An Older View on Distance Perception: Age Affects Perception of Walkable Extents

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Abstract

According to the action-specific perception account, spatial perception is affected by the specific energetic cost required to perform an action. In the current experiments, we examined the effect of age on distance perception. Older and younger adults were asked to verbally estimate distance to a target placed in a hallway. Results showed that older adults estimated distances to be farther compared to younger adults, but only for action-relevant extents. When subjects were asked to estimate distances on a carpet and a plastic surface, floor surfaces that decrease walking ability, such as plastic tarps, were judged to be farther away for older adults while such sensitivity was not as apparent in younger adults. Results suggest that perception is still sensitive to differences that affect ability even as a perceiver ages.

Motivation

Temporary Physiological Changes

Hills are judged as steeper by people who are fatigued or wearing a heavy backpack

Bhalla & Proffitt (1999)

Targets were judged as farther to those throwing a heavy ball than to those throwing a light ball.

Witt, Proffitt, & Epstein (2004)

Long-Term Physiological Changes

Older adults and people who have poor physical fitness levels judged hills as steeper

Bhalla & Proffitt (1999)

Chronic pain patients judged targets to be farther away compared with age-matched controls

Witt et al., 2009

Aging and Declined Abilities

"One out of three adults age 65 and older falls each year"

"Among those age 65 and older, falls are the leading cause of injury and death. They are also the most common cause of nonfatal injuries and hospital admissions for trauma."

"Many people who fall develop a fear of falling which limits their activities, reduces fitness level and mobility, which in turn further increases the risk of falling."

- Center for Disease Control and Prevention

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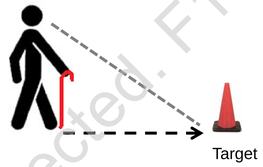
Exp 1: Older and Younger Adults

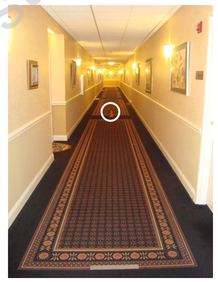
Method:

Task: Verbally estimate distances along a carpeted hallway.

Manipulations:
Age Group
•Younger (16-21 years old)
•Older Adults (68-90 years old)

Target Distance: (4, 6, 8, 10m)

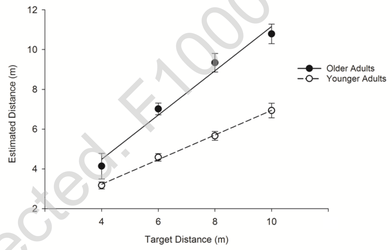




Results:

Older adults estimated distances to be farther away than younger adults,
$F(1, 17) = 13.62$, $p = .002$, $\eta_p^2 = .44$

Older adults estimated targets to be even farther than younger adults as distance to the target increased,
$F(3, 17) = 5.18$, $p = .003$, $\eta_p^2 = .23$



Exp 2: Action-Irrelevant Extents

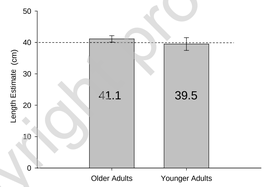
Method:

Older and Younger adults verbally estimated the visible length of a tape measure (40cm).

What is the length of the tape measure?

Results:

There was no significant difference in length estimates for action-irrelevant extents between older and younger adults, $t(30) = 0.80$, $p = .43$



For More Information

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Exp 3 & 4: Sensitivity to Floor Surface

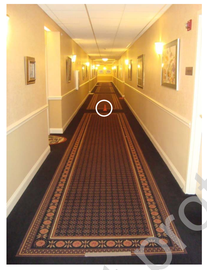
Method:

Task: Participants estimated distance on a carpet and a plastic surface.

Manipulations:
Floor Surface (Carpet and Plastic)

Target Distance
• 4, 6, 8, 10m (for first surface)
• 5, 7, 9,11m (for second surface)

Order of floor surface was counterbalanced across participants



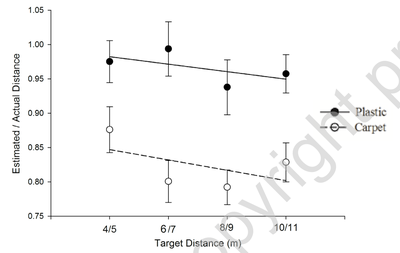
Carpet

Plastic

Exp 3: Sensitivity to Floor Surface in Older Adults

Results:

Older adults estimated distances to be farther away on plastic than on carpet,
$F(1, 12) = 12.11$, $p = .005$, $\eta_p^2 = .50$

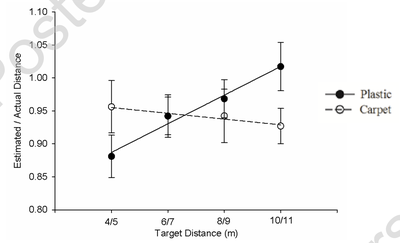


Exp 4: Sensitivity to Floor Surface in Younger Adults

Results:

Younger adults estimated distances to be just as far on plastic as on a carpeted surface,
$F(1, 14) = 0.11$, $p = .73$, $\eta^2_p = .01$

Younger adults increased their distance judgments more as distance on plastic increased. Trending significance,
$F(1, 14) = 2.35$, $p = .09$, $\eta^2_p = .14$



Discussion

• Long-term changes in behavioral potential due to age effect distance perception.

•The effects are action-relevant perceptual differences, rather than a general tendency for older adults to overestimate distances.

• Perception is still tuned to perceiver's abilities even as one ages.

• Perception in older adults is sensitive to changes in the environment that have consequences for action.