Empathy in intergenerational emotion communication: Effects of actor age, affiliative context and perceiver's age on empathic reactions to facial expressions

Dissertation

zur Erlangung des akademischen Grades
Doctor rerum naturalium (Dr. rer. nat.)
im Fach Psychologie

eingereicht an der
Lebenswissenschaftlichen Fakultät der
Humboldt-Universität zu Berlin

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Datum der Promotion: 19. Dezember 2014

Hühnel, I. (2014). *Empathy in intergenerational emotion communication: Effects of actor age, affiliative context and perceiver's age on empathic reactions to facial expressions.* Dissertation zur Erlangung des akademischen Grades Doctor rerum naturalium im Fach Psychologie. Berlin: Humboldt-Universität zu Berlin.

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Contents

Abstract

Positive interactions and social bonds between younger and older adults seem to be at risk as previous research suggests a lack of empathy to the elderly. This dissertation set out to investigate empathic reactions to emotional facial expressions of the elderly. There are a number of elements that might potentially be accountable for the reduction or absence of empathy by younger adults: This work focused on age-related changes of older faces, stereotype expectations and affiliative context as moderators of empathy and measured their effects on a cognitive and an affective dimension. A second goal was to assess empathic capabilities of the elderly themselves on the same dimensions. Three studies were conducted, and their results are reported in three individual research manuscripts. Study 1 focused on the effect of wrinkles and stereotypes on decoding accuracy and facial mimicry of emotional facial expressions. It revealed that wrinkles and stereotypes have an impact on decoding accuracy, however facial mimicry reactions to the emotion expressions of older adults were present regardless of those decoding biases. Study 2 focused on the affiliative context of interactions between younger and older adults, and suggested that the type of emotion display (happy vs. angry) as well as the observer's relationship to the expresser (in-group vs. out-group member) impacted on facial mimicry in real-life interactions. It revealed that mimicry of happy expressions of older adults was present during the two emotional events (happy and angry). However, mimicry of younger compared to older adults was stronger in the happy event, whereas no difference occurred in mimicry in the angry event. Study 3 investigated empathic capabilities of older compared to younger adults and found no differences in affective empathy, although decoding accuracy was reduced for some emotions in the older participant sample. Collectively, these results indicate that affective empathic responding via facial mimicry toward the elderly is essentially intact regardless of reduced decoding accuracy for older faces and affiliative context. They further indicate that older adults possess the same affective capabilities as younger adults. In sum, this work provides a more positive outlook for intergenerational interactions than previously suggested.

Zusammenfassung

Positive Interaktionen und soziale Bindungen zwischen jüngeren und älteren Erwachsenen scheinen gefährdet, da Untersuchungen einen Mangel an Einfühlungsvermögen gegenüber älteren Menschen nahelegen. Diese Dissertation untersuchte daher empathische Reaktionen auf emotionale Gesichtsausdrücke älterer Menschen. Eine Reihe von Faktoren könnte für die Verringerung oder Abwesenheit von Empathie von jüngere Erwachsenen verantwortlich sein: Die vorliegende Arbeit konzentrierte sich auf altersbedingte Veränderungen von Gesichtern, stereotype Erwartungen und affiliativen Kontext als Moderatoren von Empathie und maß ihre Effekte auf kognitive und affektive Empathie. Ein zweites Ziel war es empathische Fähigkeiten älterer Menschen hinsichtlich derselben Dimensionen zu beurteilen. Es wurden daher drei Studien durchgeführt und in drei Forschungsmanuskripten dargelegt. Studie 1 betrachtete die Wirkung von Gesichtsfalten und Stereotypen auf die Dekodierung und Imitation von emotionalen Gesichtsausdrücken und fand heraus, dass Imitationsreaktionen für ältere Erwachsene auftraten, trotz des Einflusses von Falten und Stereotypen auf die Dekodierung. Studie 2 untersuchte den Einfluss des affiliativen Kontextes in Interaktionen zwischen jungen und alten Erwachsenen und nahm an, dass der Emotionsausdruck per se (freudig vs. ärgerlich) sowie die Beziehung zwischen Beobachter und Darsteller (Eigengruppe vs. Fremdgruppe) sich auf Gesichtsmimikry in lebensechten Interaktionen auswirken. Es konnte gezeigt werden, dass Mimikry für freudige Ausdrücke älterer Erwachsener während der beiden emotionalen Ereignisse (freudig vs. ärgerlich) stattfand. Allerdings war Mimikry im freudigen Ereignis stärker gegenüber jungen Erwachsenen im Vergleich zu älteren Erwachsenen ausgeprägt, wohingegen keine Unterschiede in Mimikry im ärgerlichen Ereignis auftraten. Studie 3 untersuchte empathischen Fähigkeiten von älteren im Vergleich zu jüngeren Erwachsenen und fand keine Unterschiede in der affektiven Empathie, obwohl die Dekodierung einiger Emotionen bei den älteren Teilnehmern reduziert war. Insgesamt zeigen die Ergebnisse, dass affektive empathische Reaktionen gegenüber älteren Menschen unabhängig von der reduzierten Akkuratheit der Emotionseinschätzung sowie vom affiliativen Kontext im Wesentlichen intakt sind und dass ältere Erwachsene die über gleichen affektiven Fähigkeiten verfügen. Somit liefert diese Arbeit einen positiveren Ausblick für intergenerationale Interaktionen als bisher gedacht.

List of original manuscripts

This dissertation is based on the following original research articles:

Hühnel, I., & Hess, U. (submitted for publication). Facing the elderly: The impact of wrinkles and stereotypes on decoding accuracy and facial mimicry of emotional facial expressions.

Kuszynski, J., Hühnel, I., Hess, U., & Asendorpf, J. B. (submitted for publication). Facial mimicry of emotional expressions in real-life intergenerational interactions.

Hühnel, I., Fölster, M., Werheid, K., & Hess, U. (2014). Empathic reactions of younger and older adults: No age related decline in affective responding. *Journal of Experimental Social Psychology*, *50*, 136–143. doi:10.1016/j.jesp.2013.09.011

Preface

Effective interpersonal communication requires that individuals react empathically to the nonverbal expressions of emotions in others. It is recognized that empathy is important for all kinds of social interactions, for example between a mother and a child, between partners as well as larger social groups, and it is a crucial element for positive social behavior (Hoffman, 2008). Whilst industrialized societies increasingly recognize the importance of empathy in general, the aged part of the populations might be subject to a reduction of empathy toward them, as the decoding of elderly facial expressions is impaired. Reduced empathic responding can impact the quality of social interactions (Chartrand & Bargh, 1999; Hess, Philippot, & Blairy, 1999). Further, the deprivation of empathy and therefore the reduced feeling of belonging can have deleterious consequences for well-being and health (Baumeister & Leary, 1995). Although many industrialized nations are experiencing an aging population, research has not yet systematically addressed this issue of empathy to the elderly. In consequence, many interesting questions arise which are going to be addressed in the following.

Although psychologists have explored the emotion understanding abilities of the elderly (for reviews see Isaacowitz & Stanley, 2011; Ruffman, Henry, Livingstone, & Phillips, 2008), only a relatively small amount of research has focused on how emotions *shown* in elderly faces are decoded and responded to in terms of empathy. This research gap seems peculiar as communication is a two-way process and an older person, just as every other person, takes two roles in this process. On the one hand they are the observers of communication signals. On the other hand they are also an expresser of such signals. Yet, previous research has primarily focused on the elderly in the role of the observer, and hardly in the role of the expresser. The aim of this dissertation was to minimize this research gap. Specifically, it aimed to examine how emotional facial expressions of the elderly are understood and responded to in terms of empathy.

Additionally, impaired understanding and empathy of the elderly themselves might contribute to interaction problems between younger and older adults. For example, if younger adults feel misunderstood by older adults, they might become less motivated to interact in the future. As the empathic abilities of the elderly have so far mainly been

addressed in terms of emotion understanding, the second aim of this dissertation was to extend research on empathic responses of the elderly themselves.

In the coming sections, I therefore provide an overview of empathy as well as its specific measures employed in this work, and I outline why empathy in the context of the elderly might be reduced. Deducted from this overview, I present my research questions. The subsequent sections summarize the individual manuscripts, which addressed the research questions and thus comprise the empirical part of this dissertation. Finally, I integrate the findings of all manuscripts and finish the dissertation with implications, ideas for future research and concluding remarks on empathy in intergenerational interactions.

Empathy

Empathy could simply be described as feeling what another person feels (Hoffman, 1984), yet it has been defined in many different ways (Decety & Jackson, 2004; Eisenberg & Strayer, 1987). What most definitions have in common, however, is that empathy refers to the experiencing of another person's affective or psychological state and that it has both affective and cognitive components.

For the purpose of this dissertation, I will refer to Decety and Jackson (2004), who define empathy as the ability to understand and experience the emotional messages of others. Thus, it is typically separated into two components (Lamm, Batson, & Decety, 2007): (1) *cognitive empathy*, the ability to accurately infer another person's feelings (Ickes, 1993) and (2) *affective empathy*, a process in which the perception of another's emotional state generates a matching reaction in the perceiver (De Waal, 2008).

Just as there are numerous definitions of empathy, a variety of measures have been used to study it (cf. Decety & Jackson, 2004; Eisenberg & Fabes, 1990). Within this dissertation, which focuses on emotional facial expressions, I will employ two measures of empathy: (a) the decoding accuracy of emotional facial expressions, which is related to the cognitive component, and (b) the imitation of emotional facial expressions, which is related to the affective component of empathy.

Decoding and imitation of emotional facial expressions as indicators of empathy

Facial expressions communicate another's emotional state and they therefore help us to adjust our behavior toward others (Niedenthal & Brauer, 2012). Thus, understanding the facial expressions of others is an important factor in the empathic process (Ickes, 1997). Facial expressions are commonly organized into six universally recognized categories (happiness, sadness, disgust, anger, fear and surprise; Ekman & Friesen, 2003) that are similar across different backgrounds and cultures (Ekman & Friesen, 2003). The decoding of these expressions can be used as a measure of cognitive empathy. This simply requires the explicit labeling or rating of expressions along the emotion categories.

Affective empathy on the other hand refers to a more automatic process (Preston & de Waal, 2002). One part of the empathic process is mimicry (Hoffman, 1984; Walter, 2012 Yabar & Hess, 2007), the tendency to imitate vocal, facial, and postural expressions of

others (Hess et al., 1999). It improves the quality of interactions (Chartrand & Bargh, 1999; Lakin, Jefferis, Cheng, & Chartrand, 2003) and specifically, it increases perceived similarity, liking, smoothness of the interaction, and prosocial behavior (cf. Hess et al., 1999; Lakin & Chartrand, 2003; Yabar & Hess, 2007). In particular *facial mimicry*, the congruent facial response to the observed expression of others (Dimberg, 1982), is a highly accessible index for empathy (Eisenberg & Fabes, 1990). Those responses are typically assessed by electromyography (EMG); electrodes attached to the observer's face collect the muscle activity during the observation of emotional facial expressions (e.g., Dimberg, 1982; Weyers, Mühlberger, Hefele & Pauli, 2006). Another common method is the coding of facial expressions based on the Facial Action Coding System (FACS; Ekman & Friesen, 1976), which systematically describes visible facial muscle movements called Action Units. FACS can be blindly coded by expert coders (e.g., Sato & Yoshikawa, 2007) or automatically coded using programs such as the Computer Expression Recognition Toolbox (CERT; Littlewort et al., 2011).

Typically, mimicry has been considered as a matched-motor response in terms of automatic imitation of nonverbal displays, such as discrete muscle movements (Chartrand & Bargh, 1999; Lakin, Jefferis, Cheng, & Chartrand, 2003; see Hess & Fischer, 2013 for review). Thus, smiling toward a smiling face is considered an automatic matched-motor response. However, according to Hess and Fischer (2013, 2014) this view does not hold for all kinds of mimicry. Rather, there are two types of mimicry: *behavioral mimicry*, the imitation of non-emotional behavioral movements or postures and *emotional mimicry*, the imitation of emotional facial expressions of others. Only the latter is considered to be fundamentally meaningful, because the imitation of emotional facial expressions involves the interpretation of another person's intentions, appraisals and dispositions (Hess & Fischer, 2013, 2014). Thus, mimicry of a smile is not understood as the mere imitation of muscle movements, but rather as the imitation of intentions behind of the emotion expression.

Further, Hess and colleagues (Hess & Fischer, 2013, 2014; Hess, Houde & Fischer, 2014) proposed that emotional mimicry is a means to communicate to others that we know how they feel. It is argued that it functions as a social regulator; 'emotionally mimicking others can create social warmth, but also social cold when we do not mimic' (Hess et al., 2014, p. 101). This highlights the role of emotional mimicry for creating social bonds, as its

absence can signal exclusion or rejection. Note that in the following I will use the terms facial mimicry and emotional mimicry interchangeably, referring to the imitation of emotional signals.

Modulation of empathy in the context of the elderly

Affiliative context

Creating social bonds with other individuals is a fundamental human need (Baumeister & Leary, 1995). People readily form friendships and other forms of attachment with others and they seek emotional closeness and harmony. Empathy, in particular mimicry, serves this affiliation need as it smoothens interactions and communicates understanding (Hess & Fischer, 2013), and thereby facilitates mutual involvement and emotional closeness (Hatfield, Cacioppo & Rapson, 1992).

However, mimicry has been found to vary with the context of the interaction and the nature of the relation between interaction partners (Hess & Fischer, 2013). Facial mimicry mainly occurs if a positive or at least neutral relation exists between interaction partners and if they perceive some similarity between themselves (Hess, 2001). For example, a competitive versus cooperative context can cause a decrease or absence of mimicry (Lanzetta & Englis, 1989; Weyers, Mühlberger, Kund, Hess, & Pauli, 2009) and people preferably mimic persons they like (McIntosh, 2006). These are usually members of their social in-group rather than their out-group (Bourgeois & Hess, 2008; Van der Schalk et al., 2011; Yabar, Johnston, Miles, & Peace, 2006). More generally, a negative attitude toward a person also reduces or inhibits facial mimicry (Likowski, Mühlberger, Seibt, Pauli & Weyers, 2008).

Besides the relational context between interaction partners, facial mimicry also depends on the nature of the emotional display (Hess & Fischer, 2013, 2014). Whereas some emotional expressions signal positive intentions, others signal attack or distancing. For example, smiling generally signals approach intentions, frowning signals negative intentions, and crying signals powerlessness (Hess & Fischer, 2014).

In sum, people only mimic, if the relationship and the emotional signal are perceived to be affiliative and if people are motivated to affiliate. Considering the affiliative context

between younger and older adults, there are a number of reasons why young adults might not respond empathically to emotions of the elderly.

A person's age, in addition to gender and race, is effortlessly noticeable when encountering them (Nelson, 2005). Due to this social categorization, younger adults might perceive the elderly as out-group members (Cuddy, Norton, & Fiske, 2005) and findings show that elderly people are commonly devalued (Zebrowitz & Montepare, 2000), highly stereotyped (Cuddy, & Fiske, 2002; Kite & Johnson, 1988; Kite, Stockdale, Whitley, & Johnson, 2005) and subject to negative attitudes (Kite et al., 2005). As outlined above, negative attitudes about the elderly and their perception as out-group members are likely to reduce the affiliative link necessary for facial mimicry. Therefore, empathic responding and as a consequence positive interactions between younger and older adults (Chartrand & Bargh, 1999; Hess et al., 1999) as well as older adults' well-being and health (Baumeister & Leary, 1995) could be at risk.

Biased perception of older adults' facial expressions

As previously stated, accurate decoding of facial expressions is relevant to understanding another person's feelings. In turn, biased decoding of facial expressions is another potential element that might reduce empathy for the elderly in social interactions. In fact, research shows that emotional expressions in older faces are perceived differently compared to emotional expression in younger faces, often at the disadvantage of older persons (Borod et al., 2004; Malatesta, Izard, Culver, & Nicolich, 1987; Riediger, Voelkle, Ebner, & Lindenberger, 2011). According to previous literature, at least two sources of biases might account for these findings: Age-related changes in the face (e.g., Hess, Adams Jr., Simard, Stevenson, & Kleck, 2012) and stereotypic beliefs (e.g., Kang & Chasteen, 2009; Fölster, Hess & Werheid, 2014).

People rely on physical cues such as gray or white hair and wrinkled skin to categorize other people based on age (e.g., Burt & Perrett, 1995). Moreover, age-related changes in the face can influence low level perception of emotion expressions. Specifically, the wrinkles and folds in the face can reduce visual clarity (Ebner, 2008; Ebner, He, & Johnson, 2011) and therefore bias the decoding accuracy of emotion expressions. For example, emotional expressions in older compared to younger faces were rated with lower

intensity on target emotions and higher intensity on non-target emotions (Hess et al., 2012). Therefore age-related facial changes are likely to influence empathy to the elderly.

Social categorization via physical appearance can furthermore favor ageism and stereotyping. In fact, physical appearance is an important component of many stereotypic beliefs (see Fiske, 1998, for a review) and the elderly have been found to be a highly stereotyped social group (e.g., Cuddy & Fiske, 2002; Kite et al., 2005). Previous literature shows that stereotypic expectations about a person or a social group can influence emotion expectations (Tiedens, Ellsworth, & Mesquita, 2000) and emotion perception (Hugenberg & Bodenhausen, 2003, 2004). Therefore, elderly stereotypes are highly likely to bias the decoding of facial expressions in older faces.

Empathy in old age

Effective intergenerational interaction further requires that the older adults themselves empathize with others. Studies assessing the cognitive component of empathy however suggest reduced capabilities of older adults to infer the meaning of emotional facial expressions in others compared to younger adults (see Isaacowitz & Stanley, 2011; Ruffman et al., 2008, for reviews). Thus a person, who experiences a lack of empathy toward himself or herself by an older interaction partner, might experience the interaction as negative, which could in turn reduce the liking of older adults. On the other hand, evidence regarding affective empathy of the elderly is scarce. One study assessing self-reports found reduced cognitive empathy of older compared to younger adults, but no differences in affective empathy (Bailey, Henry, & von Hippel, 2008). Regarding affective empathy these findings are encouraging, however a performance based assessment of affective empathy would substantiate them.

Stimulus sociality

Studies assessing mimicry to emotional facial expressions have mostly employed still photos or videos of such expressions (Hess & Fischer, 2013, 2014). In contrast, studies of facial mimicry in life interactions are rare. However, the level of stimulus sociality influences empathic reactions. For example, perceived emotion intensity (Rymarczyk, Biele, Grabowska, & Majczynski, 2011; Weyers et al., 2006) and facial mimicry

(Rymarczyk et al., 2011; Sato, Fujimura, & Suzuki, 2008; Weyers et al., 2006) are enhanced for dynamic compared to static expressions. Further, as still photos and videos provide little or no context information, it is questionable whether congruent facial reactions to the observed expressions truly reflect the imitation of emotion signals (Hess & Fischer, 2014). Further, perceiving a stranger in a photo or video could provide more opportunity for categorical judgment than meeting a person in real life. Yet, the effects of affiliative context on emotional mimicry should have more impact in real life interactions, in contrast to observing facial expressions of a non-respondent person in a photo or video (Fischer, Becker, & Veenstra, 2012).

Moreover, the level of stimulus sociality modulates mimicry of antagonistic emotions, i.e. emotions that are signaling attack or negative intensions. To illustrate, anger and disgust were found to be mimicked when presented in photos or videos (see Hess & Fischer, 2013), but mimicry of antagonistic facial expressions was reduced or absent in real life interactions (Fischer et al., 2012; Hess & Bourgeois, 2010).

These issues should be considered when assessing empathic reactions in the context of the elderly. For example, observing emotional expressions of older adults in still photos, in which facial features and social group membership are the only contextual cues available, should provide great opportunity for wrinkles, folds and elderly stereotypes to impact on empathic reactions. Nonetheless, it is relevant to ask whether effects such as these would also occur in real life interactions. In another vein, the assessment of empathic reactions in the elderly population should take into account that older adults tend to have more experience with real life expressions than with static images in computer-based experiments. In sum, the assessment of empathy in the context of the elderly should employ varying levels of stimulus sociality in order to obtain valid and reliable results.

Research questions

The objective of this dissertation was to deliver empirical evidence on the state of empathy in intergenerational emotion communication, specifically between younger adults (aged 35 years and below) and older adults (aged 65 years and above). The overview in the previous sections suggests that the empathic reactions necessary for harmonious interactions and the creation of social bonds between younger and older adults might be

impeded. As I have outlined, there are a number of effects that might potentially be accountable for a reduction or absence of empathy. At this point of the dissertation the effects are hypothetical. To fill these gaps in the literature and specifically to assess each of those elements regarding their role in empathic responding to emotional facial expressions was the aim of this work. It was guided by the following research questions:

1) Can the reduction of decoding accuracy for older compared to younger faces be attributed to biased perception caused by wrinkles and folds of older faces?
2) Can this reduction also be attributed to biased perception due to stereotypes about older adults?
3) Does the reduction of decoding accuracy affect empathic responding in terms of facial mimicry to older faces?
4) Does the affiliative context such as the type of emotion display and the social group membership of expresser and observer influence facial mimicry?
5) Do older adults themselves show empathic responding via facial mimicry to emotional expressions, even if their emotion decoding abilities might be impaired compared to younger adults?
6) Does the level of stimulus sociality affect the outcomes of empathy in emotion communication between younger and older adults?

Empirical parts of the dissertation

To address those research questions, three studies were conducted at Humboldt-Universität zu Berlin between November 2011 and November 2013 in collaboration with my co-authors as part of the research project "Empathic reactions to the emotional facial expressions of the elderly", which was funded by the German Research Foundation. All studies employed emotional facial expressions of younger and older adults and examined at least one of the two proposed measures of empathy: decoding accuracy and facial mimicry. Study 1 and Study 2 investigated empathic reactions of younger adults (aged 17 – 35) to expressions of the elderly. Study 3 compared empathic reactions of older (aged 62 – 85) and younger adults (aged 18 – 30). Table 1 summarizes the methods and foci of the three studies. In the following three sections, I will give a brief overview of each manuscript.

Table 1
Overview of methods and foci of the three studies

	Participants	Stimuli	Emotions	Dependent variables	Focus
Study 1	Young adults	Still photos of younger and older faces	Happiness Sadness Anger Disgust	Decoding accuracy Facial mimicry via EMG	Perceptual biases due to wrinkles, folds and stereotypes
Study 2	Young adults	Life interactions with younger and older actors (confederates)	Happiness Anger	Facial mimicry automatically coded via CERT	Affiliativeness of emotion display and group membership
Study 3	Young adults Older adults	Videos of spontaneous facial expressions of younger and older actors	Happiness Sadness Anger Disgust	Decoding accuracy Facial mimicry via EMG	Age-related difference in empathic reactions

Manuscript 1: "Facing the elderly: The impact of wrinkles and stereotypical beliefs on decoding accuracy and facial mimicry of emotional facial expressions" by Hühnel & Hess (submitted for publication)

This first set of studies aimed to investigate whether there are biases in empathic responses to emotional facial expressions of the elderly, as proposed in the preceding parts of this dissertation. Previous research indicated that expressions in the elderly faces are decoded less accurately compared to younger faces (Borod et al., 2004; Riediger et al., 2011, Hess et al., 2012). We aimed to follow up this research by investigating possible causes for this impaired decoding. Furthermore we were interested in how impaired decoding would affect empathic responding via facial mimicry. Specifically, we suggested that two sources of bias would be responsible for the reduced decoding of elderly faces. On the one hand, based on similar research by Hess et al. (2012), we expected that wrinkles and folds would reduce the signal clarity of elderly faces, thus rendering elderly faces more ambiguous. On the other hand, we also expected that stereotyped beliefs about the emotions expressions of older people would have an impact on decoding accuracy of older compared to younger faces. Based on a prominent model of stereotypes, the Stereotype Content Model by Cuddy, Fiske, & Glick (2008) older adults are perceived as highly warm, but incompetent. In terms of emotion expectations, older individuals would therefore express to a lesser degree "agentic" emotions such as anger or disgust, which are related to

competence, and more sadness, which is related to incompetence, and more happiness, which is associated with warmth and affiliation.

The first study of this manuscript set out to confirm these expectations. The second study aimed at replicating these effects, and moreover at investigating the impact of these biases on the empathic responding indexed by facial mimicry. We dissociated the proposed biases by choosing two different presentation times for the expressions. We chose 4 seconds for the first condition, as it provides ample time for stereotype knowledge to be activated and applied to the judgment of the expressions. For the second condition we chose 33 ms (unmasked), which is the shortest presentation time that is reliably supraliminal, thus provides sufficient time for emotion perception. Although stereotypes might also be activated in this condition, we assumed that the short presentation would limit resources to apply the stereotype knowledge to the emotion expressions (Gilbert & Hixon, 1991).

In both studies, we found that facial expressions of older compared to younger faces were systematically rated as more ambiguous when presentation time was short, suggesting that wrinkles and folds reduce the signal clarity of older adults facial expressions. However, when participants had time to elaborate, they were more likely to rate the expressions in line with stereotypical expectations. That is, older faces were rated lower in intensity for anger and disgust and higher intensity for sadness and happiness, compared to younger faces. These results were the first to empirically demonstrate the impact of both wrinkles and stereotypes about the elderly on observer's ratings in one study.

Regarding empathic responding we expected that stereotypes but not wrinkles and folds (Hühnel, Fölster, Werheid & Hess, 2014) would impede facial mimicry of older compared to younger faces. Therefore in the 33 ms condition we expected that mimicry would not differ for younger and older faces. In the 4 seconds condition, by contrast, we expected that mimicry responses would be more pronounced in the direction of stereotype expectations.

We found that expression of happiness and sadness were mimicked independent of face age and stimulus duration, suggesting that older happy and sad faces are mimicked regardless of wrinkles, folds and stereotypes. We found no mimicry for disgust in general, and no mimicry of young angry faces during short presentation, while anger mimicry of older faces was always present. Thus older faces were mimicked regardless of wrinkles and

stereotypes. Yet, as frowning in response to a stimulus can also reflect other processes such as effort, concentration or bewilderment and as antagonistic expressions such as anger would oppose the assumption of mimicry to facilitate affiliation, our conclusion regarding anger was tentative. Overall, these findings suggested that although wrinkles and stereotypes impact on the understanding of the elderly's emotional states, young adults are able to clearly show particularly those mimicry responses to the elderly that facilitate positive interactions and increase social warmth.

Manuscript 2: "Facial mimicry of emotional expressions in real-life intergenerational interactions" by Kuszynski, Hühnel, Hess & Asendorpf (submitted for publication)

The second part of the dissertation looked at empathy in face-to-face interactions between younger and older adults in order to investigate whether affiliative context plays a role for emotional mimicry. Firstly, we assumed that smiling expressions would be mimicked, whereas angry expressions would not be mimicked, because only the former signals affiliative intentions (Hess & Fischer, 2013, 2014). Secondly, we assumed that mimicry of smiling expressions would differ depending on whether it is shown by a member of the own age group or an elderly person, i.e. a member of a social out-group for young adults (Cuddy et al., 2005).

To these ends, young adults were invited to interact with an elderly person or a person of the same age who recounted an emotional (happy or angry) event. The expressers of the emotional events were confederates to the experiment and trained to recount the story of a surprise visit of an old friend (happy event) and the story of a negative experience with the local public transportation system (angry event). Each participant interacted with either one older confederate (aged 72 – 86 years) or one younger confederate (aged 20 – 25 years) of the same sex. The facial emotion expressions of both the expresser and the observer were recorded and automatically coded using the Computer Expression Recognition Toolbox (CERT) in order to assess emotional mimicry toward the expresser. We further asked participants to rate their own emotional state before and after the interaction, as well as the emotional state of the expresser.

As manipulation checks we analyzed whether the confederates in fact displayed the desired emotion expressions and how the participants perceived those expressions. The automatic coding of the facial expressions revealed that confederates displayed more happy expressions than angry expressions during both the happy and angry event. The participants' ratings revealed similar results, such that confederates were rated higher in happiness than anger in both the happy and the angry event. Further, compared to the baseline participants felt more cheerful after both the happy and the angry interaction, but no change in irritation occurred. The finding that anger expressions of the confederate in the angry event were detected and perceived to a lesser degree than happy expressions posed a problem to our initial hypothesis that anger would not be mimicked. Yet, we were interested to learn whether the few anger expressions that were shown, were indeed not mimicked. In fact they were not. However, given this floor effect, we could not make conclusions regarding the mimicry of anger expressions in real-life interactions in general, and regarding intergenerational interactions in particular. Instead, we were able to focus on happiness expressions in the happy as well as the angry event. Here we found mimicry of the confederates during both the happy and angry event. Moreover, there was more mimicry of younger compared to older confederates in the happy event, but no difference occurred in happiness mimicry of the confederates in the angry event.

In sum, the results suggested that happiness is readily mimicked, as it is an affiliative emotion, which signals bonding and understanding (Hess & Fischer, 2013, 2014). However, they also suggested that the elderly are not always mimicked to the same extend as persons from the same age group. Yet, the interesting finding that mimicry of happiness expressions in the angry event did not differ for younger and older confederates, might suggest that young adults make greater effort to mimic affiliative expressions of the elderly in negatively valenced situations in order to signal understanding and sympathy. At last, studying mimicry of the elderly in face-to-face interaction further extended mimicry findings based on stimuli with lower sociability, such as still photos (Hühnel & Hess, submitted for publication) or dynamic expressions (Hühnel et al., 2014).

Manuscript 3: “Empathic reactions of younger and older adults: No age related decline in affective responding” by Hühnel, Fölster, Werheid & Hess (2014)

The previous manuscripts have looked at empathic reactions of young adults to the emotion expressions of the elderly. In the third part, we aimed to examine the empathic capabilities of the elderly themselves. Based on previous research (see Isaacowitz & Stanley, 2011; Ruffman et al., 2008, for reviews), we suggested that older adults’ cognitive empathy would be reduced compared to younger adults. However, as empathy also consists of an affective component (e.g., Lamm et al., 2007), we wanted to provide a more complete picture of how older adults differ from younger adults in their ability to empathize with others. Therefore, we measured decoding accuracy of emotional expressions as an indicator of cognitive empathic capabilities as well as facial mimicry toward these expressions as an indicator of affective empathy and compared the results of younger and older adults. Furthermore, previously found age-related differences in decoding accuracy of emotion might actually be due to the use of static images (cf. Isaacowitz & Stanley, 2011). Therefore we wanted to employ an ecological approach and used videos of spontaneous facial expressions of happiness, anger, sadness and disgust, which were similar to natural emotion expressions that are encountered in real life. We presented these to 39 younger and 39 older women.

We did not expect impaired affective responding to emotional expressions in old age, based on the findings that implicit automatic processes in contrast to controlled processes are less affected by aging (Ruffman, Ng, & Jenkin, 2009), and that emotional information becomes more salient in older age (Carstensen, Fung, & Charles, 2003). Our results revealed that cognitive empathy of older vs. younger adults was reduced for expressions of happiness and sadness, thus partially replicating previous studies (Ruffman et al., 2008). Affective empathy however was not reduced for older adults, as older adults mimicked all emotion expressions they were presented. On a side note, facial mimicry reactions for younger and older actors were essentially the same. We concluded that empathic reactions of older adults might not be as affected as findings solely based on decoding accuracy had suggested.

Discussion

This dissertation set out to investigate empathic reactions in the context of the elderly, as previous research suggested a lack or absence of the empathy to emotional facial expressions of older adults. A second goal was to assess empathic capabilities of the elderly themselves. A number of elements responsible for the lack of empathy had been proposed and subsequently examined in three studies. Table 2 gives an overview of the outcomes of all three studies. In what follows, I will give a summary and conclusion on the state of empathy in intergenerational emotion communication, discuss those findings in light of the current literature and highlight implications for research as well as everyday life.

Table 2
Overview of results of the three studies

	Decoding accuracy			
	Happiness	*Sadness*	*Anger*	*Disgust*
Study 1	33ms: YA > OA 4s: YA < OA	33ms: YA > OA 4s: YA < OA	33ms: YA > OA 4s: YA > OA*	33ms: YA > OA 4s: YA > OA*
Study 2	-	-	-	-
Study 3	YP > OP YA > OA	YP > OP YA < OA	YP = OP YA = OA	YP = OP YA > OA
	Facial mimicry			
	Happiness	*Sadness*	*Anger*	*Disgust*
Study 1	YA✔ OA✔	YA✔ OA✔	33ms: OA✔ 4s: YA = OA	YA ***x*** OA ***x***
Study 2	YA^✔ OA✔	-	YA ***x*** OA ***x***	-
Study 3	YP = OP YA = OA	YP = OP YA = OA	YP = OP YA = OA	OP✔ YA = OA

Note. YA = Young actors, OA = Older actors; YP = Young participants, OP = Older participants; * differences more pronounced compared to 33ms presentation; - not assessed; ✔Mimicry present; ***x*** Mimicry absent; ^ more pronounced in happy event

Summary and integration of findings

In regard to cognitive empathy this dissertation had asked whether wrinkles, folds and elderly stereotypes influence decoding accuracy of older faces. Study 1 demonstrated that wrinkles and folds of older faces overall reduce the signal clarity of emotion expressions. It further showed that young adults perceive emotions in younger and older faces in line with stereotypes, when they are given time to elaborate their stereotype knowledge. Specifically,

stereotypes, when they are given time to elaborate their stereotype knowledge. Specifically, expressions of happiness and sadness were rated higher in intensity and anger and disgust expression were rated lower in intensity for older compared to younger faces. Study 3 did not focus on stereotype expectations, but also found that sadness was better recognized in older compared to younger faces. These results are in line previous findings on the impact of wrinkles and folds (Hess et al., 2012) as well as the impact of stereotypic emotion expectations for the elderly. For example, older faces tend to receive more sadness attributions than younger faces (Ebner, 2008; Fölster, Hess, Hühnel, & Werheid, submitted for publication; Malatesta & Izard, 1984). Fölster et al. (submitted for publication) could show, that the decoding advantage for sadness in older faces disappeared, when observers' overall attributions of sadness to the elderly were taken into account.

The decoding accuracy results for happiness, anger and disgust in regard to actor age were however not consistent between Study 3 and the 4 seconds condition of Study 1. These differences might be due to the usage of different stimuli. The still photos in Study 1 provided great opportunity for stereotypic attributions to take place. In contrast, the dynamic facial expressions of 20 seconds length might have facilitated actual emotion decoding on the one hand (Rymarczyk et al., 2011; Weyers et al., 2006) and demanded more attention to the facial movements because of their subtlety on the other hand, thus leaving less necessity as well as capacity for stereotypic judgments. The case of sadness seems to be an exception, which might possibly be the strongest emotion stereotype about older adults.

Concerning affective empathy this dissertation had asked whether the proposed decoding biases, the type of the emotion display and social group membership influence empathic responding in terms of mimicry. Study 1 found that expressions of happiness and sadness led to the same facial mimicry reactions for younger and older actors, suggesting that wrinkles, folds and elderly stereotypes do not impact empathic reactions for those emotion displays. Further, anger mimicry for younger faces in the short stimulus duration was absent whereas facial reactions to anger were present for older faces regardless of stimulus duration. As anger mimicry is difficult to differentiate from other processes that lead to frowning such as effort and concentration, Study 1 at least suggests that younger adults show mimicry of older adults for those emotions that facilitate harmonious interactions and social warmth, when mimicked.

Study 2 aimed to underline the influence of the emotion display on mimicry in real-life interactions between younger and older adults, however it only focused on happy and angry expressions. Unfortunately, conclusions regarding angry expressions could not be made, as confederates rarely displayed anger and thus anger mimicry could not be found. Fortunately, the results for mimicry of happy expressions in both the happy and angry context provided novel insight into mimicry between younger in-group and older out-group members. They showed that younger adults overall mimicked happy expressions of both younger and older confederates. However, they mimicked the expressions of older confederates to a smaller degree in the happy context, whereas no difference in the amount of mimicry was found in the angry context. This possibly means that young adults are willing to mimic happiness expressions of older out-group members in a happy context, as this does not require a great amount of understanding or sympathy and comes with low social costs (Bourgeois & Hess, 2008). Yet, young adults might also expect to gain more rewards from the interaction with a member from the in-group than the out-group. This pattern changes when the background of the interaction is negative. Young adults mimicked happiness expressions of younger and older confederate to the same degree in the angry context. It is important to note that the confederates' anger was not directed at the participants but rather at an object that might also have frustrated the young participants in the past. Therefore the interaction itself was not merely negative and provided a good opportunity for the signaling of understanding and bonding via mimicry of happy expressions. Mimicry toward older actors might also have been influenced by social desirability. Overall, these intriguing findings suggest that the social background of the emotion display plays a greater role for empathy than the social group membership.

This dissertation also aimed to deliver novel insight into the empathic abilities of older adults. In regard to cognitive empathy of the elderly Study 3 demonstrated reduced decoding accuracy for older compared to younger participants for some, but not all emotion expressions. Thus, it provided evidence for better emotion decoding skills of older adults than previously suggested (Ruffman et al., 2008), which might again be due to the dynamic stimulus set. Moreover, in regard to affective empathy of older adults Study 3 demonstrated no reduction in facial mimicry responses by older participants. Thus older adults' signaling of understanding can contribute to harmonious interactions.

It is also worth noting that Study 3 found no differences in mimicry depending on actor age. The integration of the mimicry findings for older vs. younger actors from all three studies highlights the influence of stimulus sociality: For the lowest level of stimulus sociality mimicry was found for some but not all emotion expressions of older adults (happiness and sadness, Study 1). As the stimulus sociality was increased to a dynamic level, mimicry of older adults was found for all emotions (happiness, sadness, anger and disgust, Study 3). Thus, enhanced stimulus sociality led to mimicry across various emotion displays. Yet, both of the studies had in common that the actors were non-respondent targets to the observer, and no context information as to why the targets showed those emotions was available. Thus, one should not merely expect that the highest level of stimulus sociality provided in life interactions should lead to the strongest and most frequent mimicry responses (Fischer et al., 2012). In fact, the life interactions (Study 2) somewhat buffered the mimicry responses regarding happiness. This highlights the distinction between real interactions and the observation of emotional expressions on a computer screen in regard to mimicry research. However, future research should investigate a broader range of emotion expressions in life interactions between younger and older adults for a more secured conclusion on stimulus sociality. Yet, do the findings from Study 2 and 3 negate the potential impact of wrinkles and stereotypes in real-life interactions? I argue otherwise, as interactions between younger and older adults in real-life can be particularly short, for example as brief as one single glance.

In sum, facial wrinkles, folds and stereotype expectations have an impact on the decoding accuracy of emotion expressions when presented rather shortly with little context information. In contrast, facial mimicry reactions for expressions of the elderly were quite frequent in all three studies: Mimicry for happiness and sadness was present, although wrinkles and stereotypes influenced the decoding of older faces (Study 1). Older confederates' happiness expressions were mimicked, although to a smaller degree when the context was positive (Study 2). And finally, older participants demonstrated the same affective capabilities as younger participants (Study 3). The comparison of mimicry results at different levels of stimulus sociality however showed, that conclusions from photo and video stimuli should be considered with care.

Implications, critical consideration and future research

This dissertation contributes to a better understanding of intergenerational emotion communication by having used a two-dimensional approach of measuring empathy. The empirical studies demonstrated (a) that younger adults show affective empathy reactions to the elderly regardless of the reduction of cognitive empathy for older person's facial expressions and (b) that older adults possess the same affective empathy capabilities.

Beyond the issue of intergenerational empathy, the studies provide insight into empathy and facial mimicry in general. The diverging results of cognitive and affective measures of empathy provide support for the notion that empathy consists of distinct components (Lamm et al., 2007) and this dissertation attests that a combined assessment is a worthwhile approach. In regard to facial mimicry research the findings in this dissertation provide further evidence that facial mimicry can occur despite low levels of emotion intensity and decoding accuracy (Hess & Blairy, 2001). Moreover, findings provided additional evidence for the impact of affiliative context on mimicry (Hess & Fischer, 2013, 2014). The variation of sociability of the proposed interactions between younger and older adults for the assessment facial mimicry across studies also proved to be a fruitful approach for a more comprehensive picture of these effects.

Concerning the fact that older adults were mimicked although they are commonly perceived as out-group members contradicts the notion of reduced mimicry to members of an out-group (e.g., Van der Schalk et al., 2011). Here it is relevant to note, that out-groups differ in their degree of perceived essentialism. Psychological essentialism describes people's tendency to attribute a 'fixed, underlying nature to members of a category, which is understood to determine their identity, explain their observable properties, render them fundamentally alike, and allow many inferences to be drawn about them' (Haslam, Bastian, Bain, & Kashima, 2006, p. 64). People might not hold essentialist views about the elderly, which in contrast have been found for race and ethnicity for example (Verkuyten, 2003). First, age is a feature that constantly changes, and older age is something everybody potentially will reach one day. Second, young adults might hold different views about older adults depending on familiarity, ranging from the own grandparents to the 'grumpy person behind the shopping trolley'. Third, attitudes about the elderly are typically mixed, rather than one-directional (Hummert, 1990, Kite et al., 2005). Therefore, it might not be so surprising after all to find facial mimicry for the elderly. Yet again, stimulus sociality might

be another explanation, as an effect of out-group perception on mimicry was registered in real-life interactions between younger and older adults (Study 2). Here, it is interesting to note that research on the effects of out-group perception is commonly based on experiments with low stimulus sociality.

In regards to the methodological conceptualization of empathy in the present work, it is relevant to note that decoding accuracy and facial mimicry are not the only measures of empathy (cf. Decety & Jackson, 2004; Eisenberg & Fabes, 1990). Hess & Fischer (2014) further argue, that empathy is a broader concept than mimicry, as it does not necessarily require congruent emotional states or emotional displays. Thus, additional measures might be useful in future studies. Those measures might include self-reports, emotional attributions tasks using short stories, and measures of autonomic nervous system responses such as skin conductance, heart rate and respiration during a given emotion task. However, in the specific context of this work it was useful to employ the straightforward measures of decoding and mimicry, as their assessment was suitable for all studies and particularly for the life interactions and allowed for comparisons between the studies. Future research could consolidate or extend the current findings by using alternative measures as mentioned above. An interesting approach to measure the harmony or quality of interactions between younger and older adults was employed by Kuszynski, Hühnel, Hess, & Asendorpf (Manuscript in preparation), who made use of the intergenerational interactions recorded in Study 2. The interactions were presented to naïve raters who were asked to judge the synchrony of the same-age and mixed-age dyads. The results showed that synchrony was rated lower in mixed-age dyads, implying less behavioral and emotional coordination in mixed-age compared to same-age dyads.

Despite the fact that more research would help to further illuminate these issues, first implications for interactions in everyday life can be deducted from this dissertation. Regardless of the specific relationship to the older expresser - may it be the own grandmother, an older client in a government agency or a patient in a nursing home - this dissertation suggests young adults react empathically to the emotion expressions of the elderly. Even though young adults' accurate decoding might be reduced or biased, they are nonetheless able to signal understanding via mimicry. This seems to be the case especially for those emotions that help to create positive interactions and social warmth.

As a next step, future research could ask whether the effects of mimicry toward older adults are merely positive, or whether they could also have negative consequences for the elderly such as an increase of stereotype threat (Hess, Auman, Colcombe, & Rahhal, 2003; Steele, & Aronson, 1995), for example when (assumed or actual) sadness expressions of the elderly are frequently mimicked.

Conclusion

In sum, positive social interactions and the creation of social bonds between younger and older adults appear to be at lower risk than previously suggested by cognitive indicators of empathy. This dissertation demonstrated that affective empathic responding via facial mimicry to the elderly is essentially intact, and that older adults possess the same affective capabilities. These findings are encouraging and provide a positive outlook for following generations, especially in ageing societies.

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