

# Age Differences in Sensory and Cognitive Function in Elderly Nepalese<sup>1</sup>

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This paper describes age differences in sensory and cognitive function in a cross-sectional sample of 117 Nepalese men aged 50 to 88 years living in a traditional agrarian society. The prevalence of impairment of vision, hearing, vibration sensitivity, and cognitive function is progressively higher in successively older age categories in this society as it is in Western industrial societies. This has practical consequences for everyday life. Men with vision impairment are less likely to retain the esteemed social role of head of an extended household. Men with visual and hearing impairment leave their household compounds less frequently, have less frequent social contacts outside their households, and remain inactive a greater proportion of the time. In this technologically simple society without modern medical remedies, vision and hearing impairments are associated with social roles and daily activity patterns that foster economic and political dependence and social isolation.

**Key Words:** Vision, Auditory perception, Vibration, Daily activity, Social behavior, Roles, Human men

LOSS of sensory and cognitive function with age is well documented in Western industrial societies. Whether this loss occurs in all societies is not known, as there is little information from traditional, nonindustrial peasant societies. The question is important because more than half the world's people over the age of 60 currently live in the less-developed regions (Siegel & Hoover, 1984). The consequences of sensory and cognitive impairments in traditional, nonWestern agrarian societies may differ from those in Western industrial societies. Sensory loss may have a greater impact where remedies such as eyeglasses and hearing aids are unavailable; cognitive loss may have a smaller impact in societies requiring less complex knowledge to function satisfactorily. This paper explores these issues in a representative cross-sectional sample of a traditional, rural, agrarian population in Nepal. It examines (a) age differences in sensory function of men aged 50 to 88 and in cognitive function of men aged 60 to 88 and (b) associations between sensory and cognitive function and social function.

## METHODS

The study populations are Nepali-speaking caste Hindus residing in rural Lamjung District, Nepal in two socioculturally and economically homogeneous villages engaging in traditional, nonmechanized agriculture and animal husbandry in a remote, roadless area (Beall et al., 1985). The family is the sole source of social and economic support, and the ideal role for elderly men in Nepalese Hindu society is head of an extended household. All native caste Hindu male residents aged 60 years and older were invited to participate in a health study; 91% (69 out of 76) did. In one village, all those in their 50s were asked to participate; 70% (30 out of 43) did. In the other village, time constraints necessitated a random sample of 18 men in their 50s. The nonparticipation of one bedridden 85-year-old man unable to conduct cogent conversation causes underestimation of the prevalence of severe cognitive dysfunction.

*Sensory function assessment.* — Visual acuity (uncorrected) was measured independently in each eye with a Snellin Illiterate eye chart. Auditory acuity was measured with an Eckstein Brothers Tetra-tone Audiometer, Model EB-46, which presents 24 tones in combinations of four frequencies (500, 1000, 2000, and 4000 Hz) and three intensities (25, 40, and 60 dB) independently to each ear. Vibration sensitivity thresholds on the palmar surface of the left thumb and the left internal

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medial malleolus were measured with a Bio-medical Instrument Company Bio-Thesiometer which presents motion stimuli by varying the voltage to a vibrator button resting on the testing site. The minimum stimulus is applied and gradually increased until the individual indicates that he senses vibration or the maximum stimulus is attained. Four trials occur at each site; the extreme value is discarded and the remaining values averaged to yield a vibration sensitivity threshold. If vibration was sensed just after the highest stimulus was applied or if none was sensed, the response is recorded qualitatively as above the measurement range. The machine range of 0 to 50 volts was curtailed to 43 volts partway through the study because humidity corroded the dial. The calibration, checked afterward by the manufacturer, remained accurate. The few thresholds of 44 to 50 volts are reported as above the measurement range.

*Cognitive function assessment.* — The Face-Hand Test is an objective measure of mental status minimally influenced by verbal skills and sociocultural differences (Kane & Kane, 1981). It consists of 10 trials of touching the individual simultaneously on the cheek and the dorsum of the hand and asking him to indicate where he was touched. The score is the number of incorrect responses. All participants received the tests described so far.

One experienced Nepalese interviewer conducted a private structured interview with each participant aged 60 years or older. It included five objective items to assess cognitive function, modeled after several widely used questionnaires (Kane & Kane, 1981). The questions "What is the day?" and "What is the year?" measure memory and temporal orientation. A proverb interpretation, an arithmetical computation related to selling crops, and the task of assembling the four parts of a butter churn paddle (an everyday item) tested mental skills, language, and reasoning. These were scored as correct or incorrect. The interviewer also assessed the individual's overall level of understanding and responding.

*Social function assessment.* — The interviewer identified the head of each participant's household by determining who had the keys to the boxes containing family valuables, handled the money, and made decisions about purchases and sales. Respondents performing these functions were household heads. A local high school student accompanied each participant for 12 to 13 hr on 1 to 4

days and wrote a running account of the day's activities.

*Analysis.* — There were 48 men aged 50 to 59, 48 aged 60 to 69, 19 aged 70 to 79, and 2 aged 87 and 88. Although recognizing that each sensory mode has a wide range of functional capacities, the concept of impairment was operationalized by selecting an extreme deficit as a benchmark and defining impairment as that or a greater deficit. The percentage of individuals in each decennium with sensory impairment and the percentage who responded incorrectly to cognitive function test items are presented. An independent samples chi-square test using the Yates correction for continuity was used to test for decennium differences in the frequency of impairment. The two 80-year-old men were not included in statistical analyses.

## RESULTS

Men in successively older decennia had progressively higher prevalences of sensory impairment and errors on cognitive function test items. The prevalence of marked impairment of visual acuity, 20/200 or worse in the best uncorrected eye, was nil, 2% and 26% among men in their 50s, 60s and 70s, respectively,  $\chi^2(2) = 20.7, p < .05$ . No one was so impaired that he had to be led around. The prevalence of marked hearing impairment, defined as hearing no tones or hearing only 60 dB tones, was 6%, 4%, and 26% among those in their 50s, 60s, and 70s, respectively,  $\chi^2(2) = 6.3, p < .05$ . No one was unable to hear a loud voice. The prevalence of vibration sensitivity threshold impairment, defined as a threshold above 44 volts, was 17% 36%, and 56% among men in their 50s, 60s, and 70s, respectively,  $\chi^2(2) = 9.9, p < .05$ . The prevalence of multiple sensory impairments was highest in the oldest decennium: it occurred in just 2.1% of the 50- and 60-year-old men compared with 29% of the 70-year-old men,  $\chi^2(2) = 17.0, p < .05$ . Seventy-nine percent of the 50-year-old men had no sensory impairments compared with 57% of the 60-years-old and 33% of the 70-year-old men,  $\chi^2(2) = 10.12, p < .05$ .

Men in their 70s, relative to those in their 60s, had a higher prevalence of incorrect responses to each cognitive function test item. The trend reached statistical significance for the Face-Hand test and assembling the butter churn paddle. Seventeen percent and 47% of 60- and 70-year-old men, respectively, gave one or more incorrect responses to the Face-Hand Test,  $\chi^2(1) = 15.9, p < .05$ . (This test was given also to men in their 50s; 6%

gave incorrect responses.) Six percent and 39% of 60- and 70-year-old men, respectively, incorrectly assembled the paddle,  $\chi^2(1) = 5.4, p < .05$ . Forty-seven percent of the 70-year-old men incorrectly responded to two or more cognitive function test items, compared with just 17% of the 60 year old men,  $\chi^2(1) = 5.96, p < .05$ . Twenty-six percent of the 70-year-old men made no mistakes compared with 61% of the 60-year-old men,  $\chi^2(1) = 4.73, p < .05$ . The interviewer judged only one man, age 77, to have great difficulty understanding during the interview. He judged 5 to have slight difficulty and 2 to have difficulty recalling only remote dates; the remainder (88%) were judged to have no difficulty.

All but 5 of the 69 men aged 60 or more were living with at least one child. Ten had relinquished the role of household head to a son or son-in-law. They included 1 individual (2%) in his 60s, 7 (37%) in their 70s, and both 80 year olds. Eight of the 10 had elevated vibration sensitivity thresholds, 5 had severe visual impairment, 3 had marked auditory impairment, and 5 gave incorrect responses to more than one cognitive function test item. There were 7 former and 12 current household heads in their 70s. Among them, 71% of the former household heads had severe visual impairment compared with 7% of the current household heads,  $\chi^2(1) = 6.0, p < .05$ .

#### DISCUSSION

The age differences in sensory and cognitive function among elderly Nepalese men living in a traditional agrarian society are consistent with finding in Western industrial populations (Birren & Schaie, 1977). The practical consequences for everyday life of sensory and cognitive loss are intriguing because one could hypothesize that because of the technological simplicity of such a society, deficits might not have a great impact. Yet they do. Men with visual and auditory impairment are less active socially and physically. This is demonstrated by finding a higher prevalence of vision impairment among former than among current household heads in their 70s. The former household heads had less political and economic influence in their households and communities. Furthermore, the daily level of social interaction of vision and hearing impaired men was restricted. This is illustrated by 40 days of observation of the activity of 15 high caste men in their 70s. Limiting analysis to this

group focuses on the decennium with the highest prevalence of impairment and avoids confounding by the different subsistence activities of some low castes. Men with marked vision and hearing impairment left their house compounds less frequently to walk to destinations for social (e.g., visit teashop) or business (e.g., hire laborers) purposes. They did so on 67% (6 out of 9) and 50% (3 out of 6) of the observed days compared with 97% for the visually (30 out of 31) or hearing (33 out of 34) unimpaired,  $\chi^2 = 4.1, p < .05, \chi^2 = 7.9, p < .05$ . Those with marked vision and hearing impairment spent 42% and 52% of the observed time in quiet inactivity compared with 21% for those without,  $.09 > p > .07$  and  $.07 > p > .05$ . In contrast, cognitive impairment was not associated with changed activity pattern as long as sensory function was maintained. Apparently household head status is lost only when verbal communication skills are severely impaired.

In summary, the data indicate that the biological aging processes of sensory and cognitive loss do occur in these traditional rural farming communities and do substantially affect people's lives. Sensory impairment fosters social isolation and economic and political dependence. Although more research is necessary before drawing contrasts confidently between traditional and industrial societies, it is tempting to speculate that modern medicine has not only increased life expectancy but also altered the relative impact of sensory and cognitive impairment. Perhaps sensory impairment is more significant a determinant of well-being among elderly adults in societies lacking Western medical remedies.

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