International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 24s, 2025
https://theaspd.com/index.php

Prevalence of Perceptual Dysfunction in Geriatric Population

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ABSTRACT

BACKGROUND - *Aging is a natural term that involves alterations to numerous systems of the body including the sensorimotor system that is utilized for postural control, balance and coordinated movement while in motion. Proprioception involves an unconscious appraisal of the body within space and movement. Proprioception is processed by many different receptors within our muscles, tendons and joints. With aging come both structural and neurologic changes that relate to proprioception and sensorimotor function. Examples include decreased sensitivity to mechanoreceptors, slower nerve conduction and decreased processing speed in the central nervous system. Additionally, comorbidities such as osteoarthritis, diabetes and having a stroke may lead to perceptual problems for older adults. Lifestyle factors including decreased levels of physical activity (especially perceived forms of physical activity) exacerbate perceptual dysfunction. Therefore, it is common amongst many older adults to exhibit mobility problems, have difficulty maintaining balance and increased likelihood of falling which can result in injury, loss of autonomy and lower quality of life. Despite proprioception being an important factor of interacting with an environment, proprioceptive dysfunction is rarely assessed or reported in geriatric assessments. There is a need for more research in older adults to demonstrate the presence of proprioceptive dysfunction, and provide support for prevention strategies and physiotherapy rehabilitation interventions that promote healthy aging and successful aging.*

OBJECTIVE-

1. *To study the prevalence of perceptual dysfunction in geriatric population.*
2. *To identify the risk factors for perceptual dysfunction in geriatric population.*
3. *To identify types of perceptual dysfunction those most commonly experiencing by older adult*
4. *To Identify Early Signs and Indicator for the joint perception dysfunction*

MATERIAL AND METHODOLGY- *institutional protocol and ethical committee approval, vide their letter no. KVV/ IEC/01/2025 dated January 23, 2025. This cross-sectional study was conducted on 95 elderly individuals aged 65 years and older from Satara district using simple random sampling. Study participants were recruited that had no serious medical, neurological or psychiatric comorbidities based on their age. Participants were also excluded for inability to provide informed consent, severe sensory impairment, joint surgery in the previous 3 months, drug or alcohol dependency. Data collection utilized a validated questionnaire and two clinical tests. Proprioception was performed with the clinician passively moving one of the participant's limbs and asking the participant to match the position with the opposite limb, and kinesthesia was performed by moving a joint on the participant and asking participants to indicate when they sensed movement to which they indicated by recording the point of movement. While proprioception and kinesthesia were each conducted with eyes open and eyes closed. All trials were recorded, tabulated, and analyzed statistical in order to understand the prevalence of perceptual dysfunction amongst the elderly individual.*

RESULT- *This study indicated that 95 participants displayed variability when required to determine the position of their joints which implies a general decline in proprioception with older adults. Over-all there was a prevalence of joint position impairments of 10.13% with more dysfunction evident in eyes-closed than eyes-opened testing which indicates reliance on vision. The joint with the most impact was the ankle because 55% of older adults had decreased ability to align to the previous position, with the lower segments (ankle, knee, and hip) affected more than the upper (shoulder, elbow, and wrist) segments. No falls or balance difficulties were reported, although falls and balance difficulties are excellent global markers of early sensory loss and should be noted for further specific assessment and intervention with regard to lower limb stability and fall prevention.*

CONCLUSION- *This study found that perceptual dysfunction occurred in a sample of 10.13% of geriatric population. This finding suggests that older adults rely considerably more on vision to compensate for a reduction in joint awareness, given that the most marked perceptual dysfunction occurred during eyes-closed testing. The ankle was the joint most affected by degenerative perceptual dysfunction and the lower limb demonstrated more perceptual dysfunction than the upper limb. This finding is particularly relevant, as weight-bearing joints rely very much upon occur typical ability to balance. Since participants did not report any falls or challenges to their balance, having*

measurable perceptual dysfunction is an early sensorineural decline and can progress toward, for example, more substantive mobility problems. While perceptual impairment is ubiquitous among geriatric counterparts, it should not be a part of experience for older adults, and for the clinical sector any perceptual dysfunction should be easily used for documentation. Regularly assessing proprioceptive screening, particularly for high-risk joints, and providing physiotherapy intervention when perceptual dysfunction is documented has the potential to reduce (not eradicate) the incidence of falls in older adults while maximally preserving independence and quality of life

KEYWORDS- *Perceptual dysfunction, Proprioception, kinesthesia, Geriatric population, Joint position sense, Balance, Falls prevention.*

INTRODUCTION:

Aging is an inevitable process that entails the different changes in physical, psychological, and social functioning in which one interacts with and learns to adapt to their environment [1]. These changes lead to different degrees of age-related decline because of the interaction of factors such as genetic programming, cell degeneration, environmental exposure, and lifestyle factors which correspondingly impact the opportunity for older individuals to be socially connected.[2] The number of older adults is rapidly increasing globally and this includes efforts not only to understand the possibilities for longevity but healthy independent living too [3]. The sensorimotor network is one of the most severely affected systems that deteriorate with normal aging as it involves the majority of non-conscious sensory feedback and motor commands that allow for action. The sensorimotor system enables the missed aspects of the coordination, maintenance of stable postural stability, and navigation of our surroundings in a safe way. Within the system, proprioception, which is our non-conscious awareness of joint position, movement, and loading, is imperative for the maintenance of balance and functional mobility [10]. The information for proprioception is sourced through our mechanoreceptors from muscle spindle, Golgi tendon organ, Ruffini endings, and Pacinian corpuscles, which inform the central nervous system through multiple motor pathways [4]. With aging, the sensory receptors also demonstrate decreased sensitivity, peripheral nerve conduction degenerates slower, and cortical activity and representation atrophy with time [8]. Age-related changes have an impact on reaction time by being slower, loss of coordination, and stability when presented with complex or variable conditions [24]. The meaning of proprioceptive deficits among older adults is serious and far reaching, as falls are still one of the largest causes of injury, hospitalization, and long-term disability in this age group [17]. Proprioceptive deficits, even very small ones, can be imperceptible in everyday tasks; but the physiologic consequences of proprioceptive deficits become most apparent when negotiating uneven surfaces, stairs or traversing in darkly lit environments [14]. First, older adults will attempt to compensate for proprioception by using visual cues, such as visually checking surfaces before stepping on them. However, the ability to compensate using visual cues will vanish when visual conditions are not ideal, such as walking in dimly lit rooms, when faced with sudden environmental change, such as curbs, or simply when there are no visual cues at all [15]. Taken together, these environments create opportunities to lose balance and sustain an injury [25]. In addition to the contributing factors associated with decreased proprioception, the physiological effects of the aging process on skeletal muscle have, in fact, a compounded effect. Aging is associated with smaller muscle-fiber diminished contractile force, and motor unit and hence neuromuscular activation deficits, all which may compromise the sensorimotor loop that operates movement [9].There are close neurophysiological links between locomotor control and maintaining the integration of sensory signals with central pattern generators in the spinal cord, which effectively indicates that impaired proprioception, as evidenced by knee and ankle signals, will negatively affect even the automaticity of movement, as in walking [18]. The implications of impaired proprioception are particularly salient, such as at the knee and ankle, because postural control systems that employ proprioceptive feedback from the series of weight-bearing joints, as well as the action of a musculoskeletal system that is physiologically deteriorating with age [6]. The best news is that there is evidence for specific interventions and their effectiveness for proprioceptive improvements. Proprioceptive neuromuscular facilitation was shown to improve joint position sense, while postural stability improvements have been shown after balance training, and sensorimotor retraining [12]. step training programs, for example, appropriately challenge coordination and reactive speed, and have a positive effect on gait parameters, as well as dynamic stability in older adults to reduce falls [23]. There is evidence from meta-analyses for proprioceptive training for improving motor control, reducing falls, improving independence, etc. [22].

Proprioceptive stimulation may also be achieved with activities, such as tai chi, yoga, and controlled resistance activities that challenge postural control and increase sensory input from mechanoreceptors

[16]. Even physically active older adults can potentially demonstrate significant improvements in proprioceptive abilities after trials of structured training [13]. Current recommendations for rehabilitation also endorse the use of proprioceptive activities in any type of comprehensive fall prevention program for community dwelling adults and in institutionalized environments [19]. Proprioceptive measures are rarely included in a geriatric assessment, even though there is considerable evidence to suggest that proprioceptive measures should be part of routine ascertainment. If an active elder was offered measures of joint position sense (e.g., measures of joint angles), kinesthesia awareness (e.g., moving the arm to point, going through positions, asking the subject to return to the position), and postural stability (e.g., postural sway), proprioceptive deficits could likely be identified before a performance degradation was observed [21].

In addition, new motion sensing technology continues to advance rapidly, including wearable motion monitoring sensors, robotic-assisted rehabilitation, and immersive virtual environments to develop and advance proprioception, will usher in new possibilities for more individualized, precise proprioceptive programming[25] Together with community education initiatives, screening efforts, and home-based exercise programs [11], this opens the door of transition from the clinical to the community while maintaining a focus on the elder's natural, everyday context. From a public health perspective, it should be acknowledged that proprioceptive decline is an all-modifiable risk factor associated with functional dependence in later life [7]. Proprioceptive dysfunction is complex and multifaceted, but interventions can be introduced rapidly to slow down or even reverse the deleterious effects of proprioceptive decline [5]. Growth in the availability of targeted rehabilitation, early detection strategies and universal palliative prevention strategies could promote conservation of mobility, reduce injury risk, and improve health and wellness of the aging population.

1. **AIM:** To Find the Prevalence of Perceptual Dysfunction in Geriatric Population**.**

2. OBJECTIVE:

1. To study the prevalence of perceptual dysfunction in geriatric population.
2. To identify the risk factors for perceptual dysfunction in geriatric population.
3. To identify types of perceptual dysfunction those most commonly experiencing by older adult
4. To identify Early Signs and Indicator for the joint perception dysfunction

3. MATERIAL AND METHODOLOGY: This cross-sectional study was conducted on 95 elderly individuals aged 65 years and older from Satara district using simple random sampling. Study participants were recruited that had no serious medical, neurological or psychiatric comorbidities based on their age. Participants were also excluded for inability to provide informed consent, severe sensory impairment, joint surgery in the previous 3 months, drug or alcohol dependency. Data collection utilized a validated questionnaire and two clinical tests. Proprioception was performed with the clinician passively moving one of the participant's limbs and asking the participant to match the position with the opposite limb, and kinesthesia was performed by moving a joint on the participant and asking participants to indicate when they sensed movement to which they indicated by recording the point of movement. While proprioception and kinesthesia were each conducted with eyes open and eyes closed. All trials were recorded, tabulated, and analyzed statistical in order to understand the prevalence of perceptual dysfunction amongst the elderly individual.

4. RESULT:

This study indicated that participants displayed variability when required to determine the position of their joints which implies a general decline in proprioception with older adults. Over-all there was a prevalence of joint position impairments of 10.13% with more dysfunction evident in eyes-closed than eyes-opened testing which indicates reliance on vision. The joint with the most impact was the ankle because 55% of older adults had decreased ability to align to the previous position, with the lower segments (ankle, knee, and hip) affected more than the upper (shoulder, elbow, and wrist) segments. No falls or balance difficulties were reported, although falls and balance difficulties are excellent global markers of early sensory loss and should be noted for further specific assessment and intervention with regard to lower limb stability and fall prevention.

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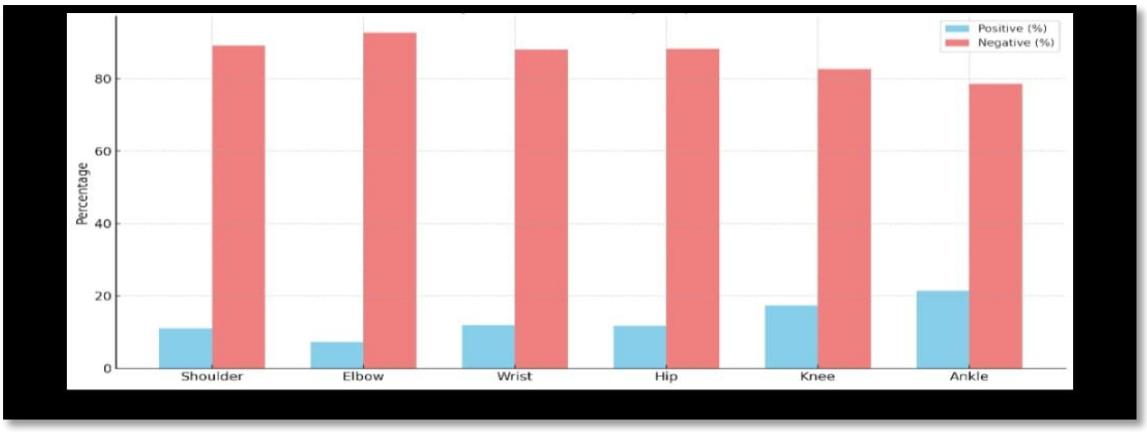

Data:

Figure No. 01: Proprioception Test: With eyes open

Interpretation: Proprioceptive dysfunction increases from shoulder (11%) to ankle (28%) under eyes open conditions, despite overall high negative scores (70–90%).

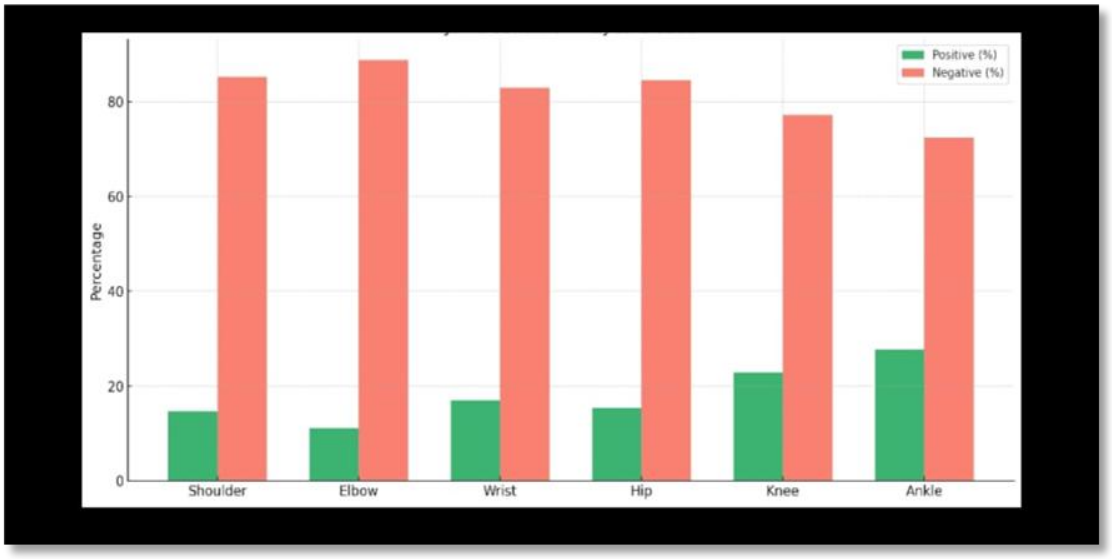

Figure No. 02: Proprioception Test: With eyes close

Interpretation: In eyes closed conditions, proprioceptive dysfunction rises from shoulder (20.7%) to ankle (34.95%), indicating increased dependence on vision in lower limb joints.

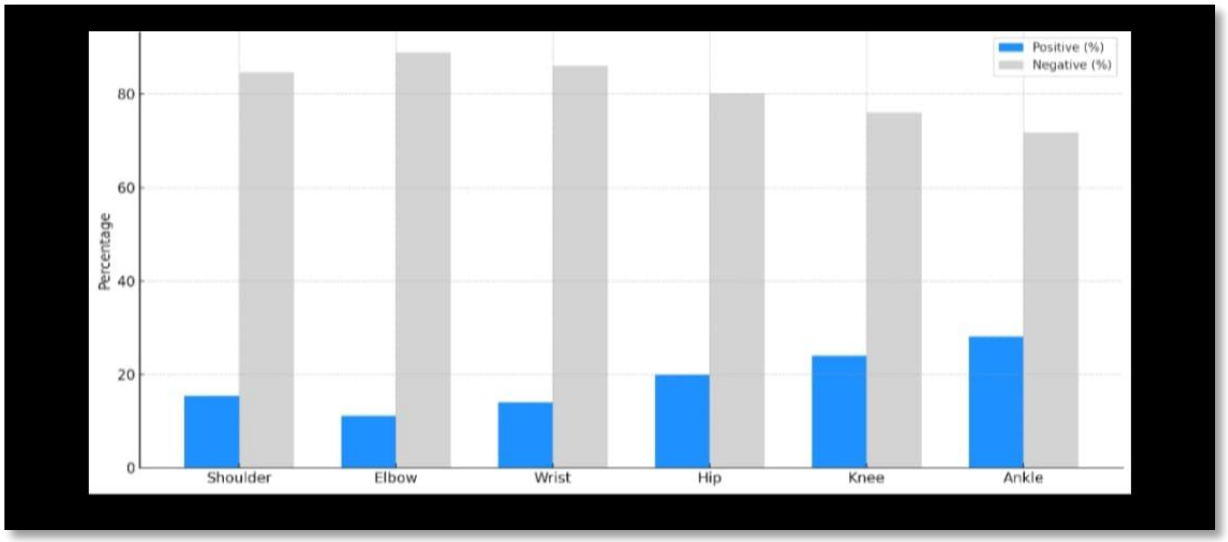

Figure No. 03: Kinesthesia Assessment: With eyes open

Interpretation: Kinesthesia response was observed at the ankle (55%), followed by the knee (45%) and hip (35%), while the elbow had the lowest positive response (15%)

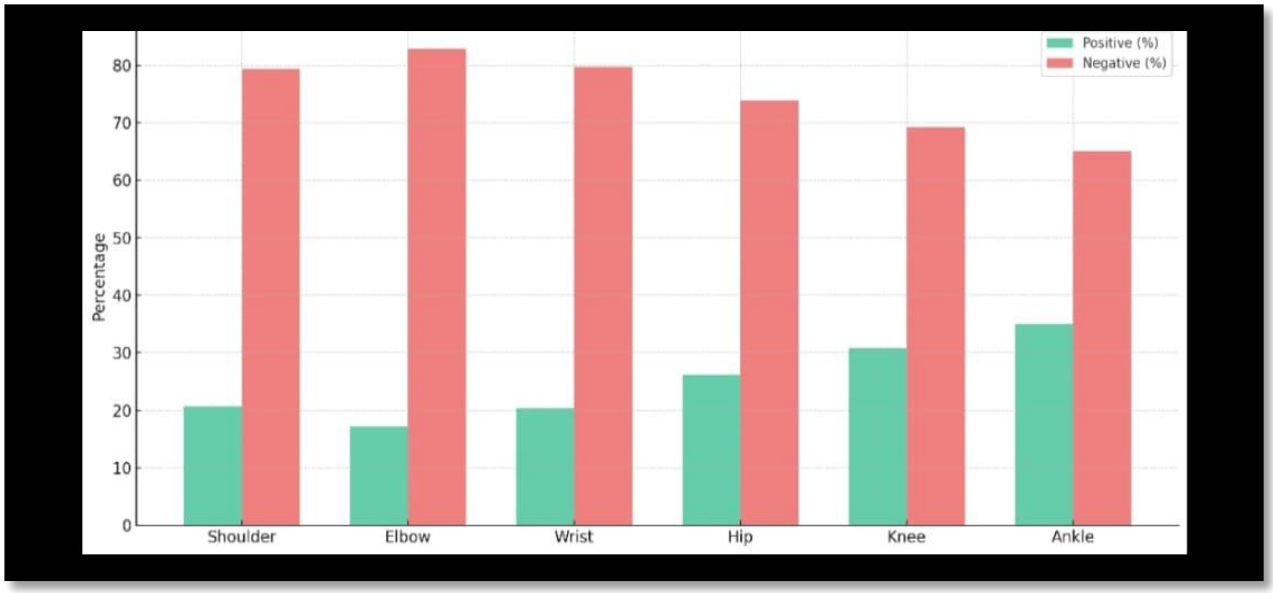

Figure No. 04: Kinesthesia Assessment With eyes close
Interpretation: Kinesthesia positivity was highest at the ankle (35%) and lowest at the elbow (17%).

5. DISSCUSSION: As we get older, our ability to feel position and movement of joints or proprioception and kinesthesia declines. We have demonstrated this decline in older adults while finding that deficits were joint specific since older adults lost greater proprioceptive and kinesthetic abilities in the lower limb (the ankle and knee) than the upper limb (the shoulder and elbow). We demonstrated this more pronounced decline in lower limb abilities when participants completed tasks with their eyes closed and had to rely solely on proprioceptive feedback, which demonstrated the extent to which older adults rely on vision to substitute diminished sensory feedback. Our findings reflect all too common changes that occur with age that develop progressively from valid physiological, genetic and molecular pathways. Changes in proprioception and kinesthetic abilities ultimately lead to the inability to adapt, which increases vulnerability to injury or chronic disease. Older adults can experience a decline in proprioception and kinesthesia without the presence of neurodegenerative disorder, they may experience learning proprioceptive and kinesthetic declines without even realizing. We know that age-related declines in proprioception and kinesthetic abilities can potentially lead to balance problems, slower reaction time, and falls which are all detrimental to independence and quality of life. Research suggests physical activity and certain training can be advantageous. Exercise programs, such as tai chi, yoga, resistance training, or balance exercise, can increase strength but also coordination with proprioceptive awareness. Approaches to rehabilitation that emphasize sensorimotor function and neuroplasticity provide an exciting opportunity to reduce falling risk and promote independence. Our study provides evidence that older adults should be screened for proprioceptive function as it is useful, even when the individuals appear healthy and are not experiencing functional deficits. By knowing that deficits are present and providing other community-based exercise and rehabilitation programs, we can help older adults become safer, more mobile and independent as they grow older.

6.CONCLUSION: This study found that perceptual dysfunction occurred in a sample of 10.13% of geriatric population. This finding suggests that older adults rely considerably more on vision to compensate for a reduction in joint awareness, given that the most marked perceptual dysfunction occurred during eyes-closed testing. The ankle was the joint most affected by degenerative perceptual dysfunction and the lower limb demonstrated more perceptual dysfunction than the upper limb. This finding is particularly relevant, as weight-bearing joints rely very much upon occur typical ability to balance. Since participants did not report any falls or challenges to their balance, having measurable perceptual dysfunction is an early sensorineural decline and can progress toward, for example, more substantive mobility problems. While perceptual impairment is ubiquitous among geriatric counterparts, it should not be a part of experience for older adults, and for the clinical sector any perceptual dysfunction should be easily used for documentation. Regularly assessing proprioceptive screening, particularly for high-risk joints, and providing physiotherapy intervention when perceptual dysfunction is documented has the potential to reduce (not eradicate) the incidence of falls in older adults while maximally preserving

independence and quality of life.

- **7.LIMITATION:** Most articles that discuss proprioception in older adults are cross-sectional, making it harder to establish causation or even the real of proprioception decline. there is not uniformity of tools and methods across studies to allow for comparisons across studies, or to develop broad conclusions regarding prevalence. Many older adults often have comorbidities of osteoarthritis, diabetes, and other physical and neurological conditions, which not every study has controlled for, and can lead to excess variability, or misrepresentation of results. Much of the previous literature has focused on research among community dwelling older adults without addressing nursing home or hospital populations who may be experiencing more profound proprioception difficulties. As previously mentioned, the limitation on independent older adults diminishes any breadth of generalizability. Additionally, cognitive, and social factors like cognitive decline, depression, and loneliness were often ignored and would be critical factors in proprioceptive performance and functioning in general.

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