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Perceptions of Rapport across the Life Span: Gaze Patterns and Judgment Accuracy

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Abstract

Although age-related deficits in emotion perception have been established using photographs of individuals, the extension of these findings to dynamic displays and dyads is just beginning. Similarly, most eye-tracking research in the person perception literature, including those that study age differences, have focused on individual attributes gleaned from static images; no previous research has considered cue use in dyadic judgments with eye-tracking. The current study employed a Brunswikian lens model analysis in conjunction with eye-tracking measurements to study age differences in the judgment of rapport, a social construct comprised of mutual attentiveness, positive feelings, and coordination between interacting partners. Judgment accuracy and cue utilization of younger (n = 47) and older (n = 46) adults were operationalized as correlations between a perceiver's judgments and criterion values within a set of 34 brief interaction videos in which two opposite- sex college students discussed a controversial topic. No age differences emerged in the accuracy of judgments, however pathways to accuracy differed by age; younger adults' judgments relied on some behavioral cues more than older adults. Additionally, eye-tracking analyses revealed that older adults spent more time looking at the bodies of the targets in the videos whereas younger adults spent more time looking at the targets' heads. The contributions from both the lens model and eye-tracking findings provide distinct but complementary insights to our understanding of age-related continuities and shifts in social perceptual processing.

Perceptions of Rapport across the Life Span: Gaze Patterns and Judgment Accuracy

Successful social interactions depend on accurate perception of interpersonal qualities, both at the person level, such as discerning an individual's affective state, as well as at the interpersonal level, such as characterizing a group interaction as positive or negative (Hall & Bernieri, 2001). What remains to be seen, however, is whether this ability is enhanced with age and experience. The present study sought to compare how perceivers of different age groups make judgments of rapport, a dyadic quality comprised of the feelings that arise from each interacting partner.

We draw upon different methods of highlighting potential age differences in the interpersonal judgment process. We combine the traditional Brunswikian approach, which measures probabilistic relationships among aspects of the perceiver's environment and their judgments, with the novel addition of gaze pattern analysis. This allowed us to obtain a more nuanced understanding of how visual attention to specific environmental cues affects interpersonal judgments in the context of aging.

Rapport

Rapport is a term informally used to describe social interactions where people experience a sense of togetherness and harmony. It is often associated with metaphors such as "good chemistry" and terms like "we got along," and "we clicked." Rapport has been defined as an inherently social phenomenon that is an emergent property of the *interaction* (Bernieri, 2005; Tickle-Degnen & Rosenthal, 1987, 1990). According to this account, rapport is not an emotional state, personality disposition, or other attribute that can be ascribed to one individual.

Aside from being defined at the dyad or group level, rapport is a visible construct, meaning that it is successfully encoded within the behavioral stream of interacting partners'

expressive behaviors (Ambady, Bernieri, & Richeson, 2001; Bernieri, 2005; Bernieri et al., 1996). There are three essential components of the rapport construct, each associated with nonverbal correlates. The first, mutual attentiveness, is the level of attention, involvement, and interest among the interacting partners reflected through body postures that represent openness to communication. The second component is positivity or positive affect, defined as mutual feelings of caring and friendliness, expressed through smiling and nodding, which indicate liking and approval. The final component is coordination, referring to harmony and being in sync, and is identified by postural mimicry and interactional synchrony (Tickle-Degnen & Rosenthal, 1990).

Rapport Perception: A Lens Model Approach

Drawing on the idea that rapport has various indicators that are readily observed by third-party perceivers, Bernieri and colleagues (1996) employed a lens model analysis to investigate the relationship between the ecology of rapport and perceivers' judgments. According to Brunswik (1955), the perceptual process is characterized by "vicarious mediation," or the fact that perceivers' judgments rely on the observable cues in the environment that have probabilistic relationships to the percept-- in this case, rapport.

The lens model provides a method of analysis that breaks down the perceptual process into two parts. The first is the relationship between observable cues in the environment and the to-be-judged construct (*cue validity*). Cue validity refers to an objective description of the stimuli independent from the perceiver. This part of the lens model identifies the observable cues that are valid indicators of the construct (i.e., that are correlated with the construct) and those that are not.

The second part of the perceptual process in the lens model is the relationship between perceivers' judgments and the observable cues (*cue utilization*), from which a high correlation

indicates strong usage of a cue. *Accuracy* requires both parts of the model to be satisfied: There must be enough cues that are sufficiently correlated with the construct, and perceivers must use the cues appropriately. Thus, *consistency*, a measure of how well the cues predict the perceiver's judgments, as well as *knowledge*, the perceiver's ability to distinguish between valid and invalid cues, are major components of how perceivers make accurate judgments about the criterion.

Whereas earlier researchers tended to focus on individual attributes (e.g., personality traits; Gifford, 1994), Bernieri and colleagues (1996) were the first to apply the lens model to study a purely dynamic social psychological construct, rapport. In their original study, unacquainted male-female dyads engaged in a debate activity together while being videotaped, after which they rated their experience of rapport on dimensions reflecting the three components of rapport (attentiveness, positivity, and coordination). The combined ratings of both partners constituted the rapport criterion. A set of trained coders then measured an extensive set of behavioral cues evident in the videos. The authors reported several significant cues to rapport criterion (*cue validity*) including interpersonal proximity, back-channel responses (e.g., head nods and uh-hmms), and female gesturing. A separate set of perceivers judged the level of rapport from the videos (to asses *accuracy*), and their judgments were related to the varied existence of the observable cues expressed in each dyad (*cue utilization*). Accurate perception of rapport occurred to the extent that judgments correlated with valid cues but not with invalid cues.

The manifestation of rapport (its expression within the behaviors assessed) as well as its judgments (how perceiver judgments correlated with the cues) varied significantly across interpersonal contexts (Bernieri et al., 1996). For example, whereas physical proximity may be a valid indicator of when two people are getting along in an adversarial context, it may not be as important in a cooperative context. Furthermore, because the lens model emphasizes the

importance of the perceiver's environment, it is reasonable to assume that individual factors, such as age, may alter the judgment process.

Social Perception in Older Age

Although there is no current research investigating older adults' judgments of rapport, there is much literature reporting age-related declines in the ability to accurately label emotion expressions (Ruffman, Henry, Livingstone, & Phillips, 2008); because one of the components of rapport is positivity amongst interacting partners, we can look towards the emotion literature for some relevant background for investigating rapport perception.

The ability to accurately perceive emotions in others is related to successful social functioning (Izard, 2001; Izard et al., 2001; Elfenbein, Der Foo, White, Tan, & Aik, 2007). Therefore, the age deficit commonly found in emotion perception seems to be at odds with self-reported decreases in negative affect, maintenance of positive affect, and general satisfaction with social relationships in older age (Charles & Piazza, 2009; Lansford, Sherman, & Antonucci, 1998). However, not every social aptitude has been shown to decline with age.

In fact, increased age is associated with: (a) higher emotional intelligence (Mayer, Caruso, & Salovey, 1999), (b) using various strategies to effectively maintain emotional stability (Blanchard-Fields, 2007), and (c) better ability to make diagnostic judgments about traits based on behavioral information, all of which suggest that older adults have a great deal of social expertise (Hess, Osowski, & Leclerc, 2005). In particular, older adults have an advantage in using more diagnostic information for making judgments about others based on behavioral information (Hess & Auman, 2001).

When making social judgments in everyday life, perceivers generally take advantage of the dynamic environment around them, and have access to social cues other than just a face.

Categorization of emotion expressions is often influenced by the affective context in which it appears (Aviezer et al., 2008), and it has been noted that scene context influences older adults' perceptions more than face context, presumably because they are rich in affective information (Ngo & Isaacowitz, in press). This finding is in line with a body of research that finds age differences in attentional inhibition, which notes that older adults encode more extraneous information than younger adults in various perceptual tasks (e.g., Campbell, Hasher, & Thomas 2010, Gutchess et al., 2007). However, having the aid of contextual cues does not appear to eliminate the age deficit in emotion perception (Ruffman et al., 2008). Moreover, although some losses in cognitive functioning and resources occur in older age individuals (Salthouse, 2004), researchers have not found a clear link between cognitive decline and attenuated facial processing (Keightley, Winocur, Burianova, Hongwanishkul, & Grady, 2006; Ruffman et al., 2008). Therefore, previously reported studies on labeling emotional faces may have failed to tap into the social perceptual skills that older adults use in everyday life.

Whereas access to multiple channels of information is beneficial to all perceivers (combining auditory and visual information, Collignon et al., 2008), ecologically valid tasks may be especially important for older adults because tasks that mimic real-world interactions allow older adults to draw on their real-life experience. Some studies that diverge from the traditional static-face emotion perception task show that older adults achieve the same or even greater level of accuracy as younger adults (e.g., in identifying dynamic smiles, Murphy, Lehrfeld, & Isaacowitz, 2010;, and short videos of affective information, Krendl & Ambady, 2010). Studies that have used stimuli of unrehearsed, real-time conversations also find that older adults achieve similar or better accuracy as younger adults. These findings come from varied domains, such as empathic accuracy (Richter & Kunzmann, 2011), judging levels of marital satisfaction (Ebling &

Levenson, 2003), and continuous valence judgments of interactions between married couples (Sze, Goodkind, Gyurak, & Levenson, 2012). These findings are consistent with a selective engagement hypothesis (Hess, Leclerc, Swaim, & Weatherbee, 2009), which suggests that older people prefer to invest cognitive resources in tasks that hold more meaning and relevance to them, and helps explain the age-related decline in tasks that lack ecological validity.

Further research reveals that age differences in judgment processes may exist beyond differences in accuracy. For example, = older adults look at different parts of an emotional face than younger adults --younger adults observing an angry face focused more on the eye region whereas older adults observing the same face attended to the mouth region (Murphy & Isaacowitz, 2010). Additionally, research from the cognitive aging and neuroscience literatures has demonstrated that even when older and younger adults show comparable performance on a memory task, they activate different brain regions, with older adults sometimes recruiting more areas compared to their younger counterparts (Reuter-Lorenz et al., 2000); this may serve as a compensatory 'scaffolding' strategy in older age (Park & Reuter-Lorenz, 2009). Thus, because older adults' performance often reflects different strategies for attaining accuracy,, it is equally important to examine differences in attention and processing as well as differences in accuracy, when investigating age effects on interpersonal perception.

Using Eye-Tracking to Study Aging and Social Perception

One clear way to investigate age differences in strategies used to make interpersonal judgments is to use the lens model to consider cue utilization separately by age, which would provide information about probabilistic relationships between judgments and cues in the perceiver's environment. However, when considering individual differences in cue use, this analytic approach cannot objectively measure the perceivers' overt attention. Instead, a different

method may be employed -- eye-tracking analyses of gaze allocation allows researchers to directly investigate attention to visual information. For example, eye-tracking has revealed that people tend to look at the eye region of members of their ingroup when given extended periods of time (e.g., 5 s), and that this preferential attention further predicts willingness to interact with and faster recognition of faces of ingroup members (Kawakami et al., 2014).

Although eye-tracking has mostly been used to investigate static stimuli reflecting individual qualities, (cf. Crosby, Monin, & Richardson, 2008), it also has the potential to highlight patterns of gaze allocation during interpersonal perception of dyadic contexts. To date, there is no eye-tracking research on rapport perception, though it would be a useful supplement to the lens model approach, especially from an aging perspective; previous research has found attentional differences between younger and older adults' gaze allocation during perception tasks (e.g., looking at emotional faces, Murphy & Isaacowitz, 2010; Sullivan, Ruffman, & Hutton, 2007). Eye-tracking can measure visual attention to physical cues (such as faces or bodies), but cannot measure abstract concepts such as level of expressivity, which may be captured by the lens model. Therefore, eye tracking can be a valuable supplement to investigating age differences in social judgments in conjunction with the lens model by also providing an index of fixation to visually-observable physical aspects of the dyad (see also Isaacowitz, 2012).

Current Study

The current study sought to provide insight into the way younger and older adults make social judgments by using a lens model analysis in conjunction with eye-tracking. Our goal was to supplement the Brunswikian approach's focus on cue use (indicated by judgments) with eye-tracking's ability to measure attention to specific visual targets (indicated by fixations). The rapport judgment paradigm provided an ideal tool for understanding everyday social judgments

because it uses dynamic stimuli and incorporates an accuracy criterion that is derived directly from the targets' experience of rapport. Despite past findings suggesting age-related declines in emotion perception, a different age pattern may emerge for this mode of social perception, given that older adults have more experience judging social interactions in everyday life. Furthermore, it is important to keep in mind that the current task differs from typical emotion perception tasks because the interpersonal context as well as the criterion judgment has been held constant. All stimulus clips depict the same contextual scene; the only stimulus variance is that attributable to target persons. Finally, eye-tracking analyses may reveal additional information regarding the types of salient visual information that participants attend to when making their judgments, and whether this varies by age.

Our first research question was *how do younger and older adults compare in making accurate judgments of rapport?* On the one hand, we might expect older adults to have *higher* accuracy in judging rapport, based on previous research that finds age-related improvements when participants make interpersonal judgments from videos (e.g., Murphy et al., 2010), especially of unrehearsed dyadic interactions (e.g., Sze et al., 2012) and because age is associated with social expertise and heightened social decision making from accumulated past experiences with social relationships (Hess et al., 2005). On the other hand, we could expect older adults to attain the *same* level of accuracy as younger adults, based on previous evidence for no age differences in emotional judgments from videos (e.g., Krendl & Ambady, 2010; Richter & Kunzmann, 2011). We did not expect to find any age *decrement* in accuracy judgments because the stimuli being rated were ecologically representative compared with posed and static images.

Our second research question was d*o people of different age groups use different cues when making their judgments?* Whereas previous evidence suggests that younger adult perceivers judged rapport based on some invalid cues (e.g., smiling, Bernieri et al., 1996), and accuracy improved through training aimed at avoiding invalid cues (Bernieri & Gillis, 1995), we expected that older adults' judgments would rely on more valid cues because they would have more experience observing and judging interactions and relationships over the course of their lifetime. Thus, we hypothesized that older adults would have improved judgment policies (i.e., higher knowledge) compared to younger adults.

Our third and final research question was *what can eye-tracking reveal about attentional allocation during the rapport judgment process?* Because social judgments are inherently dynamic in the real world, we hypothesized that visually attending to different information in the videos will be related to the rapport judgments being made. Furthermore, because older and younger adults' visual attention has been shown to vary when looking at emotional faces (e.g., Murphy & Isaacowitz, 2010), we predicted younger and older adults will differ in where they look at a dynamic social process like rapport.

Method

Observers

A total of 93 female observers participated in this study. Forty-six older adults (M_{age} = 70.98, *SD* = 6.47; range from 61-85) were recruited from a database maintained by the Lifespan Emotional Development lab; 85% were White, 4% Hispanic, 7% African American, and 4% described themselves as Other. Forty-seven younger adult participants (M_{age} = 19.63, *SD* = 1.50; ages 18-24) were recruited from the Northeastern University participant subject pool and

received course credit; 65% were White, 15% Asian American, 2% African American, 6% were Hispanic, 6% were East Asian, and 6% described themselves as Other.

All participants completed a series of background measures to ensure that both age groups were matched for cognitive ability and mood: Shipley vocabulary test (Zachary & Shipley, 1986), the digit span task from the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981), emotional mindset scale (EMS; Livingstone & Srivastava, in prep), Emotional Self-Efficacy Scale (ESES; Kirk, Schutte, & Hine, 2008), Positive and Negative Affective Scale (PANAS; Watson, Clark, & Tellegen; 1988), Life Orientation Test (LOT; Scheier & Carver, 1985), Midlife Sense of Control Scale (MIDI; Lachman & Weaver, 1998), Emotion Regulation Questionnaire (ERQ; Gross & John 2003), Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swan, 2003), Rosenbaum Near-Vision (Rosenbaum, 1984), Pelli-Robson Contrast Sensitivity (Pelli, Robson & Wilkins, 1988), and Snellen Visual Acuity (Hetherington, 1954). Older adults completed the Folstein Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) to screen for dementia.

Judgment Stimuli

The video clips developed by Bernieri and colleagues (Bernieri et al., 1996; Gillis et al., 1995) were digitized and formatted onto a DVD. Each of these 37 clips was extracted from longer conversations that were approximately 10 min in length; the 50 s used in each clip were taken from the second minute of the interaction. One video was removed because the conversation included a statement that was prejudiced against older people. Targets were opposite-sex pairs of high school students and college undergraduates having a discussion on a controversial topic.

Eye-Tracking

Gaze patterns were recorded at a rate of 60 Hz using an ASL (Applied Science Laboratories, Bedford, MA) Eye-Trac 6 Desktop Video Head Tracking eye-tracker and GazeTracker (EyeTellect, LLC, Charlottesville, VA) eye-tracking software. We obtained eye-tracking information for participants whose gaze was tracked for 75% or more of each trial; data for 14 older adults and 8 younger adults were excluded as a result of not having usable eye-tracking data. Fixation was defined as duration of viewing within a LookZone as a proportion of total fixation duration.

Previous research suggests that processing of face and body features occurs rapidly and possibly through a common neural network, and that emotion perception is facilitated when expressions from the face and body are congruent (de Gelder et al., 2010; Kret, Stekelenburg, Roelofs, & de Gelder, 2013). However, perceptual contributions from the body and from the face vary depending on the type of evaluation (e.g., stimuli with angry bodies are perceived as moving forward despite having fearful faces; App, Reed, & McIntosh, 2012). Although no research has been done on attentional differences to faces and bodies during dyadic interactions, we were interested in assessing whether attention to these features varied by age. LookZones, or areas of interest, were established over key areas in the video clips: each interactant's head and body (i.e., from the neck to the feet). These two areas of fixation were chosen because they were constantly present on the screen for the duration of the video (as opposed to gestures or other movements that varied per video). Participants were seated approximately 2 ft away from a computer monitor and their eye movements were calibrated before the practice session which consisted of two video clips that were not included in the analyses.

Judgment Task

After signing informed consent and completing the background measures, participants read the definition of rapport from Grahe and Bernieri (2002):

> *Rapport is a term used to describe the combination of qualities that emerge from an interaction. These interactions are characterized by such statements as "we really clicked" or "we experienced real chemistry". When you come away from a conversation that was 2 hours long and you feel invigorated, you have experienced an interaction high in rapport. Terms like engrossing, friendly, harmonious, involving, and worthwhile describe interactions high in rapport.*

Participants watched and rated two videos as practice, and 34 videos formed the experimental presentation. After each clip, participants verbally gave a rapport rating on an 8-point Likert scale (1 = no rapport; 8 = high rapport).

Analytic Approach for Lens Model

Criterion and cue measurement. The criterion employed was a composite of the two self-reports of rapport coming from each target in the video (Bernieri et al. 1996). Cue values were also provided by Bernieri et al. (1996) where a group of independent coders watched the target videos and established cue values at both the individual (e.g., number of gestures) and dyadic (e.g., proximity) levels. The 18 cues coded by independent raters were: Adaptor duration, Expressivity, Mutual gaze, Forward leans, Gestures (Male and Female), Mutual silence, Nervous behavior, Posture orientation, Proximity, Racial similarity, Regulators, Smiling, Synchrony, Attractiveness (Male, Female, and Both), and Similarity in appearance. Coded cues were not entirely orthogonal (we refer the reader to Bernieri et al., 1996 for inter-cue correlation matrices as well as details about coding procedures and a full description of the cues).

The set of 34 clips employed in this investigation was sampled from the set of 50 clips reported in Bernieri et al. (1996). Because the current study used a smaller sample of target videos, we obtained cue validity coefficients for this particular set of stimuli by determining the correlation of each cue value with the rapport criterion across our set of 34 video clips. Three cues (out of the 18 examined) correlated significantly with the rapport criterion ($p < .05$) and thus constituted the valid predictors of rapport within this fixed set of stimuli. The three valid cues to rapport were: Female gestures, Regulators, and Mutual silence. The cues of Synchrony, Proximity, and Forward lean had marginally significant correlations with the criterion ($p < .1$). It is worth noting that the cue validities across these two sets of stimuli were highly correlated, $r = .97$; Table 1 lists a comparison of cue validities between the current stimuli set at the original set.[1]

Judgment accuracy and cue utilization. In accordance with Brunswik's lens model procedures, judgments of rapport for each participant were correlated with the criterion to generate an accuracy score. Cue utilizations for each participant were generated by correlating judgments with cue values across the set of 34 clips. For example, for the cue of Female gestures, we determined for each participant the extent to which their judgments correlated with the amount of female gesturing that took place within the video clip. In this manner an individual cue utilization correlation was computed for each participant, and for each cue. Correlations are not distributed normally and thus typical parametric tests of significance employing them as raw data would not be appropriate. Therefore, all accuracy scores and cue utilization scores were subjected to Fisher's *z*-transformations to satisfy the distribution requirements for performing parametric tests of significance, but the original r values are reported here for ease of presentation (Rosenthal & Rosnow, 2008).

Results

Background Measures

Older and younger adults performed similarly on many of the cognitive and affective measures; see Table 2 for means and standard deviations. All older adults scored above a screening threshold on the Mini Mental State exam.

Judgment Accuracy

We operationalized *accuracy* as the correlation between judges' ratings and the targets self-reported rapport. An accuracy score was computed for each individual participant.[2] Accuracy scores across the 46 older adult perceivers ranged from -.07 to .55 (M = .24), and accuracy scores across the 47 younger adult perceivers ranged from -.09 to .53 (M = .24). There were no outliers. An independent samples t-test on z-transformed accuracy scores revealed no significant difference between older and younger adults in accuracy of judgments of rapport, $t(91) = -.01$, *ns*; see Table 3.

A single observer's judgment accuracy, across 34 trials, is considered above chance ($p < .05$) if the correlation coefficient exceeds .34. Ten of the older adults and 12 of the younger adults attained a level of accuracy that exceeded chance; an additional six older and five younger adults had accuracy scores that were marginally significant across the 34 trials (r = .33-.29; $p < .10$). These are comparable results to those in Bernieri et al. 1996, who reported the average accuracy across 45 young adult judges to be r = .19, with 14 perceivers achieving higher than chance accuracy.

Furthermore, we measured the composition of the highest and lowest accuracy perceivers (93 total perceivers: 23 in the top 25% and 23 in the bottom 25%) and found that older and younger adults were represented equally: $\chi^2(1) = .09$, *ns* (Top 25%: $N_{\text{Younger Adult}} = 13$, $N_{\text{Older Adult}} =$

10; Bottom 25%: $N_{\text{Younger Adult}} = 12$, $N_{\text{Older Adult}} = 11$). There were no differences between the highest and lowest scoring perceivers on any of the background measures.

Cue Utilization

Cue utilization pertains to the linear relationship of each observer's judgments to the appearance of an individual behavioral cue across the 34 videos; for example, did participants rate rapport higher when interactants sat closer? Utilization coefficients were calculated for each observer for each of the 18 cues. The individual coefficients were then averaged for each age group to summarize cue usage separately for older and younger adults.

Overall, cue utilizations individually were relatively weak, which is consistent with the notion that rapport has no single, identifying stereotypic cue that is universally accepted by all perceivers. What is notable is that the magnitude of the correlations found between rapport judgments and each of the assessed cues shows remarkable consistency across three independent samples of perceivers. For example, the significant utilization of Expressivity, Regulators, Proximity, and Synchrony in rapport judgments first reported by Bernieri et al. (1996) is replicated twice in Table 4 by the younger and older adult perceivers in this current study.

Younger and older adults demonstrated the same overall judgment policies; the pattern between the age groups is so similar that a correlation between younger and older adults across the 18 cues is almost one, $r(18) = .96$; see Table 4 for all Pearson *r* values. In both age groups, judgments of rapport correlated significantly with Expressivity (an invalid cue), and marginally with Regulators, Proximity, and Synchrony (valid cues). Because Regulators, Proximity, and Synchrony were valid cues, this means that observers used these cues appropriately; appropriate cue utilization is also reflected by judgments that were not related to several cues that were unrelated to rapport (Mutual gaze/Eye contact, Nervous behavior, Attractiveness (male, female,

and combined), Racial similarity, Smiling, Female attractiveness, Posture orientation, Male gestures, Adaptors, and Similarity in appearance). Incorrect utilization was demonstrated by judgments that correlated with one invalid cue, Expressivity, and were not correlated with three valid cues (Female gestures, Mutual silence, and Forward lean).

Despite having similar judgment policies, the strengths of some cue utilizations varied by age. Compared to older adults, the rapport judgments made by younger adults appeared to be more influenced by six invalid cues: Expressivity (p = .02), Mutual gaze (p = .03), Adaptors (i.e., physical touching behaviors like scratching and touching hair), (p < .01), Posture orientation (p = .00), Male attractiveness (p = .05), and Smiling (p = .001). The judgments of older adults, on the other hand, relied more heavily on one invalid cue, Male gestures (p = .03). Although younger adults' judgments were more strongly associated with Forward lean (p = .05), a valid cue, this actually shows inappropriate utilization; Forward lean was negatively associated with rapport, thus, older adults' using it less shows more appropriate utilization of that cue.

Consistency and Knowledge

In the lens model, *consistency* refers to the extent that a perceiver's judgments are not random and are explained by the cue variances across a set of stimuli. Thus, the consistency of each participant's judgment policy was the multiple R^2 attained for each perceiver by regressing the 18 behavioral cue values on to their judgments for each of the 34 video clips (Hammond, Hursch, & Todd, 1964). The analysis of consistencies revealed that the judgments of younger adults (M_c = .71, SD = .13) were more strongly predicted by the cues than were judgments made by older adults (M_c = .65, SD = .13), $t(91) = 2.37$, p = .02.

Another way to interpret the effectiveness of perceivers' judgment process is through *knowledge*, which is a level of agreement between cue validities and cue utilizations. Knowledge

refers to the extent to which perceivers can detect the importance of certain cues over others (Beal, Gillis, & Stewart, 1978). We computed a correlation coefficient between the cue utilization and cue validity across the 18 behavioral cues for each perceiver. Older adults had higher knowledge scores (M_k = .45, *SD* = .20) than younger adults (M_k = .36, *SD* = .45), which indicates that older adults were better able to discern the appropriateness of the cues in judging rapport, $t(91) = -1.86$, $p = .07$.

Eye-Tracking Analysis

Younger adults spent significantly more time looking at the targets' heads (*M* = 31%, *SD* = 9%) compared to older adults (*M* = 19%, *SD* = 12%), $t(72) = 4.68$, $p < .001$. Older adults, however, spent more time looking at the bodies of the interacting targets (*M* = 19%, *SD* = 11%) than younger adults (*M* = 10%, *SD* = 5%), $t(36.75) = -4.46$, $p < .001$. There was no age difference in time spent looking at the female versus male dyad partner.

We correlated the fixation variables with accuracy scores (*r*), and found that fixation to the heads of the targets was positively correlated with rapport judgment accuracy in younger adults $r(44) = .37$, $p = .01$, and negatively correlated with judgment accuracy of older adults $r(30) = -.40$, $p = .03$. Fixation to the bodies of the targets was not related to accuracy.

Discussion

The current study aimed to determine whether life experience through advanced age may improve judgmental accuracy of dyadic rapport. Bernieri and colleagues (1996) found that within young adult perceivers, rapport judgments correlated strongly enough with the valid behavioral cues to rapport to generate significant, if modest, levels of accuracy. We used a lens model approach in conjunction with eye-tracking to illustrate how this social perception skill varies by age in terms of both accuracy as well as differential attention to observable cues.

Lens Model

The lens model approach gave us several tools for measuring the judgment process of younger and older adults. We first discuss the accuracy results, and then focus on how the different age groups used various behavioral cues in their judgments.

Research Question 1) How do younger and older adults compare in making accurate judgments of rapport?

We found strikingly similar performances in accuracy, with both younger and older adults achieving equal levels of judging rapport. Although the current study is the first to compare different age groups in a rapport judgment task, we considered other social judgment paradigms from the aging literature to inform our hypotheses. Several possibilities could have arisen in the present context, which we will consider in detail.

On the one hand, age-related expertise, a known contributor to older adults' superior judgment skills by using more diagnostic information (Hess & Auman, 2001; Hess et al., 2005), could have suggested improved accuracy for older adults. While we thought this was a plausible hypothesis, for increased experience to lead to increased accuracy there would likely need to be some way that the perceiver receives feedback. Some researchers have argued that, because we rarely get outcome feedback on person perception judgments, we are unlikely to gain awareness of the accuracy or inaccuracy of our judgments over time (e.g., DePaulo & Pfiefer, 1986; Gillis et al., 1995). In other words, accurate social perception is difficult to improve.

Because rapport occurs in a social context that by definition involves positive feelings among interacting partners, and of which perceivers may discern how these feelings spontaneously unfold, we did not expect to find an age-decrement similar to typical emotion perception studies commonly found with static images (e.g., Ruffman et al., 2008) in the current

study. Our rationale was that rapport judgments rely on more dynamic sets of cues and may benefit more from experience, thereby counteracting any influence of age-related declines in the emotion perception component. And indeed, we did not find an age-decrement, suggesting that previous evidence for age-related declines in emotion perception when participants make judgments based on a single mode of sensory information (usually visual) might be tapping into the types of cognitive abilities that normally weaken with age. While those tasks are designed in such a way as to guarantee high experimental control, by doing so they are distanced from the kinds of situations in which people use social perceptual skills in everyday life, especially given that low levels of motivation promote age differences in processing social information (Hess et al. 2009). This further highlights the importance of using ecologically valid tasks in social perception research.

Studies on emotional judgments made from dynamic stimuli, which give access to multiple sensory channels, sometimes find age advantages (e.g., Murphy et al., 2010; Sze et al., 2012), while others find no age differences (e.g., Krendl & Ambady, 2010; Richter & Kunzmann, 2011). Our age-similarity result in the rapport judgment context is novel, and extends this line of social perception findings from dynamic displays in suggesting that the ability to decipher how well people are getting along may transcend perceptual differences due to age.

Research Question 2) Do people of different age groups use different cues when making their judgments?

We hypothesized that the judgment policies of older adults would be better than those of younger adults because previous studies found that older adults use more diagnostic information (Hess et al., 2005) pay attention to different information (Murphy & Isaacowitz, 2010) when

making social judgments. We did not observe this to happen here. The judgment policies of older adults were remarkably similar to those of younger adults. The rapport judgments of both age groups relied on three valid predictors of rapport (i.e., Regulators, Proximity, and Synchrony) as well as one invalid cue (i.e., Expressivity).

We found some age differences in that younger adults appeared to rely on *in*valid cues to a greater extent than did older adults. The lower cue utilizations for invalid cues by the older adults resulted in a corresponding decrease in their policy consistency and increase in knowledge; younger adults' judgments were better predicted by the cues measured, but older adults were better able to distinguish which cues were valid, and used them less. Thus, to get to the same accuracy, older adults must be relying on other cues or information (for example, audio cues, or interaction effects among cues) than the observable cues that were currently analyzed with the lens model.

A similar pattern of results has been observed before. In a study that compared training methods to improve accuracy; young adult perceivers that were given outcome feedback after each trial (i.e., told what the true level of rapport had been for the two people they just judged) displayed higher knowledge and lower consistency (Gillis et al., 1995). The current study replicates and extends this finding. The judgments of older adults may become more sophisticated over time, relying less on the invalid facial and expressivity cues related to emotional positivity and personal charisma and more on dynamic configural cues related to emergent attributes of the dyad (i.e., interpersonal coordination).

Although the target stimuli were filmed over 20 years prior to the current study, the accuracy and judgment policy results reported here with two age groups are similar to previously reported findings with this rapport judgment paradigm from a sample of younger adults (Bernieri

et al., 1996). This speaks to the robustness and sustained validity of classic tests of nonverbal behavior that employ visual social stimuli that are decades old (for a review see Hall & Bernieri, 2001).

The current study replicated another finding in that judgments of rapport are highly reliant on expressivity even though it was not a valid predictor of rapport. Expressivity seems to be a very salient cue to perceivers, possibly because it is very noticeable (e.g., someone with very animated facial expressions is considered high in expressivity). It has also been theorized to be an important aptitude that predicts positive successful social interactions (Friedman, Prince, Riggio, & DiMatteo, 1980; Friedman, Riggio, & Segall, 1980). Bernieri and colleagues (1996) posited an "expressivity-halo" that may impact interpersonal judgments similarly to how the well-known attractiveness halo works in personality perception (e.g., Dion, Berscheid, & Walster, 1972; but see also, Eagly, Ashmore, Makhijani, & Longo, 1991). In other words, judgments of rapport would be inaccurate to the extent they are influenced by trait characteristics of individuals (e.g., their charisma and expressiveness) rather than by the emergent properties of the interaction as a whole (e.g., synchrony).

Although cue utilization coefficients are suggestive, they merely reflect empirical relationships between judgments and stimuli and do not categorically explain the judgment process. Any correlation between judgment and cue value can be due to a statistical artifact (e.g., a third unknown variable) rather than a defined judgment process. This is why other measures are needed to supplement lens model analyses of interpersonal perception. For example, eye-tracking data can provide an assessment of the perceiver's allocation of attention during the judgment process. While eye-tracking cannot specifically map onto cue utilization, it provides a venue for investigating individual differences in attention to salient visual information.

Research Question 3) What information about the rapport judgment process can be obtained from eye-tracking?

We measured visual attention to the heads and bodies of two people engaging in a debate. Older adults spent more time looking at the bodies of the targets in the videos than younger adults. This suggests that even though older and younger adults reached the same conclusions, they paid attention to different sources of information along the way. In particular, the information younger adults use when making their judgments may be based in the face area, whereas older adults may pay more attention to body signals. Previous research shows that older adults avoid the eye region of the face in favor of other information (Murphy & Isaacowitz, 2010), but have no problem discerning gender of a face, suggesting that the perceptual shortcomings are limited to emotion perception tasks (Keightley et al., 2006).

Body context cues are a source of rich, dynamic information compared to the face, which may be more deceptive. In fact, Ekman and Friesen (1974) suggested that a leakage hierarchy exists where muscle movements in the face are not only more controllable than in our bodies but are also more easily monitored by the communicator. The eye region, for example, is well known to be important for decoding deception (Cook et al., 2012; DePaulo et al., 2003). Therefore, under self-presentational pressures a target's true internal state will be more accurately judged when the perceiver attends to the body not the face. Research on perceiving prejudice in others as well as detecting deception has supported this notion (Babad, Bernieri, & Rosenthal, 1989; Bond & DePaulo, 2006). Therefore, the skilled interpersonally sensitive perceiver would likely give more credence to what the targets' bodies are doing than what their faces appear to be signaling, especially within contexts where it is polite and proper to withhold negative sentiment from others.

In the emotion perception literature, researchers tend to attribute significant age differences to lower cognitive functioning in older age. However, there is no established link between age differences in general cognitive ability to age differences in emotion perception (Keightley et al., 2006). In our study, as well as other studies that use dynamic stimuli, there were no age differences in accuracy. It appears that when tasks give only static facial cues, there are big age differences, which is especially problematic given our finding that older adults tend to de-emphasize facial cues in favor of information given by the body. Our study would suggest that when you give older adults the chance to evaluate bodies and movement, they do just as well as younger adults. Thus, it may be the case that their life experiences and access to more information compensate for any lack of ability to discern the emotional qualities of a face, which may be analogous to older adults' compensatory strategy in recruiting additional brain regions to improve performance (e.g., Reuter-Lorenz et al., 2000).

Visual attention measured in this study was not meant to map on to the 18 cues measured in the lens model (e.g., it would be impossible to gauge attention to such cues as "Proximity" and "Nervous behavior"), but rather to provide an additional source of information regarding younger and older adults' judgment-making processes. Thus, although accuracy and cue utilization patterns did not differ by age, the age differences in consistency (i.e., how well judgments are predicted by the cues measured) as well as visual attention suggest older adults used different sources of information in judging rapport. The information gained from a lens model approach helped us understand perceivers' overall usage of cues when making judgments, while the novel addition of eye-tracking allowed us to isolate visual attention patterns during the judgment process of a dynamic interaction, and showed interesting age differences that extend previous research on aging and social perception to the specific context of rapport.

Limitations

Several limitations of the current study warrant note. The face processing literature often poses an own-age bias as an explanation for older adults' poorer performance in face processing (e.g., Lamont, Stewart-Williams, & Podd, 2005), though this bias has not always appeared with different tasks and stimuli sets (e.g., Ebner & Johnson, 2009). Whereas in the current study we found that older and younger adults had similar accuracy when rating the level of rapport of younger adult targets, it may be the case that older adults are even be better when evaluating people closer in age to themselves. Additionally, because the stimuli were over 20 years old, we attempted to minimize any distractions to cultural or historical factors (e.g., dress, conversation topics relevant to the time period, etc.) by presenting two videos as practice before the 34-video presentation. Because accuracy of our older and younger perceivers was similar to the previously published accuracy results, we do not feel that these aspects of the stimuli affected the rapport judgment. Additionally, due to an exclusively female group of perceivers, we were unable to calculate gender differences in the judgment process or preferentially looking at the targets in the videos. Thus, future research may benefit from the addition of mixed age and gender perceivers as well as targets.

Bernieri et al. (1996) cite boredom and fatigue over a 55-minute judgment task for their low average rating of rapport by younger adults (M = .19). Our stimulus presentation was shorter (approximately 35 minutes), which may account for why the average of both of our age groups was higher (M = .24). However, the authors cite a "lack of conceptual precision" between the targets' ratings of rapport (which were based on several dimensions) and observers' judgments on a single Likert scale; they acknowledge that "interactant rapport, as a relational variable between two or more individuals, may be too complex and difficult to perceive, assess, and

quantify with a single number" (p.123). In other words, rapport may be measured best when all three components of the interaction (positivity, mutual attention, and coordination) are judged by the perceiver.

Alternatively, the possibility remains that judgment policies vary much more as a function of the social environment and interpersonal context than due to individual differences in perceivers. Previous research indicates that judgment policies differed markedly across different contexts (i.e., adversarial versus cooperative; Bernieri et al., 1996). This would make sense to the extent that one's physical environment and social relations are stronger causal factors on one's moment-to-moment behavior than is their personality. Therefore, perceiver judgment policies for the same outcome (e.g., rapport) might differ more due to the social context (e.g., lovers on a couch, strangers in an elevator, a student-professor conversation during office hours, or a conversation with your auto-mechanic) than to the interpersonal sensitivity of the perceiver (see also Hall & Bernieri, 2001). The present findings suggest that individual differences of the perceiver, such as the social experience gained from age, are important factors in highlighting different strategies for making judgments; however, accurately determining dyadic rapport may be more reliant upon situational aspects of interpersonal context.

Conclusion

By using two different empirical methods, the present research sought to discover how age shapes interpersonal judgment processes. The Brunswikian approach allowed us to measure probabilistic relationships between interpersonal judgments and behavioral cues, and eye-tracking demonstrated age differences in visual attention. Younger and older adults had very similar levels of accuracy and overall judgment policies in their rapport judgments. However, age differences in looking patterns, strengths of cue utilizations, knowledge, and consistency

revealed differences in younger and older adults' approaches to judging dyadic rapport. Although older adults have typically performed worse on traditional laboratory emotion perception tasks, which use mostly static facial expressions (Ruffman et al., 2008), previous research using dynamic stimuli (e.g., Sze et al., 2012), demonstrate that older adults perform well in ecologically valid tasks. This study extends previous research in demonstrating that older adults benefit from access to multiple channels of sensory information, and further suggests that they tend to prefer body contextual cues to information from the face. Older adults have sophisticated knowledge of the kinds of information relevant to making interpersonal judgments, and may have learned to de-emphasize facial cues in tasks like this because of the obvious self-presentation that occurs in facial expressions. The judgment styles of older adults demonstrate how perceivers should not be influenced by a single cue, but rather take the whole picture into account. In summary, using multiple ecologically valid approaches to examine social perception skills helps illustrate the nuanced ways in which these skills are developed and maintained across the adult lifespan.

Notes

[1] Our objective here was not to determine the statistical significance of newly found cues, but simply report the extent to which the cue properties of our subset of 34 stimuli matched that of the original set of 50 from which they were taken (Bernieri et al., 1996). Therefore the issue of statistical significance in Table 1 is irrelevant, which is why they are not reported.

[2] We performed a Pearson correlation with accuracy scores (r values) and scores on all of the background measures. Accuracy was significantly correlated with scores on the LOT ($r(93) = -.25$, $p = .01$) and Suppression ($r(93) = .23$ $p = .03$) on the ERQ. Furthermore, we performed partial correlations between age and accuracy partialing out each of the background measures in turn, but the correlation between age and accuracy remained nonsignificant each time.

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Table 1. *Cue validities listed as Pearson r values*

	Current study 34 videos	Original studies 50 videos
Female gestures	**.58**	**.44**
Regulators/Back channel responses	**.47**	**.42**
Mutual silence	**-.34**	**-.36**
Synchrony	**.32**	**.31**
Forward lean	**-.30**	**-.28**
Proximity (mean of nose, chair, and knee distances)	**.29**	**.28**
Mutual gaze/Eye contact	.27	**.33**
Nervous behavior	-.22	-.26
Expressivity	.20	.17
Male attractiveness	.20	.13
Racial similarity	-.18	-.20
Smiling	-.08	-.03
Female attractiveness	.06	-.04
Posture orientation	-.05	-.09
Male gestures	.04	.17
Adaptors (duration)	-.02	-.08
Both attractiveness	.14	.05
Similarity in appearance	.11	. 04

Note. Original studies are Bernieri et al. (1996) p.117 and Bernieri and Gillis (1995) p.125. Cues in boldface were valid cues (i.e. significant and marginally significant correlations with the rapport criterion).

Table 2. *Means and standard deviations for background measures*

Measure	Younger Adults N= 47	Older Adults N = 46
Shipley Vocabulary***	65.40 (12.93)	81.55 (11.37)
EMS	48.72 (6.26)	50.15 (8.73)
ESES*	17.94 (2.83)	19.52 (3.58)
PANAS Positive***	29.81(7.35)	36.28(6.93)
PANAS Negative	15.43 (4.28)	13.5 (6.23)
LOT	21.62 (6.61)	23.54 (6.01)
MIDI	46.11 (5.36)	48.00 (8.36)
ERQ Reappriasal	32.23 (5.38)	33.37 (8.26)
ERQ Suppression	11.66 (4.41)	11.98 (5.78)
CESD	10.30 (8.22)	7.63 (7.35)
TIPI Extraversion	4.43 (1.54)	4.96 (1.68)
TIPI Agreeableness***	5.21 (1.06)	6.20 (1.02)
TIPI Conscientiousness*	5.17 (1.32)	5.80 (1.41)
TIPI Emotional Stability	5.13 (1.23)	5.64 (1.42)
TIPI Openness to Experiences	5.87 (0.89)	5.44 (1.23)
Digit Span Forward	7.72 (1.01)	7.39 (1.51)
Digit Span Backward	5.38 (1.47)	5.36 (1.60)
Snellen Visual Acuity ***	28.89 (26.97)	53.91 (36.59)
Rosenbaum Near Vision ***	21.63 (4.09)	75.00 (70.15)
Pelli-Robson Contrast ***	1.64 (0.10)	1.46 (0.19)

Note. * p<.05. ** p< .01. ***p<.001; significance levels for independent samples t–tests between age groups.

Table 3. *Accuracy in Pearson r values*

	Dyad composite score		Male target		Female target	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Younger adult perceivers N=47	.24(.13)	-.09 - .53	.19(.11)	-.13-.38	.22(.16)	-.17-.58
Older adult perceivers N=46	.24(.13)	-.04 - .55	.15(.12)	-.10-.45	.25(.14)	-.04-.55

Table 4. *Cue utilizations by age group*

	Younger adult N=47	Older adult N=46	Original study N=45[a]
Expressivity[†]	.48	.40	.48
Regulators	**.31**	**.32**	**.37**
Proximity	**.31**	**.26**	**.37**
Synchrony	**.29**	**.30**	**.34**
Racial similarity	-.19	-.21	-.21
Mutual gaze[†]	.17	.10	.15
Male gestures[†]	.14	.21	.12
Mutual silence	**-.14**	**-.15**	**-.10**
Female gestures	**.13**	**.12**	**.11**
Adaptors[†]	.09	-.01	.04
Nervous behavior	-.07	-.12	-.22
Posture orientation[†]	.06	-.03	-.03
Male attractiveness[†]	.05	.00	.13
Both attractiveness	.05	-.01	.18
Smiling[†]	.04	-.08	.39
Female attractiveness	.03	-.01	.16
Similarity in appearance	.02	.00	.04
Forward lean[†]	**.00**	**-.07**	**.08**

Note. Cues in boldface were valid cues (i.e., significant and marginally significant correlations with the rapport criterion).
[a.]Perceivers in Bernieri et al. (1996) were 45 undergraduates, 62% female. Cue utilizations are reported on p. 119

† indicates significant difference between age groups.