. Gülsoy H, Aslan Z, Uslu Ü, Nalbant Ö. Investigation of the Effect of Disaster Awareness Training Given to Individuals Aged 60 and Over on Disaster Awareness and Preparedness: Alanya Alaaddin Keykubat Refreshing University Example. Pre-Hospital Journal, 2023;8(3):266-277.
3. Akyüz E, Büyükyılmaz F. Investigation of Postoperative Nursing Care Needs and Affecting Factors in Elderly Patients. Izmir Katip Çelebi University Journal of Health Sciences, 2024;9(1):87-93.
4. Babaoğlu E. Elderly Care Models that Can be Practised in Clinical and Home Care. Cyprus Turkish Journal of Psychiatry & Psychology (CTJPP)/Cyprus Turkish Journal of Psychiatry and Psychology, 2024;6(1):76-83.
5. Çiftci D, Özdemir ST, Oksel E, Akyol A. Use of the Henderson Nursing Model in the Nursing Care Process of a Geriatric Individual: A Case Report. Journal of Nursing Science, 2024;7(1):119-129.
6. Aslan H, Çetkin T, Dikmen RD. Effects of chronic illness adaptation on the healthy lifestyle behaviours of patients in internal services. Cukurova Medical Journal. 2021;46(3):1140-1149. doi: 10.17826/cumj.913997.
7. Ge L, Ong R, Yap CW, Heng BH. Effects of chronic diseases on health-related quality of life and self-rated health among three adult age groups. Nursing & Health Sciences. 2019;21(2):214-222. doi: 10.1111/nhs.12585.
8. Güngen BD, Aras YG, Acar T, Alagöz AN, Acar BA. Migrende Ağrı Tipi ile Depresyon, Anksiyete ve Uyku Bozukluğu İlişkisi. Journal of Turkish Sleep Medicine. 2016;3(1):11.
9. Eyigör C, Uyar M. Ağrı. In Yasemin Yıldırım, Çiçek Fadıloğlu (Eds.), Palliative Care Symptom Management and End-of-Life Care. İzmir: Nobel Medicine, 2018.
10. Ibrahim S, Manu MK, James BS, Kamath A, Shetty RS. Health related quality of life among patients with chronic obstructive pulmonary disease at a tertiary care teaching hospital in Southern India. Clin Epidemiology Glob Health 2021;10:100711. doi: 10.1016/j.cegh.2021.100711.
11. Sarıhan K, Uzkeser H. Relationship Between Vitamin B 12, Vitamin D, Magnesium Levels and Fall Risk in Patients with Fibromyalgia. Journal Of Physical Medicine & Rehabilitation Sciences, 2024;27(1):1-10.
12. Tavşanlı NG, Özçelik H, Karadakovan A. Investigation of quality of life of elderly individuals with pain. Ağrı. 2013;25(3):93-100. doi: 10.5505/agri.2013.20082.
13. Van Wilder L, Rammant E, Clays E, Devleesschauwer B, Pauwels N, De Smedt D. A comprehensive catalogue of EQ-5D scores in chronic disease: results of a systematic review. Qual of Life Res. 2019;28(12):3153-3161. doi: 10.1007/s11136-019-02300-y.
14. Akpınar NB, Ceran MA. Chronic diseases and rehabilitation nursing. Adnan Menderes University Faculty of Health Sciences Journal. 2019;3(2):140-152.
15. Chalise HN. Aging: Basic concept. Am J Biomed Sci & Res. 2019;1(1):1-10. doi: 10.34297/AJBSR.2019.01.000503.
16. Dodig S, Cepelak I, Pavic I. Hallmarks of senescence and aging. Biochem Med (Zagreb). 2019;29(3):030501. doi: 10.11613/BM.2019.030501.
17. Daştan B, Hintistan S. Use of Ambient Assisted Living Technologies in Elderly Care: Traditional Review. Turkiye Klinikleri J Nurs Sci. 2021;13(4):1005-1013.
18. Döner NH, Yeşilbalkan ÖU. From Past to Future: Virtual Reality and Application Areas in Health. Izmir Katip Çelebi University Journal of Faculty of Health Sciences, 2024;9(1):143-149.

19. Gülsoy H, Şenturan L. Validity and reliability study of the elderly health promotion scale. Journal of Traditional Medical Complementary Therapies. 2020;3(2):140–149.
20. Kalyoncu S. Aromatherapy Interventions In Chronic Pain Management In Elderly Individuals: A Literature Review. Journal of Life Long Nursing, 2023;4(3):250-270.
21. Mutluay E. Pain in elderly cancer patients. Turkish Journal of Oncology. 2015;30(2):90-95. doi: 10.5505/tjoncol.2015.994.
22. Babadağ B, Balcı Alparslan, G. I am old, I have pain!. Journal of Education and Research in Nursing. 2016;13(2):67-71.
23. Karadakovan A. Elderly Health and Care. Ankara: Academician of Medicine, 2014.
24. Uyar M, Köken İ. Chronic pain neurophysiology. TOTBİD Journal, 2017;16:70-76. doi: 10.14292/totbid.dergisi. 2017.
25. Canpolat H, Odacı, N. Nursing care provided to an elderly individual living alone according to the functional health patterns model through home visits: A case report. Journal of Social and Analytical Health, 2023;3(3): 217–223.
26. Ang GC, Low SL, & How CH. Approach to falls among the elderly in thecommunity. Singapore Medical Journal. 2020; 61(3): 116.
27. Ataş Balcı L. Yaşlı Bireylerde Kognitif Denge ve Yürüme Eğitimi ile Çift Görev Eğitiminin Düşme Riski Üzerine Etkinliğinin Araştırılması [Doktora Tezi]. İstanbul: Medipol Üniversitesi, Sağlık Bilimleri Enstitüsü; 2016.
28. Avcı Ş. Yaşlı Bireylerde Denge Eğitimi, Düşme Riski ve Yaşam Kalitesi İlişkilerinin İncelenmesi [Doktora Tezi]. Bolu: Abant İzzet Baysal Üniversitesi, Sağlık Bilimleri Enstitüsü; 2022.
29. Aydın Z. Yaşlılarda Düşmenin Önlenmesinde Multikomponent ve Denge Egzersizlerinin Etkisi [Tıpta Uzmanlık Tezi], Balıkesir: Balıkesir Üniversitesi, Sağlık Bilimleri Enstitüsü; 2019.
30. Güneş Gencer GY, İpek L, Kara DS, Fatmanur Uzun F, & Çetin SY. Türkiye'de Yaşlılarda Düşme ve Denge ile İlgili Yapılmış Çalışmaların İncelenmesi. Yaşlı Sorunları Araştırma Dergisi (YSAD). 2021; 14(2):70-83
31. Özcan G, Alparslan GB. Huzurevinde Kalan Yaşlı Bireylerin Fiziksel Aktiviteleri ile Düşme Davranışları Arasındaki İlişki. STED. 2022; 31 (1):57-66.
32. Öden TN, Van Giersbergen MY. Düşmeler ve Düşmelere Bağlı Yaralanmaların Azaltılması için Kanıt Temelli Uygulama Önerileri. Sağ. Perf. Kal. Derg. 2021;(18): 17-40