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Stereotyping and Effort Mobilization in Older Age: The Role of Self-involvement

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Abstract

In this chapter, we present a framework which aims at explaining stereotyping in older age. Previous studies have shown that older adults are more prone to exhibiting stereotyping and prejudice towards many social groups, compared to young adults. However, our model suggests that these age-related increase in stereotyping might be compensated for through self-involvement and the associated effort mobilization. In particular, we posit that the effortful, piecemeal analysis of incoming information that results from self-involvement leads to decreased stereotyping among older adults. We provide a literature review and present empirical studies that support the model's hypotheses as well as discuss ideas for further research on the topic.

Keywords: aging; stereotyping; effort; self-involvement; Motivational Intensity Theory; Selective Engagement Theory

Stereotyping in Older Age

Probably quite a few people have heard their grandparents expressing views about minorities or gender roles that were considered inappropriate. They might have thought these views are just from different times, cringed silently, and let it go. But such socially inappropriate behaviours might be very surprising if an older person has never expressed them before. Indeed, research shows that in comparison to young people, older adults are more prone to exhibit biased reactions towards people representing other social groups (e.g., Firebaugh & Davis, 1988; Herek, 1994; Wilson, 1996). These reactions involve stereotyping (over-generalized belief about a particular category of people; Y.D. Hess & Pickett, 2020) and prejudice (negative emotional reaction toward others based on their membership in social groups; Fiske, 2020). One of the possible explanations for this phenomenon among older adults relates to cohort differences and the socialization process. Older adults grew up in times when stereotypes were widely held and expression of negative attitudes toward minority or unconventional groups were not considered inappropriate. Later in life, older adults simply did not change their prejudiced attitudes. Consequently, they are now more likely, in comparison to young people, to show stereotypical thinking and prejudiced reactions (Katz & Braly, 1935; Schuman et al., 1997; T.W. Smith, 1990). For example, in the US it was shown that pre-war cohorts demonstrate higher levels of prejudice toward a number of different ethnic minorities than do people born after World War II (Wilson, 1996). Similarly, in the UK, the cohorts which grew up after the mass immigration to the country started in the 1960s and 1970s show much lower levels of ethnic prejudice than the older generations (Ford, 2008).

The idea of the cohort replacement might spark optimism for the future because as the older generations will disappear and younger ones emerge, the level of stereotyping and prejudice should decline. Under this scenario, with time, the overall level of prejudice in society would be lower (Firebaugh & Davis, 1988). However, although there is an undeniable progress toward more open-minded societies, older adults still show stronger stereotyping and prejudice than younger generations. For example, only 4% of US citizens accepted inter-racial marriages in the 1950s whereas nearly 90% supported it in the 2010s (Newport, 2013). However, older adults are still less likely to accept interracial marriages in this day and age. Thus, the explanation that older people are *just from different times* does not seem to fully account for the increased stereotyping and prejudice in older age.

More recent research suggests that older people become more biased as they age, with cognitive limitations--especially decreased self-regulatory ability or executive functions--being responsible for age-related differences in stereotyping and prejudiced reactions. In this chapter, we review a range of findings on age-related differences in person perception, stereotyping, implicit and explicit prejudice, and we elaborate on the impact of cognitive abilities on these processes. We argue that the purely cognitive approach to explain increased category-based perception (i.e., stereotyping) in older age is limited. In contrast, we suggest that one should take into consideration the interactive impact of cognition and motivation to understand increased stereotyping in older age.

Cognitive account

The classic models of stereotyping suggest that people, irrespective of their prejudice level, are equally aware of existing cultural stereotypes and activate stereotypical associations once they meet a member of a stereotyped group (Devine, 1989). However, low-prejudiced people employ controlled processes to respond without biases, in comparison to high-prejudiced people. Nevertheless, when conscious control is precluded, even low-prejudiced people may display biases. There is a large scholarly work focused on what processes are involved in control of prejudiced responses (e.g., Amodio, Devine, & Harmon-Jones, 2007; Monteith, 1993; Monteith, Sherman, & Devine, 1998) and what the moderators of these effects are (e.g., Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; Sherman, Macrae, & Bodenhausen, 2000). Importantly, substantial evidence suggests that the ability to inhibit stereotypes is essential to respond without biases (e.g., Bartholow, Dickter, & Sestir, 2006; Devine, 1989; Ito et al., 2015; Payne, 2005; Payne, Shimizu, & Jacoby, 2005).

Given that inhibitory abilities substantially decline as people become older (Connelly, Hasher, & Zacks, 1991; Hasher, Stoltzfus, Zacks, & Rypma, 1991), it was suggested that compromised inhibitory function might be responsible for the increased stereotyping in older age. For example, despite the reported high motivation to respond without bias and being repeatedly reminded to refrain from using stereotypical information when forming impressions, older people's evaluations of students were shown to be biased by ethnic information to a greater extent than those of young adults (von Hippel, Silver, & Lynch, 2000). This increased impact of stereotypes on older adults' evaluations was mediated by individual differences in inhibitory abilities. Furthermore, other research has shown that older adults with decreased cognitive ability hold more negative attitudes toward people from stigmatized groups (e.g., the homeless) and feel that these people could change their condition to a greater degree than young adults or older people with high cognitive abilities (Krendl & Wolford, 2012). Further evidence was provided by studies in which older adults were reported by their peers to present more socially inappropriate behaviours in comparison to their younger counterparts (Henry, von Hippel, & Baynes, 2009; von Hippel

& Dunlop, 2005). Interestingly, the level of peer-reported prejudice or inappropriateness was explained by decreased inhibitory abilities (Henry et al., 2009).

Similarly, apart from blatant biases, a similar age-related effect has been shown on an implicit level. Specifically, when presented with Black versus White faces, older adults with compromised executive function showed more racial bias in an Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998) in comparison to those with intact abilities (Cassidy, Lee, & Krendl, 2016). Furthermore, their brain connectivity patterns suggested that young people and older people with intact executive functions, relative to those with low abilities, engaged more control while performing IAT. More detailed research on the mechanisms of age-related differences in implicit attitudes involved modelling methods which allow the impact of the automatic and controlled processes to be partitioned (Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005). It turns out that age-related differences in IAT performance, in line with the aforementioned brain connectivity patterns, occur due to diminished regulation of automatic race bias, not because of differences in the representations, that is, the strength of stereotypical associations (Gonsalkorale, Sherman, & Klauer, 2009). These results were conceptually replicated with another modeling method showing that an age-related increase in implicit biases occurs because of less effective controlled processes, while automatic processes seem to operate similarly among younger and older adults (Stewart, von Hippel, & Radvansky, 2009). Additionally, this study showed that the relationship between age and the IAT's controlled component was mediated by participants' inhibitory control. This research shows that older and younger adults do not differ in their strength of automatic association but in the ability to control and inhibit those automatic biases.

Furthermore, stereotypes have been found to impact interpretation of ambiguous information (Dunning & Sherman, 1997; von Hippel, Sekaquaptewa, & Vargas, 1995). This tendency to incorporate stereotypes in tacit inferences might be especially pronounced among older adults because they are more likely to support their memory with prior knowledge as a compensatory mechanism for decreased cognitive abilities (Arbuckle, Vanderleck, Harsany, & Lapidus, 1990; T.M. Hess, Osowski, & Leclerc, 2005; Umanath & Marsh, 2014). Indeed, it turns out that stereotypes impact inferences that people make while reading a short story, but older adults' interpretations are more affected by stereotypes than those of young people (Radvansky, Copeland, & von Hippel, 2010). In a study conducted in the US with a mostly white sample, participants first read a short narrative and then responded in a recognition test in which they decided whether a presented sentence appeared in the story they had read or if it was a novel one (Radvansky et al., 2010). Older adults were found to be more prone than younger adults to make and remember stereotypical inferences in their judgments. Specifically, older adults exhibited a higher rate of accepting *novel* statements that were consistent with ethnic stereotypes, for example, that an African American student failed in an exam, although the story only stated that the student took an exam without mentioning anything about his performance. Furthermore, as shown with a lexical decision task, all participants independent of their age activated stereotypes but older adults inhibited them less than young people. The authors concluded that failure to inhibit stereotypes during reading was responsible for the increased stereotyping in the recognition test.

The research reviewed above provide evidence that the tendency of older adults to incorporate stereotypes in their thinking is a consequence of cognitive decline, especially inhibitory abilities. It suggests that stereotyping should be expected in older age as the decrease in cognitive function is a normal age-related phenomenon. However, the life-span perspective offers a more positive outlook on older age suggesting that even if age-related cognitive decline might be inevitable, age-related cognitive losses may be counteracted or compensated for (e.g., Baltes, 1987; Labouvie-Vief, 2003).

Interactive Impact of Abilities and Motivation

T.M. Hess (1994, 1999) proposed a framework for understanding age-related changes in representational processes that highlight the role of motivation. This model is based on the classical theories of impression formation in which all operations can be placed on a dimension described by two extremes: category-based versus individuating processes (e.g., Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2001). Stereotyping as an instance of categorization processes is, in general, given priority over individuation because such gist-based representations offer efficient mental shortcuts (Fiske, Lin, & Neuberg, 1999; Fiske & Neuberg, 1990). However, the process of stereotyping is conditional on cognitive processing limitations, cognitive operations, and motivation (Macrae & Bodenhausen, 2001). It seems that motivation impacts person perception processes especially when it impinges on the self, e.g., through importance of personal values or increased self-presentation concerns (Fiske & Neuberg, 1990). In particular, whether an impression is based on a category or individuating information depends on the self-relevant consequences for the perceiver. From a broader perspective, it seems that when the outcome of a task concerns a person's self-esteem, self-definition, personal interests, or goals, people are more likely to process information carefully. We will refer to such situations as instigating self-involvement (Gendolla, 2004).

In this vein, T.M. Hess (1994, 1999) proposed that categorization in older age is thought to operate relatively effortlessly, while individuating information processing consumes cognitive resources. The two factors, processing resources and goals, have an independent and interactive impact on the employment of a particular processing strategy: category-based versus piecemeal. Processing resources are prone to the impact of age-related changes in health and physiological processes, as well as situational factors such as constraints (e.g., fatigue, concurrent task, or demands) or situation-specific goals. Processing goals are influenced by age-related changes in experience, social roles, and life contexts, as well as by chronic goals and situational factors. Thus, apart from the fact that older adults need to have available processing resources or capacity, they need to be motivated to employ them to perform individuating and piecemeal processing of social information. Hess' model thus suggests that the bias that older adults show is not only due to constraints on cognitive resources, but also because of selectivity in allocating the available resources (T.M. Hess, 2000). Importantly, the increased selectivity in older age is due to cognitive resources being more scarce.

For example, it was demonstrated that when an experimental task is framed in way that is meaningful for older adults, they engage more in comparison to conditions where the task is presented in a less meaningful manner (T.M. Hess, Follett, & McGee, 1998, Study 1). The researchers focused on examining (in)consistency effects. Inconsistency refers to better recall of information *inconsistent* with a prior knowledge (e.g., category-based information) over consistent information, whereas the consistency effect is the opposite (i.e., superior recall of information consistent vs. inconsistent with prior knowledge). While the consistency effect is thought to be the result of a rather automatic, effortless processing style, the inconsistency effect demands engaging cognitive resources in information processing. It turned out that only when a task was framed as a job selection task, older adults revealed an inconsistency effect in the information they recalled, but only when they had relatively high working memory span. Another study found that older adults were most accurate in making trait inferences and recalling information regarding the target person when a task was self-relevant to them or when they were made accountable for their impressions (T.M. Hess, Rosenberg, & Waters, 2001). In contrast, young people had similar levels of accuracy independent of the condition. Self-relevance of context (i.e., listening to a young person's experiences in a first job vs. a pensioner's experience with looking for a retirement home) and accountability (i.e., being told that the impression will be discussed with another participant) can both elicit higher engagement, thus resulting in more careful information processing. However, in this study the resource selectivity was inferred from the performance outcomes and further research was needed to shed light on the resource allocation more directly. A follow-up study (T.M. Hess, Germain, Swaim, & Osowski, 2009) in which participants decided on the suitability of candidates for a job—using the earlier mentioned modelling method that partitions performance into controlled and automatic processes—found that the enhanced inconsistency effect among older adults associated with high accountability occurred due to conscious recollection processes, that is, effortful processing. At the same time, the accountability manipulation did not impact the processing style of young adults. The research by Hess and colleagues indicates that older adults are able to prevent biases in impression formation tasks by higher resource utilization. We will next review a model of effort that is helpful in understanding nuances of effort mobilization in older age.

Effort Mobilization

Effort is defined as mobilization of resources to perform a goal-oriented behavior (Gendolla & Wright, 2009). A detailed model of effort mobilization is proposed by Motivational Intensity Theory (Brehm & Self, 1989). According to this theory, people mobilize only as much effort as needed to successfully perform a task. Effort is thus determined primarily by perceived task difficulty: the more difficult a task, the more effort is invested. Perceived task difficulty obviously depends on objective task characteristics but is also affected by variables like ability or fatigue. Individuals with low abilities in a particular domain perceive a task as being more difficult and consequentially mobilize more effort to perform it in comparison to those who perceive one's ability as high and a task as an easy one (Wright, 1998). Similarly, fatigue impacts perception of task difficulty: the more fatigued people are, the more difficult a task seems to be (Wright, Martin, & Bland, 2003). Consequently, they would invest more effort to support performance in a task in comparison to people who are not fatigued.

Importantly, the proportional relationship between difficulty and engagement has limitations: one mobilizes effort if one believes that succeeding in a task is possible and that it is justified by its importance. If this is not the case, effort mobilization is low. In other words, effort mobilization rises monotonically with a task difficulty and sharply drops if the task is too difficult. However, when a person is free to choose a level of a task difficulty or when difficulty is unknown, effort mobilization is no longer a function of difficulty. In such situations the primary factor influencing effort mobilization is success importance: the higher it is, the more effort is mobilized. Success importance is determined by, for example, rewards (e.g., Richter, 2012), mood (e.g., Richter & Gendolla, 2009), or personality traits (e.g., Richter, Baeriswyl, & Roets, 2012; Szumowska, Szwed, Kossowska, & Wright, 2017). Importantly, success importance is also influenced by abstract goals related to personal interests, self-definition, or self-esteem, that is, when self is involved (Gendolla, 2004).

Self-involvement Impacts Effort Mobilization

As mentioned in the preceding section, self-involvement relates to success importance (which determines the maximum amount of effort an individual is willing to invest in a task) but actual effort mobilization is directly determined by task difficulty. It has been proposed that several performance settings trigger high self-involvement: social evaluation of abilities, self-evaluation under self-awareness, or personal importance related to interests and values (Breckler & Greenwald, 1986). Some authors suggested that virtually all kinds of goals are self-involving as they affect well-being (Geen, 1995). However, goals differ in the degree to which they are self-involving. Here, we focus on the impact of goals that have a *proximal* impact on the self as opposed to those with a more *distal* impact (Gendolla, 2004). Such distal influences might be exerted by the desire to attain rewards, such as money, or avoid unpleasant states, such as pain or negative emotions, but they do not directly impact self-esteem, self-definition, or personal interests and values.

It was shown that self-involvement resulted in higher commitment to goal attainment and prevented early disengagement from a task (Gendolla & Richter, 2010). The range of manipulations used to instigate self-involvement in research on effort mobilization included social evaluation, both explicit (e.g., Kelsey et al., 2000; Kelsey, Soderlund, & Arthur, 2004; Wright, Tunstall, Williams, Goodwin, & Harmon – Jones, 1995) and implicit (e.g., Gendolla & Richter, 2006a), ego-involvement (Agratap, Wright, Mlynski, Hammad, & Backage, 2016; Gendolla, 1999; Gendolla & Richter, 2006b; Wright, Patrick, Thomas, & Barreto, 2013), self-awareness, explicit (e.g., Gendolla, Richter, & Silvia, 2008; Silvia, 2012; Silvia, McCord, & Gendolla, 2010) as well as implicit (e.g., Silvia, 2012; Silvia, Jones, Kelly, & Zibaie, 2011), and personal importance related to goals or values (e.g., Gendolla, 1998; 1999; Gendolla & Richter, 2006b). For example, explicit social evaluation, in comparison to the control condition, resulted in higher effort mobilization that increased with task difficulty (Wright, Dill, Geen, & Anderson, 1998). However, as predicted by Motivational Intensity Theory, in the condition with the highest difficulty, effort investment sharply dropped in the explicit social evaluation group where it was presumably believed that there was little justification for putting effort into a task where success was perceived as impossible. In contrast, in the control condition, effort expenditure was low across all task difficulty levels. Interestingly, even the mere presence of an experimenter in the laboratory resulted in higher effort mobilization in response to a task demand (Gendolla & Richter, 2006a). Furthermore, when a task had an implication for identity, effort mobilization was high during difficult tasks (Gendolla, 1998). In contrast, easy tasks, even those highly relevant to identity, and difficult tasks of low self-relevance did not increase effort mobilization.

The body of research discussed above confirms that goals with proximal relevance to self-esteem, self-definition, or personal importance, that is self-involvement, influence effort mobilization during demanding tasks. Typically, research testing the predictions of Motivational Intensity Theory involves participants performing cognitive tasks such as modified versions of Sternberg short-term memory task or letter scanning tasks, with a range of difficulty levels and/or different levels of success importance. In recent research, effort is usually quantified with cardiovascular responses (Richter et al., 2016). Below, we briefly review different approaches to quantifying effort and then introduce cardiovascular measures and explain why they are useful in studying motivational processes in older age.

How to Measure Effort?

There are at least three approaches to measure effort: self-report, behavioural outcomes, and physiological responses (Meshkati, Hancock, Rahimi, & Dawes, 1995). In the following section we will briefly present ways of quantifying effort in line with these three approaches but we will mainly focus on introducing physiological measures related to cardiovascular function as these are the measures we believe to be the most suitable to capture effort mobilization in the context of our own studies.

Self-report measures of effort are very popular in psychology (e.g., Hart, 2006; Paas, Van Merriënboer, & Adam, 1994; Robinson & Morsella, 2014). Among the widely used self-report measures are the Subjective Assessment Technique (Reid & Nygren, 1988), the NASA Task Load Index (Hart & Steveland, 1988), and the Work Profile (Tsang & Velasquez, 1996). However, these measures of effort, as any other self-report method, suffer from several limitations: individuals may not be aware of their effort investments, they may quite easily fake their responses (e.g., due to social desirability), and the measures might be prone to self-serving biases. Consequently, the relationship between self-reports of effort and actual effort expenditure may not be straightforward (e.g., Harper, Eddington, & Silvia, 2016; Muraven, Tice, & Baumeister, 1998; Silvia & Gendolla, 2001; B.T. Smith & Hess, 2015).

Behavioural measures of effort are based on task performance qualities such as achievement or persistence (e.g., Freund, 2006; Jaśko, Czernatowicz-Kukuczka, & Kossowska, 2015; Roets, Van Hiel, Cornelis, & Soetens, 2008; Sankaran, Szumowska, & Kossowska, 2017). Task persistence is often defined as time spent on task (e.g., Freund, 2006; Jaśko et al., 2015) but there are also other operationalisations, e.g., number of stimulus exposures requested by subjects (e.g., Roets et al., 2008). The caveat is the fact that participants may work on a task for a long period but with a very low intensity, and others may work briefly but with a very high intensity (Gendolla & Richter, 2010). When effort is measured with achievement, it is not possible to assess the two phenomena, effort and task outcome, separately. This issue is especially relevant in the current context as in many studies on impression formation task outcomes were treated as a measure of effort: It was assumed that when one's evaluations were based on individuating information, the impression was formed in a more effortful manner then when it was based on stereotypical information. Moreover, task achievements depends also on abilities: The same achievement can be obtained by investing a lot of effort by a person with rather low abilities and very little effort by a person with high abilities (e.g., Eysenck & Calvo, 1992; Wright, 1998).

The third approach to measuring effort is based on physiological indices, including, but not limited to, capturing of eye activity, especially pupil dilatation (e.g., Beatty, 1982; Bijleveld, Custers, & Aarts, 2009; Piquado, Isaacowitz, & Wingfield, 2010; Zekveld, Kramer, & Festen, 2011), changes in skin conductance (e.g., Kahneman, Tursky, Shapiro, & Crider, 1969; Mackersie & Cones, 2011; Pribram & McGuiness, 1975), brain activity, especially with EEG (e.g., Fairclough & Ewing, 2017; Kok, 1997; Ullsperger, Metz, & Gille, 1988) or neuroimaging methods (e.g., Cabeza et al., 1997; 2002; Schacter, Alpert, Savage, Rauch, & Albert, 1996; Reuter-Lorenz et al., 2000), and cardiovascular reactivity (e.g., Aasman, Mulder, & Mulder, 1987; Kelsey, 2012; Wright, 1996). In our research, we quantified effort physiologically using cardiovascular measures. In fact, Wright's (1996) integration of Motivational Intensity Theory (Brehm & Self, 1989) with Obrist's active coping hypothesis (Obrist, 1976; 1981) resulted in an influential framework for analysing effort mobilization via measurement of cardiovascular reactivity. Much research has already demonstrated the utility of this framework for assessing the impact of resource mobilization on goal attainment (Gendolla, Wright, & Richter, 2012; 2019; Richter, Gendolla, & Wright, 2016).

Cardiovascular Measures of Effort

Assessing activation of the autonomic nervous system provides important information about effort mobilization (e.g., Fairclough & Mulder, 2012; Richter, 2010). It is because autonomic nervous system modifies the spontaneously generated heart activity. While the sympathetic branch is, in general, responsible for energizing behaviour, the parasympathetic nervous system is responsible for relaxation. Both systems operate constantly, and their interaction brings about a sympathovagal balance (cf. Berntson, Cacioppo, & Quigley, 1991). During rest, the heart is under dominant influence of the parasympathetic system. As a response to a task challenge, the parasympathetic "break" of a heart is released, that is, activity of parasympathetic activity decreases, and the activation of sympathetic system increases (Rowell, 1986; Van Roon, Mulder, Althaus, & Mulder, 2004; White & Raven, 2014).

The sympathetic influence on the cardiovascular system, exerted through adrenergic receptors, includes changes in heart contractility, blood pressure, cardiac output, and heart rate. The most sensitive non-invasive index of beta-adrenergic activation of the heart is pre-ejection period, which is a measure of heart contractility (Kelsey, 2012). Pre-ejection period is defined as the time interval from the start of ventricular depolarization to the opening of the aortic valve and the ejection of blood from the left ventricle to the aorta. The shorter this interval, the stronger the impact of the sympathetic nervous system on the myocardium, which suggests higher effort mobilization. Although adrenergic influence on blood pressure and heart rate is less evident than for pre-ejection period (Mezzacappa, Kelsey, & Katkin, 1999), blood pressure and heart rate are popular cardiovascular measures in psychophysiological research (Kelsey, 2012). Systolic blood pressure is the maximum, whereas diastolic blood pressure is the minimum arterial pressure between two heart beats, and both are measured in millimetres of mercury (mmHg). Heart rate is the number of heart contractions per minute and is measured in beats per minute (Berntson, Quigley, & Lozano, 2007). Systolic blood pressure is influenced by heart rate, contractile force, and total peripheral resistance. While the contractile force is indeed reflective of sympathetic adrenergic influence on the heart, heart rate and total peripheral resistance have complex relationships with sympathetic activity (Obrist, 1981; Papillo & Shapiro, 1990). Thus, systolic blood pressure is not reflective of sympathetic activation when heart rate or total peripheral resistance masks or mimics the impact of heart contractility (Wright & Kirby, 2001). Like systolic blood pressure, diastolic blood pressure is influenced by heart rate, contractile force, and total peripheral resistance. However, the impact of total peripheral resistance on diastolic blood pressure is stronger than its impact on systolic blood pressure (Segers, Steendijk, Stergiopulos, & Westerhof, 2001). Consequently, changes in sympathetic-driven myocardial contractility are more likely to be masked on diastolic blood pressure than on systolic blood pressure. Heart rate is under the influence of both branches of the autonomic system and thus also does not conclude a very good indicator of sympathetic activity (Berntson et al., 2007; Wright & Kirby, 2001). Thus, although not perfect, systolic blood pressure is a better measure of beta-adrenergic sympathetic activity than diastolic blood pressure (Gendolla et al., 2012; Richter, Friedrich, & Gendolla, 2008; Wright & Kirby, 2001) and is much easier to capture than pre-ejection period.

Parasympathetic impact on the heart can be assessed using spectral analysis of variation in the interval between successive heartbeats (Berntson et al., 1997; Task Force, 1996). Total variability can be decomposed into very low (below 0.04 Hz), low (0.04–0.15 Hz), and high (0.15–0.40 Hz) frequency ranges, which reflect one or more physiological phenomena (Berntson et al., 1997). While very low and low frequency heart rate variability (HRV) reflects a mixture of sympathetic and parasympathetic activity, high frequency HRV represents cardiac parasympathetic control (Berntson et al., 1997; Berntson et al., 2007; Task Force, 1996). In this vein, some research tested the predictions of Motivational Intensity Theory focused not only on measures of heart contractility or blood pressure, but also on the relative impact on the heart of the sympathetic and parasympathetic nervous systems (e.g., Harper et al., 2016; Kreibig, Gendolla, & Scherer, 2012; Richter, 2010; Silvia, Eddington, Beaty, Nusbaum, & Kwapil, 2013; Silvia, Beaty, Nusbaum, Eddington, & Kwapil, 2014). For example, in their work on goal relevance and goal conduciveness, Kreibig, Gendolla, and Scherer (2010) demonstrated higher sympathetic activation as well as parasympathetic withdrawal in response to goal conduciveness information when the goal was highly relevant to participants. We share the belief that expanding research on Motivational Intensity Theory to include assessments of both branches of autonomic nervous system is an important avenue in understanding effort mobilization, as the two systems may operate in a coupled, reciprocally or non-reciprocally, or uncoupled fashion (Berntson et al., 1991; Paton, Boscan, Pickering, & Nalivaiko, 2005).

Importantly, cardiovascular measures of effort have already been successfully used not only in research programmes focused on assessing impact of self-involvement on effort mobilization but also in studies investigating age-related changes in cognitive function (e.g., Ennis, Hess, & Smith, 2013; T.M. Hess & Ennis, 2012; B.T. Smith & Hess, 2015; Stewart, Wright, & Griffith, 2016; Weiss, 2016). The changes in effort mobilization captured with cardiovascular measures has been observed despite the fact that older adults tend to have higher baseline blood pressure, lower heart rate, and reduced autonomic regulation (e.g., Bertel, Buhler, Kiowski, & Lutold, 1980; Lakatta, 1993) or higher SBP sensitivity to task challenge (Uchino, Birmingham, & Berg, 2010). Furthermore, high frequency HRV decreased in response to a task challenge among young and older adults (Uchino, Uno, Holt-Lunstad, & Flinders, 1999). Thus, according to the evidence presented above, we suggest that effort mobilization among both young and older adults is reflected in withdrawal of parasympathetic impact (decreased high frequency HRV) and an activation of sympathetic nervous system (shorter pre-ejection period; higher systolic blood pressure).

Effort in Older Age

According to Selective Engagement Theory, a general decline in cognitive resources in older age results in increased costs of engagement in cognitive activities (T.M. Hess, 2014). These costs are manifested in two ways: first, more effort is required to achieve a particular level of performance; second, greater fatigue or depletion experienced after engaging in a cognitive activity. Individuals monitor these costs and consequently, perception of the ratio of benefits to costs impacts the probability of engaging in a task. If the actual benefit-cost ratio is high enough to reach a person's threshold of engagement, the probability of engagement in a task is high. If the benefit-cost ratio is low, there is little likelihood that one would engage in a given activity. Due to the aforementioned normative, age-related increased costs of cognitive activity, for older adults the benefit-cost ratio of engaging in an activity is already reduced at any level of perceived gains. Thus, older adults, in comparison to their younger counterparts, are more selective in engaging in cognitive activities (it is more difficult to exceed the threshold of engagement). Furthermore, as a result of higher selectivity, the value attached to a task (e.g., personal relevance) is a much more influential determinant of effort mobilization in older than in younger age.

In terms of Motivational Intensity Theory, one could translate these predictions into the following: Due to decreased cognitive ability and feeling more fatigued, older adults perceive tasks as more difficult and thus would mobilize more effort to support performance than young people would. Moreover, because of their lower cognitive abilities and the associated costs of engagement, older adults are also less likely to perceive task success as possible so they might disengage from tasks earlier than young adults. However, drawing on Motivational Intensity Theory, we would predict that value attached to a task and task difficulty would exert an interactive impact on the effort mobilization among young and older adults rather than value of success in a task having directly a stronger impact on older adults in comparison to young people.

It turns out that indeed, age is related to increased perception of task demands and costs of cognitive activities and that these perceptions, especially in older age, influence effort mobilization, operationalized as increase in systolic blood pressure (T.M. Hess, Smith, & Sharifian, 2016). Moreover, older adults engage more effort during both easy and difficult tasks relative to young people and fatigue is disproportionate in its impact on older adults' performance in comparison to younger adults (T.M. Hess & Ennis, 2012). Furthermore, a study which compared effort mobilization in a task with five difficulty levels showed that older adults, compared to young people, not only exert more effort at lower and mid-levels of task difficulty but also that they disengage from a task earlier (Ennis et al., 2013). Studies looking more directly at the impact of success importance have shown that self-involvement impacts effort mobilization especially when the task demands are high (T.M. Hess, Growney, & Lothary, 2019) and it has a disproportionately greater impact on older adults, relative to younger adults (B.T. Smith & Hess, 2015).

Stewart and colleagues (2016) focused on the impact of cognitive abilities on effort mobilization, which was assessed with systolic blood pressure. It turned out that only healthy older adults mobilize more effort with increasing task difficulty. In contrast, older adults who suffer from mild cognitive impairment (a prodromal state of dementia) did not change their engagement across different task difficulties. Their effort mobilization was in general lower and task performance was worse in comparison to healthy adults. Interestingly, subjective perception of task difficulty or success importance did not differ between healthy older adults and those suffering from mild cognitive impairment. This means that only healthy older adults engaged in a task in accordance to its difficulty and older people with mild cognitive impairment did not, either because they had a biased perception of their own performance or because they did not perceive succeeding in the task as possible.

The studies mentioned in this section focused on cognitive tasks but there is also evidence suggesting that if older adults have resources and if they invest them in a task they are, to some extent, able to regulate biases (Krendl, Heatherton, & Kensinger, 2009; Krendl & Kensinger, 2016). In particular, a neuroimaging study demonstrated that age-related cognitive decline reduces the ability to regulate negative attitudes towards people from stigmatized groups, such as drug addicts, the homeless, or people with physical deformities (Krendl et al., 2009). However, older adults with preserved executive functions demonstrated less bias in comparison to older adults with rather low cognitive abilities. Importantly, older adults who had preserved executive functions had increased activity in the left lateral cortex, in comparison to young adults and low-functioning older adults. The left lateral cortex has previously been shown to correlate with inhibiting negative reactions to social stigma (Lieberman, Hariri, Jarcho, Eisenberger, & Bookheimer, 2005). Krendl and colleagues (2009) interpreted this in terms of cognitive effort: High-functioning older adults had to invest more effort, in comparison to young adults, to overcome biases. At the same time, high-functioning older adults had cognitive resources to mobilize in comparison to low-functioning elderly people, therefore they were able to regulate biases. Similarly, in our own research we focused on understanding the impact of self-involvement and associated effort mobilization on stereotyping in older age.

Self-involvement Influences Effort and Stereotyping in Older Age

Drawing on the aforementioned studies on the impact of motivation on stereotyping (e.g., Devine, 1989; Fiske et al., 1999), the motivational changes in older age (Baltes, 1987; T.M. Hess, 2014), and the effort mobilization literature (Brehm & Self, 1989; Wright, 1996), we propose that when older adults have available cognitive resources and are in self-involving situations, they would engage in effortful information processing, which, in turn, should decrease their stereotyping. We predict that under such conditions, older adults would display low stereotyping (comparable to those of young people) but, to support performance, they would need to invest more effort than younger counterparts. In contrast, low self-involvement does not inspire older adults to engage extra resources in their information processing, which results in low effort mobilization but high stereotyping. The predictions for effort mobilization for young and older people as a function of task difficulty in low and high self-involvement conditions is presented in Figure 1.

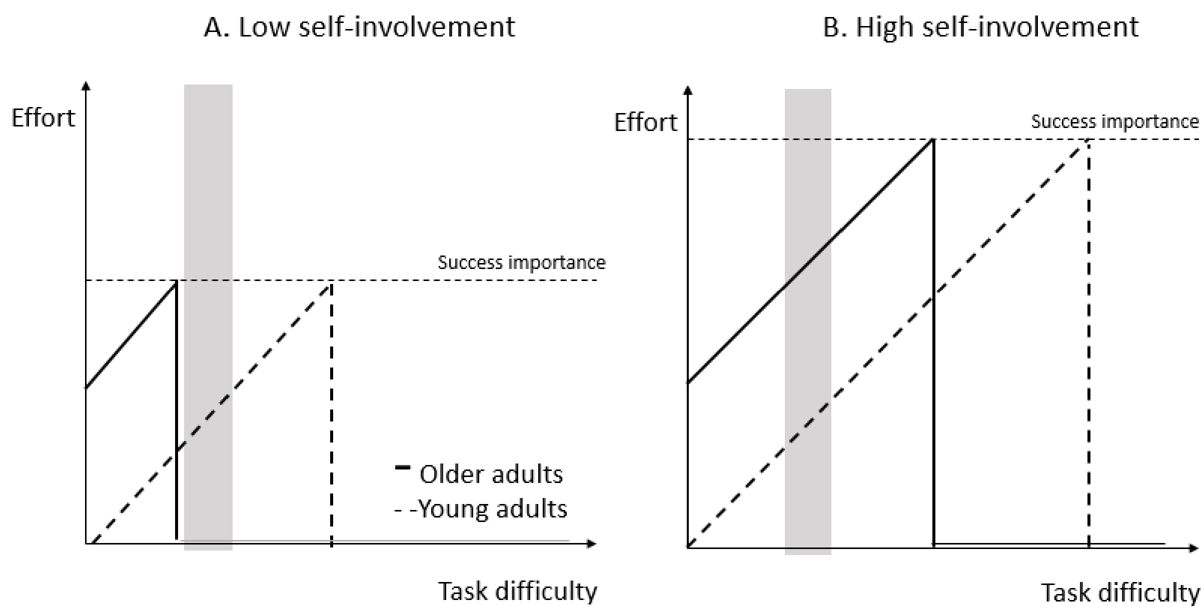

Figure 1. Predictions for effort mobilization of young and older adults as a function of task difficulty under low (Panel A) and high self-involvement (Panel B). Grey areas in the charts reflect range of task difficulty levels we aimed at testing in Czarnek and others (2019).

In order to test these predictions, we aimed to replicate the results of Radvansky and colleagues (2010), which showed that older adults are more prone to incorporating stereotypical inferences in their thinking. As a reminder, participants in this study read short stories and then responded in a recognition test in which they decided whether a presented sentence appeared in the story they had read. Radvansky and others (2010) showed that older adults are more prone to accepting *novel* statements that were consistent with the ethnic stereotypes, e.g., that an African American student performed poorly whereas the story only mentioned he took an exam. It means that older adults were more prone than younger adults to making and remembering stereotypical inferences while reading a story.

In our research, we found that indeed older adults were more prone to use stereotypical knowledge to “fill gaps” in the stories, that is, stereotypes guided their understanding of ambiguous information (Czarnek, Kossowska, & Sędek, 2015). However, we found that the relationship between age and stereotyping was moderated by the self-relevance of the story read by participants. Specifically, when older adults read about their peers, their stereotyping was low and similar to that presented by young adults. In contrast, when older adults read about people of other ages, they presented higher stereotyping in comparison to young adults.

We hypothesised that a mechanism of this effect was higher effort investment triggered by the age self-relevance but we did not measure effort mobilization when participants performed the task; that is, while reading and responding in a recognition test. Thus, as a next step we aimed to elucidate the patterns of effort investments under low and high self-involvement among young and older people. In particular, for older adults under high self-involvement, we predicted high effort mobilization, which would allow them to inhibit stereotyping. For older adults under low self-involvement, we expected little effort investment but high stereotyping. Finally, we expected young people under both low and high self-involvement to present low effort mobilization as well as low stereotyping. This is because our target task difficulty was relatively moderate (please see Figure 1).

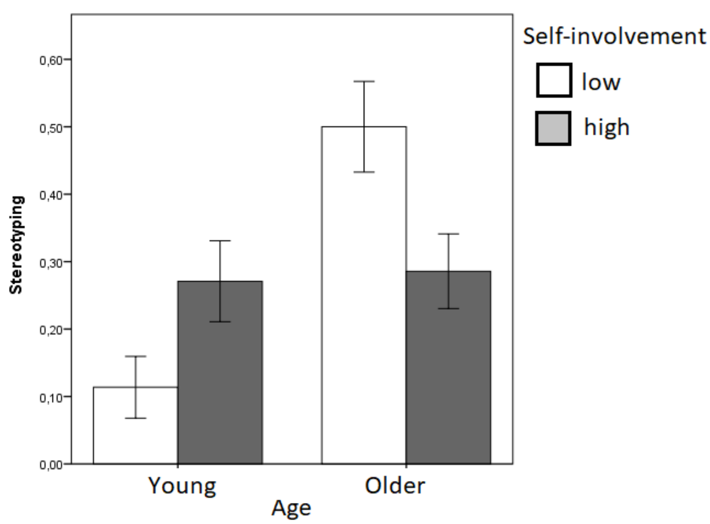

Figure 2. Average scores for stereotyping depending on age and self-involvement (from Czarnek et al., 2019). Error bars represent +/- 1 standard error of the mean.

We again found that older adults under high self-involvement presented low stereotyping tendency (similar to that of young people) in comparison to older adults under low self-involvement, as shown in Figure 2 (Czarnek, Kossowska, & Richter, 2019). Importantly, we measured effort investment with cardiovascular response: Effort was defined as a decrease in high frequency HRV (parasympathetic withdrawal) and an increase in systolic blood pressure (sympathetic activation). The results conformed to our predictions for the parasympathetic withdrawal: Older adults in the high self-involvement condition had decreased high-frequency HRV in comparison to other conditions, which suggests increased effort mobilization, as shown in Figure 3. Although HRV reactivity showed the expected self-involvement effect, systolic blood pressure did not. One explanation for the lack of the impact of self-involvement on systolic blood pressure involves the impact of total peripheral resistance, which we could not control in this study. Thus, future studies would benefit from measuring pre-ejection period, which is a more direct measure of sympathetic impact on the heart than the systolic blood pressure. Nevertheless, we found that the hypothesized pattern of effort mobilization occurred only in the test period, but not when participants were reading the stories. This suggests, in contrast to the argument of Radvansky and colleagues (2010), that the increased effort could shield older adults from stereotyping at later stages of information processing rather than only during encoding. This also requires further examination, for example in a study that would vary the difficulty levels within both age groups.

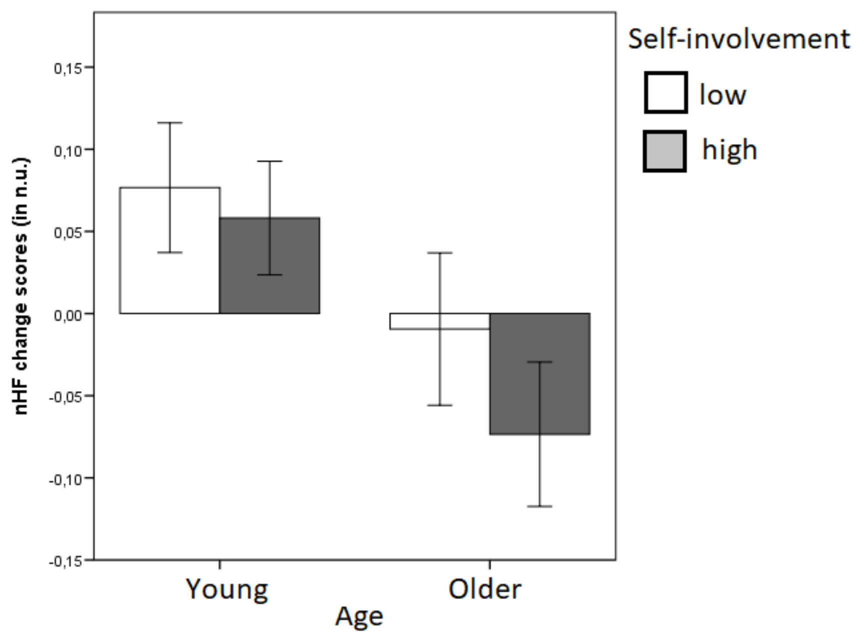

Figure 3. Average scores for high frequency HRV during recognition test depending on age and self-involvement (from Czarnek et al., 2019). Error bars represent +/- 1 standard error of the mean.

Our studies presented above involved relatively moderate difficulty levels for which we did not expect effort mobilization differences for young adults. As Figure 1 shows, we would expect differences in effort mobilization between young people under low and high self-involvement only at high levels of task difficulty because, under both conditions of self-involvement, the required effort should have been justified. In contrast, for older people, we would expect differences due to involvement to emerge at moderate levels of difficulty, but not at low or very high difficulty levels.

To test the effort mobilization and stereotyping when the task is difficult, we ran another study with young participants only (Czarnek, Kossowska, & Richter, 2020). Previous studies demonstrated that inhibiting stereotypical association is especially difficult when people are fatigued (Govorun & Payne, 2006). Thus, all participants performed demanding cognitive tasks for about one hour and then we asked them to read stories and respond to a recognition test that would measure their stereotyping, again defined as tendency to accept novel information that is consistent with stereotypes. Here, we instigated self-involvement with an accountability manipulation. Accountability is an explicit**,** informed social evaluation executed by an experimenter (Lerner & Tetlock, 1999). We found that people under high accountability had higher heart rate throughout the reading and responding to a recognition test but the differences in the systolic blood pressure and stereotyping, although in the expected direction, did not reach significance. We believe this issue and studies that manipulate with a task difficulty is an important avenue for further investigations.

Relatedly, if increased stereotyping is viewed as a self-regulatory failure (e.g., Bartholow et al., 2006; Devine, 1989; Radvansky et al., 2010), then the analysis of behavioural restraint (Wright, Mlynski, & Carbajal, 2019) seems especially relevant in the current context. According to this perspective, difficulty of a task is influenced by the magnitude of unwanted impulses as well as the (perception of) ability to resist them. The importance of restraint, in turn, determines how hard people would try to resist impulses in face of high difficulty. This analysis suggests that it is important to distinguish between an impulse magnitude, here stereotyping, and ability to resist this impulse. It seems that both mechanisms (increased stereotype activation and decreased ability to inhibit stereotypes) could be responsible for increased stereotyping in older age. Our research, however, does not allow us to separately assess which of the two factors is responsible for increased stereotyping in older versus young age[1]. A solution to this problem could be an experimental manipulation of ability to resist stereotypes (e.g., fatigue) or magnitude of stereotype activation (e.g., stereotype salience). Our prediction would be that the mechanism of increased stereotyping is indeed a self-regulatory failure, that is, decreased inhibition of stereotypes, rather than stronger activation of stereotypical associations in older age. This is because already mentioned research that partitioned automatic and controlled processed involved in stereotyping, suggests that young and older people do not differ in automatic processes of stereotype activation but older adults demonstrate weaker inhibition of stereotypical associations (Gonsalkorale et al., 2009; T.M. Hess et al., 2009; Stewart et al., 2009). We believe, this issue, however, require further studies.

[1] We are grateful to Rex Wright for drawing our attention to this issue.

Conclusions

In this chapter, we presented a framework which, we believe, helps in understanding increased stereotyping in older age and could guide research to understand the phenomena in the future. Earlier studies suggested that cohort differences cannot explain the increase in stereotyping and age-related changes in cognitive abilities should be taken into consideration. Here we extend these findings by demonstrating an important role of motivation, or its intensity aspect specifically, in stereotyping in older age. The novelty of our approach lies in examining the impact of motivation on the relationship between aging and stereotyping which previously has hardly been tested. We integrated the predictions of Selective Engagement (T.M. Hess, 2014) and Motivational Intensity Theory (Brehm & Self, 1989; Wright, 1996) to predict effort mobilization and performance in social-cognitive tasks. Importantly, we highlight the need to independently assess effort from task achievement. Drawing from Motivational Intensity Theory, we used cardiovascular measures that reflect sympathetic activity such as systolic blood pressure or pre-ejection period, and we suggested extending these measures with capturing parasympathetic withdrawal using high-frequency heart rate variability. Our studies also provided a test of the assumption that stereotyping is the result of a relatively effortless information processing (e.g., Fiske et al., 1999; Wight & Kirby, 2001). The presented research thus advances theories of motivated social cognition and models of stereotyping in older age, in particular.

We demonstrated initial evidence supporting the model, but more work is needed to elucidate the relationship between aging and stereotyping and the role that motivation plays in this relationship. Further research should especially refine the measurement of the activation of the sympathetic activity and consider tasks with different levels of difficulty, unknown difficulty, or where one can choose it. Another avenue would be to focus on other ways to manipulate self-involvement, e.g., including third person evaluation, self-awareness, or importance of values.

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