A Cross-Cultural Comparison of Impressions Created by Age-Related Variations in Gait

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Running Head: IMPRESSIONS CREATED BY GAIT

Abstract

Cross-cultural similarities and differences in impressions of age-related gait qualities were investigated. Specifically, Korean subjects' perceptions of the age, sex, and traits of 5 to 70 year old American men and women, whose gaits were depicted in point-light displays, were compared with American subjects' perceptions documented by Montepare and Zebrowitz-McArthur (1988). Substantial cross-cultural agreement was found for perceptions of the walkers' age and sex. Moreover, with walkers' perceived age and sex controlled, both American and Korean ratings of the walkers' strength and happiness showed a linear decrease with age and ratings of their sexiness showed a curvilinear relationship. Whereas American ratings of dominance showed a linear decrease with walkers' age, no such relationship was observed for Korean ratings. The findings supported both the ecological theory of social perception and an interactionist model of cross-cultural perception, which suggest that some reactions to gait information are universal while others are determined by culturally specific values which may influence the movements of younger and older individuals and the meanings perceivers associate with these movements.

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In his pioneering work, Johansson (1973) demonstrated that gait patterns are potent sources of information about human biomechanical actions. Using a point light technique, in which points of lights on the main limb joints represent a moving person as small luminous dots moving against a black background, Johansson showed that these dynamic displays are readily identified as a walking, running, or jumping person. Johansson also showed that it takes perceivers less than 400 msec to determine whether they are viewing the actions of a human walker or a puppet, indicating that our visual systems are well-attuned to information provided by human motion. Further evidence of this sensitivity is provided by the finding that infants as young as 4 months of age readily differentiate biological from nonbiological motions (Fox & McDaniel, 1982).

In addition to providing information about a person's actions, gait patterns are a valuable source of information about a variety of personal attributes, including a person's identity, sex, and emotional state (Barclay, Cutting, & Kozlowski, 1978; Beardsworth & Buckner, 1981; Cutting & Kozlowski, 1977; Kozlowski & Cutting, 1977; Montepare, Goldstein, & Clausen, 1987). Variations in gait also exert a strong influence on perceivers' impressions of a person's traits. In a seminal study, Wolff (1943) found that perceivers who viewed films of individuals playing a ring toss game readily attributed a variety of psychological qualities to people who walked a certain way. More

recently, Montepare and Zebrowitz-McArthur (1988) used the point-light technique to examine gait-based impressions and the extent to which they were linked to age-related gait qualities.

Montepare and Zebrowitz-McArthur (1988) found that perceivers' judgments about the sexiness, happiness, strength, and dominance of walkers ranging in age from 5 to 70 showed substantial agreement and varied systematically with the walker's age. This was true even though age could not be accurately identified from the point light displays. This finding, which was attributed to the absence of information about the walkers' heights, indicated that variations in gait per se rather than stereotypic age labels accounted for variations in the traits attributed to walkers of different ages. Consistent with McArthur and Baron's (1983) ecological theory of social perception, these trait impressions reflected the detection of behavioral propensities that actually covary with age. As would be expected from their reproductive potential, the gaits of adolescents and young adults were perceived as sexier than those of children and older adults. Consistent with the carefree nature of childhood and the vigor and hardiness of youth, perceived happiness and physical strength showed a linear decrease with walker's age. Finally, consistent with the tendency for social status to decline with age in western cultures, older gaits were seen as less dominant than younger ones.

The aim of the present study was to extend knowledge about how variations in gait influence social perceptions by comparing Koreans' and Americans' perceptions of the different aged walkers studied by Montepare and McArthur (1987). In keeping with Bull's (1983)

propositions regarding the usefulness of such cross-cultural comparisons, evidence of agreement in reactions to gait information would support the universalist view that gait-based perceptions reflect a sensitivity to culturally invariant human motion information. On the other hand, evidence of cultural differences would support the view that gait-based perceptions derive from perceptual experiences with culturally specific nonverbal information. Finally, evidence of both cross-cultural similarities and differences would support the interactionist position that some meanings in gait information are universal and others are culturally-dependent.

While no research has examined cross-cultural correspondences in impressions created by variations in gait, there is evidence for agreement in impressions of various facial and vocal qualities. For example, Ekman and his colleagues (1987) found pancultural agreement in perceptions of emotions communicated by facial expressions. Trait impressions elicited by a babyish facial structure also show considerable cross-cultural agreement (McArthur & Berry, 1987; Zebrowitz & Montepare, 1992). In addition, there is agreement regarding the emotions posed by speakers in content free vocalizations (Beier & Zautra, 1972; Van Bezooijen, Otto, & Heenan, 1983), and there is agreement regarding the traits possessed by speakers with childlike vocal qualities (Montepare & Zebrowitz-McArthur, 1987). On the other hand, Peng and Zebrowitz (1992) found that American and Korean perceivers reacted differently to the slowness of speech which characterizes an elderly voice (Helfrich, 1979). Consistent with the high value placed on old age in eastern cultures and the high status of

the elderly, Koreans perceived greater power in those who spoke slowly. Americans, however, perceived greater power in those who spoke more rapidly, which is consistent with the positive value placed on youthfulness.

Like vocal speed, walking speed declines with age, and speed was a major component of the age-related variations in gait that contributed to trait impressions in the Montepare and Zebrowitz-McArthur (1988) investigation. It thus seems reasonable to predict that whereas Americans perceived older, slower walkers as relatively low in dominance, Koreans should perceive them as relatively high on this dimension. Although the differential status of elderly people in the two cultures should yield differences in the perception of dominance from age-related gait qualities, other trait impressions should show cross-cultural agreement. Since the ages of maximum fertility are comparable across cultures, the perceived sexiness of different aged gaits should also be comparable, showing a curvilinear relation to walkers' age. Similarly, commonalities in the carefree nature of childhood and the vigor of youth should yield cross-cultural agreement in impressions of happiness and strength, with these impressions showing a linear decline with walkers' age for both Americans and Koreans. Finally, given that sex- and age-related variations in gait reflect underlying structural attributes common to all humans, there should be cross-cultural agreement in judgments of the walkers' sex and age.

Method

Subjects

Twenty-four male and 24 female Korean undergraduates at Seoul National University served as subjects and received W100 (approximately $1.25) for their participation. Subjects of each sex were randomly assigned to one of two orders of gait displays and to one of two orders of trait scales.

Stimulus Materials

The gait stimuli consisted of the point-light displays of walkers used in Study 1 of Montepare and Zebrowitz-McArthur's (1988) research. The walkers were two males and two females representing 4 age groups (5-7 year old children, 13-14 year old adolescents, 26-28 year old young adults, and 65-70 year old older adults). The displays were created by attaching pieces of reflecting tape (1.9 cm x 3.5 cm) to the walkers' main limb joints and videotaping them while they walked from one end of a 4.92 m wide room and back again in front of a dark wall. The limb joints which were highlighted were: 1) the inside and outside of both wrists, elbows, knees, and ankles; 2) the lateral side of each shoulder; and 3) the lateral side of each hip just below waist level.

The walkers wore dark shirts and pants and walked back and forth several times before the actual videotaping was begun in order to minimize self-consciousness. The walkers were videotaped one at a time and were instructed to look straight ahead and to walk at a comfortable and natural pace. The walkers traversed across the viewing field 5 times and their side views were recorded on a master tape as they passed in a straight line before a stationary camera 7.9 m from the

lens. During the viewing sessions the displays were presented on a video monitor adjusted so that the brightness was reduced and the contrast was maximized. To control for the possible influence of size differences on subjects' judgments, the walkers' heights were equated using a zoom lens to about 14.73 cm on the video screen. Because this made some of the displays brighter than others the experimenter manually equated the brightness on the monitor during the viewing sessions.

Two orders of display presentations were prepared with a 5 second pause between each presentation and edited onto separate experimental tapes. One order was a random sequence of walkers with the restriction that no two same-aged walkers appeared consecutively. The second order was the reverse of the first. Each display sequence was reproduced 3 times on the experimental tapes for each order of presentation.

Dependent Measures

Trait ratings of the walkers were made on 7-point bipolar scales with endpoints labeled with Korean adjectives. The trait adjectives were initially translated into Korean by a Korean visiting scholar at Brandeis University and were subsequently translated back to English by a Korean professor at Seoul National University. Due to time constraints, fewer ratings were made than in the American study (Montepare & Zebrowitz-McArthur, 1988). Two scales measured perceptions of power, one reflecting physical power (physically weak/ physically strong) and the other reflecting social power (submissive/ dominant). Perceptions of happiness and sexiness were assessed with the scales happy/sad and unsexy/sexy as in the American study. Finally, subjects

estimated the age of each walker in years and judged if each walker was a 'male' or a 'female'. [1]

Procedure

An American female experimenter ran the videorecorder and a Korean male experimenter read instructions and answered questions. Subjects received a copy of the rating scales with a cover sheet containing a Korean translation of instructions used in the American study. Subjects were run in groups of 8 and sat in a row at least 8 feet away from the video monitor.

To make trait, age, and sex ratings, subjects viewed the 16 walkers a total of three times. Subjects made judgments about one group of traits during the first presentation and a different group of traits during the second presentation, with the order of the two groups of traits counterbalanced across subjects. All subjects made judgments about the walkers' age and sex during the final presentation to reduce potential biases in trait ratings due to stereotypic labeling.

Results

Interrater and Intergroup Agreement in Gait-Based Impressions

As a first step in assessing the generalizability of gait-based social perceptions, interrater agreement among Korean raters was examined as it was in the American study. To this end, standardized Cronbach's alphas were computed among the subjects' ratings of the 16 walkers. The resultant statistics as well as those obtained in the American study are presented in Table 1. As can be seen, Korean perceivers, like American perceivers, showed high agreement regarding the age and sex of the walkers. In addition, they showed high agreement

regarding the relative strength, happiness, dominance, and sexiness of the walkers.

Insert Table 1 about here

To assess cross-cultural agreement, mean scores were computed for each walker by averaging across Korean subjects' ratings of each dependent measure and then correlated with American subjects' mean scores computed in a similar way. Consistent with predictions, strong cross-cultural agreement was found for perceptions of age and sex, r (14) = .89 and .73, both $p < .01$, respectively. Table 2 shows the mean ages Korean subjects attributed to the walkers in each of the four age groups as well as the percentage of the subjects' correct sex identifications within each group. These data have several noteworthy parallels to the American data which also appear in Table 2. More specifically, the Korean subjects overestimated the ages of the children and adolescents and underestimated the ages of the older adults just as the American subjects had done. The age estimates of young adults were the only ones to approach accuracy for both groups of subjects. As suggested previously by Montepare & Zebrowitz-McArthur (1988), this pattern of age estimates indicates that relative rather than absolute age is accurately specified by gait information.

Another noteworthy parallel is that the number of correct sex identifications made by Korean subjects varied across walkers' age group in the same way as those made by American subjects (see Table 2). For both groups, the percentage of correct identifications was better

than chance levels for adolescent, young adult, and older adult walkers, but not for child walkers. These results indicate that gait is not a reliable source of information regarding the sexual identity of prepubescent males and females, a finding most likely reflecting the absence of the sex differences in body structure which develop at puberty and contribute to sex differences in movement parameters (Cutting, 1978).

Insert Table 2 about here

Consistent with predictions, Korean and American subjects' trait ratings showed significant agreement for ratings of happiness, r (14) = .91, $p < .001$, sexiness, r (14) = .62, $p < .05$, and strength, r (14) = .56, $p < .05$. Also consistent with predictions, dominance ratings failed to manifest significant agreement, r (14) = .46 $p > .05$.

Impact of Age-Related Variations in Gait on Trait Impressions

To assess similarities and differences in the impact of age-related gait qualities on Korean and American subjects' trait impressions, a series of 2 (subject culture) X 2 (subject sex) X 2 (walker replication) X 4 (walker age) X 2 (walker sex) analysis of covariance were performed on mean trait ratings. In these analyses, subject culture and sex were between-groups factors and walker replication, age, and sex were within-groups factors with walker replication nested within walker age and sex. Ratings of perceived age and sex served as covariates to rule out the possibility that any observed differences in trait impressions of the walkers were simply

the result of stereotypic labelling and not reactions to movement qualities per se. For the sake of brevity, we report only results pertaining to the interaction between subject culture and walker age and planned comparisons which are relevant to the hypotheses regarding cross-cultural agreement in reactions to age-related variations in gait.

Consistent with predictions, impressions of the walkers' sexiness showed no significant subject culture X walker age effect, F (3,274) = 2.11, $p > .05$, indicating that the effects of walker age on perceived sexiness were equivalent for Korean and American subjects. Moreover, as can be seen in Table 3, planned comparisons revealed that the curvilinear trend previously found for American ratings was also highly significant for Koreans thereby demonstrating strong cross-cultural generality in the perception of greater sexiness in adolescent and young adult walkers than child and elderly walkers.

Insert Table 3 about here

Although a significant interaction effect suggested that the effect of age on impressions of the walkers' happiness differed for Korean and American subjects, F (3,274) = 9.15, $p < .001$, planned comparisons revealed that the overall trends were similar in the two perceiver groups, albeit stronger for Koreans . More specifically, consistent with predictions, both Korean and American subjects' ratings of the walkers' happiness showed a strong linear decrease with age (see Table 3).

Ratings of the walkers' strength also showed a significant subject culture X walker age effect, F (3,274) = 22.08, $p < .001$. However, planned comparisons once again revealed that the age effects were highly similar for both groups. In particular, Korean subjects' ratings of the walkers' strength showed a strong linear decrease with age as did American subjects' ratings. American subjects' ratings also showed a significant curvilinear trend. However, the pattern of means was consistent with the linear trend insofar as child and adolescent walkers were perceived as stronger than young or older adult walkers (see Table 3).

Consistent with predicted cross-cultural differences in the effects of walker age on impressions of social power, a significant interaction effect was observed for ratings of dominance, F (3,274) = 3.08, $p < .05$. Whereas, American subjects' showed a strong linear trend, rating older walkers as less dominant, trend analyses failed to reveal a significant linear or curvilinear effect of walker age on Korean subjects' dominance ratings (see Table 3).

The foregoing covariance analyses provided one way of determining that perceivers' impressions of the walkers reflected their reactions to gait movements per se and were not merely the results of stereotypic labeling. Another way to test this proposition is to assess the relationship between perceivers' trait ratings and measures of specific gait qualities. Thus, Pearson correlations were computed between ratings of the walkers' traits and a composite of measures reflecting the youthfulness of their gaits. The specific measures characterizing a youthful gait had been identified in the American study and consisted

of ratings of greater hip sway, knee bending, picking up feet, arm swing, loose-jointedness, as well as a bouncier rhythm. A faster walking speed was also identified as a youthful gait quality and was represented in the composite as more steps per second. This composite was significantly correlated with Korean subjects' estimates of the walkers' age, r (14) = -.80, p < .001 as it had been for American subjects' estimates, r (14) = -.89, p < .001. Consistent with the age trends reported for American subjects' trait ratings, a youthful gait was curvilinearly correlated with their ratings of sexiness, r (14) = -.48, p < .10, and linearly correlated with their ratings of happiness, strength, and dominance rs (14) = .84, .42, and .69, ps < .001, .10, and .01, respectively. Consistent with the age trends reported for Korean subjects' ratings, a youthful gait was curvilinearly correlated with their ratings of sexiness, r (14) = -.40, p approximately .10, and linearly correlated with their ratings of happiness and strength, rs (14) = .91 and .83, ps < .001, respectively, but not with their ratings of dominance, r (14) = .03, p > .05.

Although Koreans' perceptions of dominance failed to increase linearly with walker age as predicted, the high reliability of their judgements indicated that something in the gait information did convey dominance to them. To explore what these qualities might be for Koreans, correlation coefficients were computed between Korean's dominance ratings and the ratings of the walkers' gait qualities. Although none of the correlations were significant, the correlations between dominance ratings and a slow walking speed and a large arm swing were sufficiently high to suggest that they may have contributed

to the observed dominance effects, rs (14) = .32 and .34, ps > .05.

Discussion

The present study revealed that patterns of gait exert a strong and reliable impact not only on the social perceptions of perceivers from the same culture as the walkers, but also on the perceptions of those from a different culture. Moreover, perceivers show substantial intercultural agreement in their perceptions of the walkers' age and sex as well as their relative happiness, physical strength, and sexiness. The present study further showed that American and Korean perceivers respond similarly to age-related variations in gait. Furthermore, these shared impressions held true independent of the age and sex attributed to walkers, indicating they were directly related to the walkers' patterns of movement and were not simply the result of age- or sex-stereotypic labeling.

Why do age-related variations in gait have such a pervasive impact on certain trait impressions? Consistent with the ecological theory of social perception (McArthur & Baron, 1983), one feasible explanation is that actual age-related differences in personal qualities such as happiness, physical power, and fertility give rise to different patterns of gait which are the same for walkers from different cultures. Perceivers from different cultures may reliably extract this information from gait patterns as a result of either innate adaptive social and biological sensitivities or attunements shaped by repeated perceptual experiences with different-aged people.

In addition to showing strong cross-cultural similarities in gait-based perceptions, the present study also revealed an interesting

difference. Specifically, although walkers with a youthful gait were perceived as more dominant than those with an older gait by American subjects, they were not so perceived by Korean subjects. Consistent with ecological theory, youthful gait qualities may be associated with greater dominance for American perceivers because youthfulness is valued in western cultures and aging is associated with decreasing independence and lower social status (Bond & Hwang, 1986; Keith, 1982).

Given that older people have high status in Korean society, one may ask why Korean subjects failed to associate greater dominance with older gaits as had been predicted. One possible explanation is that the older adult walkers in the present study did not manifest those gait qualities which convey dominance to Koreans. Interestingly, the gait qualities most highly correlated with Koreans' dominance judgments - a slow walking speed and a large arm swing - are similar to characteristics associated with the Yangban style of walking, which is a traditional gait form practiced by older men in high social positions in Korean society (H.K. Lee, personal communication, 1989).

The idea that particular gait qualities are culturally specific and convey different meaning to perceivers from different cultures suggests that despite structurally based proclivities to walk in particular ways, the way people ultimately do walk can be strongly influenced by social forces. Indeed, several researchers have noted cross-cultural differences in movement patterns which suggest that some gait qualities can be culturally prescribed. Mauss (1935), for example, was one of the first to document the existence of a social education for walking. Using observations of the way Maori (New Zealand) women

walk, Mauss observed, "Naive women adopt a peculiar gait...that was acquired in youth, a loose-jointed swinging of the hips that looks ungainly to us, but was admired by the Maori...Mothers drilled their daughters in this accomplishment, termed onioni. This was an acquired, not a 'natural' way of walking" (cited in Polhemus, 1978, p.35).

In summary, the present research was successful in extending our knowledge about the value of gait information for social perceptions. First, it demonstrated that a person's gait serves as a potent source of information about a variety of personal attributes, and this is true both within and across diverse cultural contexts. Second, it indicated that age-related variations in gait yield both interesting cross-cultural similarities and differences in impressions of a person's traits, suggesting that an interactionist model best characterizes the nature of perceivers' reactions to gait information. Although this research has brought us one step further in our understanding of the role of gait information in person perception, challenging questions remain. For example, it would be interesting to investigate Korean and American perceivers' impressions of Korean walkers who vary in age to see whether the style of gait manifested by elderly Koreans differs from that manifested by elderly Americans and whether it yields perceptions of powerfulness by Korean perceivers.

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Footnotes

1. Three additional ratings obtained in the present study will not be discussed either due to low reliability in the American and Korean samples (naivete) or due to the absence of comparable measures in the American sample (honesty and warmth).

Authors Notes

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Table 1

Interrater Agreement in Ratings of the Dependent Measures

Dependent Measure	Standardized Alpha	
	Korean Raters	American Raters
Physical Strength	.96	.81
Dominance	.71	.89
Happiness	.98	.96
Warmth	.76	.76
Sexiness	.77	.86
Perceived Age	.95	.97
Perceived Sex	.92	.93

Table 2

Korean and American Subjects' Age and Sex Judgments Across the Four Walker Age Groups

	Children	Adolescents	Young Adults	Older Adults
Mean Perceived Age				
Korean	23.27	27.91	33.17	34.70
American	18.56	27.13	33.60	40.37
Correct Sex Identifications				
Korean	50%	70%	68%	68%
American	55%	70%	64%	69%

Table 3

Adjusted Mean Values of Korean and American Subjects' Trait Ratings Across the Four Walkers Age Groups

Trait Measure	Children	Adolescent	Young Adults	Older Adults	*F* Linear Trend	*F* Quadratic Trend
Sexiness						
Korean	3.31	3.80	3.85	3.67	5.23*	9.37*
American	3.17	4.06	4.21	3.76	15.39*	37.47*
Happiness						
Korean	5.57	4.29	3.38	3.11	359.65*	26.76*
American	5.04	4.00	3.77	3.25	164.50*	7.09*
Physical Strength						
Korean	5.29	4.08	3.40	3.09	164.65*	< 1
American	4.15	4.59	4.04	3.90	5.25*	5.21*
Dominance						
Korean	4.11	4.06	4.15	4.00	< 1	< 1
American	4.71	4.42	4.10	3.72	29.19*	< 1

* $p < .001$