Body full of language

The relationship between the characteristics of autobiographical memories and the body language of healthy older adults

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Abstract

With growing age, not only changes in cognitions occur, but also in emotions. It is important to facilitate the sharing of autobiographical memories to enhance the well-being of older adults. This partly qualitative and partly quantitative study explored the relationship between characteristics of autobiographical memories and the emotion expression of healthy older adults. Using an adapted version of the Autobiographical Memory Test, 5 participants were asked to recall and share three sad and three happy memories. The memories were transcribed, coded and analyzed. It was found that the vividness and positive valence, compared to the non-vividness and negative valence of autobiographical memories, is related to the emotion expression of the mouth. It was also found that the *vividness* and *positive valence* is less related to the emotion expression of the hands than the *non-vividness* and *negative valence* of autobiographical memories. As there is little research done with these four components, the findings encourage further investigation, taking individual differences and other pitfalls into account to broaden the knowledge about emotion expression in autobiographical memories. These findings can be used as a stepping stone for comparison and future investigation of older adults diagnosed with dementia.

Dutch version of the abstract

Met het ouder worden treden niet alleen veranderingen op in cognities, maar ook in emoties. Het is belangrijk om het delen van autobiografische herinneringen mogelijk te maken om het welzijn van ouderen te verbeteren. Deze deels kwalitatieve en deels kwantitatieve studie onderzocht de relatie tussen kenmerken van autobiografische herinneringen en de emotie-expressie van gezonde oudere volwassenen. Met behulp van een aangepaste versie van de Autobiografische geheugentest werd aan 5 deelnemers gevraagd drie droevige en drie gelukkige herinneringen op te roepen en te delen. De herinneringen werden getranscribeerd, gecodeerd en geanalyseerd. Het bleek dat de levendigheid en positieve valentie, vergeleken met de niet-levendigheid en negatieve valentie van autobiografische herinneringen, verband houden met de emotie-expressie van de mond. Er werd ook vastgesteld dat de *levendigheid* en *positieve valentie* niet meer gerelateerd is aan de emotie-expressie van de handen dan de *niet-levendigheid* en *negatieve valentie* van autobiografische herinneringen. Omdat er weinig onderzoek is gedaan naar deze vier componenten, moedigen de bevindingen verder onderzoek aan, rekening houdend met individuele verschillen en andere valkuilen om de kennis over emotie-expressie in autobiografische herinneringen te verbreden. Deze bevindingen kunnen als een uitgangspunt worden gebruikt voor vergelijking en toekomstig onderzoek van oudere volwassenen met de diagnose dementie.

Introduction

Throughout life, it can happen that we forget. A specific word, a memory, a person, or a misplaced object. This seems to happen to everyone. But with increasing age, other symptoms can occur such as a deterioration in verbal fluency, losing track of time and changes in personality or behavior. Nevertheless, this does not mean that older people are utterly impaired. Research shows that older people share a broad range of emotional displays (Lee, Algase, & McConnell, 2013). Remembering and sharing emotions is important to promote positive feelings, enhance the well-being and integrate those memories into one's identity (Westerhof, Bohlmeijer, & Webster, 2010). With the growing number of older adults, it is important to understand and support not only older adults with cognitive and emotional impairments, but also healthy older adults. By getting older, the perception, regulation and experience of emotions are impacted due to different changes in physiology and psychology (Kremer & Uijl, as cited in Nazareth, Jansen, Truong, Westerhof, & Heylen, 2019). This study will thus focus on the emotion expression of healthy older adults, which can be used as a stepping stone and/or comparison for further research of the emotion expressions of older adults in the range of mental health.

Autobiographical memories

One way to research the expression of emotions is to use autobiographical memories. Autobiographical memories are important personal memories about one's life (Holland & Kensinger, 2010), for example the loss of a significant person, marriage or the first job. These memories from critical periods in the past are often self-defining and form a sense of identity in the long term (Conway, 2005). Furthermore, maintaining and sharing meaningful memories facilitate the overall well-being of especially older adults (Habermas & Köber, 2015), as it affects the physical and mental health (Bluck & Alea, 2009, Westerhof & Bohlmeijer, 2014).

It is not just important to research how well individuals remember their past, but also why they remember these memories after a long period of time and what they are using these memories for. According to Bluck, Alea, Habermas and Rubin (2005), autobiographical memories serve three functions. First, the *directive* function in which memories of past experiences can guide or solve present problems and predict future thought and behavior. Second, the *social* function in which autobiographical memories provide material for conversation. This facilitates social interaction and allows us to understand others better (Cohen, as cited in Bluck et al., 2005). Lastly, the *self*-function in which autobiographical

knowledge is influenced by the ability to support continuity and development of the self. The memories are about who one was, is and could be. Individuals use these information to form a sense of identity (Barclay; Conway, as cited in Bluck et al., 2005).

Characteristics of autobiographical memories

Autobiographical memories do not only have several functions, but also various characteristics. In autobiographical memories, a distinction can be made between episodic and semantic memories. Episodic memories are personally experienced events from a specific time and place (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). These are important as they are constructed by emotionally reliving of those specific events and details (Sheldon, Fenerci, & Gurguryan, 2019). According to Conway and Pleydell-Pearce (2000), autobiographical memories are not entirely episodic, but also involve general information about the past, the self and the familiar world of the individual, which is called a semantic memory (Holland & Kensinger, 2010; Levine et al., 2002; St. Jacques & Levine, 2007). An autobiographical memory may thus contain an episodic component such as "I went to the cinema with my son", which is a personally experienced event, as well as a semantic component such as "I enjoy going to cinemas", which is a fact about oneself. Autobiographical memories are often characterized by the emotions experienced at that time, which makes them more memorable than neutral events (Mather, 2015). Additionally, with regard to individuals with dementia, those memories can remain intact for a long time (Elfrink, Zuidema, Kunz, & Westerhof, 2017).

Besides the episodic and semantic characteristics, there are several other characteristics of autobiographical memories. In connection with emotions, the vividness and valence of autobiographical memories can be for example explored. Vividness has been studied a lot and a strong correlation between vividness and emotions is often found. Reisberg, Heuer, Mclean, and O'Shaughness (1988) found that vivid memories are highly correlated with emotional intensity. This means that vivid memories are likely to be remembered, when the events evoked strong emotional feelings. Vivid memories are very clear and contain many emotional and sensorial details, such as visual, smell or taste, as well as contextual details such as location and time of the specific event (D'Argembeau, Comblain, & Van der Linden, 2003, Mather, 2016; Reisberg et al., 1988; Talarico, LaBar, & Rubin, 2004). The characteristic valence also plays a key role in emotional memories. Valence indicates the degree to which the specific memory is perceived positive or negative. The event, the emotional experience in the past and the emotional experience at the time of memory retrieval can either be attractive, which resembles positive valence, or aversive, which is negative valence. Valence influences the nature of our

memories and how likely they are going to be remembered (Frijda, 1986; Mather, 2015; Sutin & Robins, 2007).

These two characteristics of autobiographical memories are often studied together. According to some studies, memories with a positive valence are recalled more vividly and detailed than negative ones (D'Argembeau et al., 2003; Lindeman, Zengel, & Skoweonski, 2016). This leads to the conclusion that positive memories contained more sensorial and contextual details. Furthermore, remembering and sharing a positive and vivid memory can facilitate emotional well-being (Bluck & Alea, 2009). Further research of vividness and valence is thus relevant for a better understanding of the expression of emotions in association with the well-being of older adults. Until now, we looked at the relevance of autobiographical memories and its characteristics. The next paragraph will focus on the relevance of emotion expressions.

Emotion expression

"Everyone has their own ways of expression. I believe we all have a lot to say, but finding ways to say it is more than half the battle." (Jami, 2011). Emotional expressions are involuntary signals that provide information about the emotional state of an individual (Ekman, 2004) and as the quote indicates, words are not always the most important in expression. Expressing emotions physically is relevant as they play an integral part of social interaction by informing others how we feel and affect the social outcomes (Vosk, Forehand, & Figueroa, 1983). Through the expression of the emotions, the individual communicates information about the emotional state and gives us the opportunity to give meaning to specific moments (Mozziconacci, 2002; Scherer, 2005). According to Ekman and Friesen (2003), when we are looking at our conversation partner, we gather at least four sources of information visually, namely the face, the tilts of the head, the total body posture and the skeletal muscle movements of the arms, hands, legs and feet. These sources can tell us something about the emotions of our conversation partner. A smile can for example stand for pleasure, a raise of the eyebrow skepticism, or when someone is surprised, the eyebrows appear curved and high, the eyes open wide and the jaw drops open, parting the lips (Ekman & Friesen, 2003; Lhommet & Marsella, 2014).

Most of nonverbal communication is often called body language, which includes facial expression, posture, and gestures that differentiate between the spoken words of a person and our understanding of their information. The position of the hands and arms can for example communicate specific emotions, as well as movements of the eyes, a smile or the style of sitting and standing. When looking at the posture, happiness can for example be expressed through

open or moving arms or the feet pointing to something or someone of interest. Sadness on the contrary, can be expressed through a shrunken body, bowed shoulders, or hands that are closed or kept lower than their normal positions (Noroozi, Kaminska, Corneanu, Sapinski, Escalera, & Anbarjafari, 2018). Noroozi et al. (2018) presented a new comprehensive survey on emotional body gesture recognition to exploit body languages. They described in their survey how emotions can be recognized technically and what cultural and biological differences there are.

Not only the body, but also the voice is part of our nonverbal communication. The voice intensity can for example be analyzed, the speech rate or pausing to get information about the emotional states of the speaker. The pitch intensity might increase for happiness or decrease for sadness (Laukka, 2004; Juslin & Scherer, 2008). Considering the scope of this research, the focus will only be on the body language.

Research

This research will focus on two nonverbal expressions, one facial and one bodily expression. In the context of this study, in which participants will be asked to share happy and sad memories, the movement of the mouth corners and the movement of the hands will be focused on, next to the autobiographical characteristics vividness and valence. Happy facial expressions for example, often come with a smile, which is mouth corners up (Eisenbarth & Alpers, 2011; Givens, 2006). According to De Gelder (2009), when looking into the literature on emotions, about 95% of the literature is about the face as a source of emotion analysis, although bodily expressions are as important as facial expressions. A difference between those two types of expressions is that we tend to refer someone's mental state based on the observing of the facial expressions, whereas with bodily expressions, we refer to the person's actions. When trying to read the face does not work, focusing on the body can help telling the other's emotional state (De Gelder, 2009).

After the face, the hands are one of the richest source of body language information (Pease & Pease, as cited in Noroozi et al., 2018). According to Beattie (2016), people make hand movements when they talk, and those hand movements often communicate more than they intend. There are studies that have found significant differences between emotions and different types of hand movements. Lateralized hand movements for example, often express "active" emotions, such as anger and interest. Opening and closing hands is also typical for "active" emotions, such as anger, joy or fear. Affective states can be thus distinguished by the movement of the hands and often, certain emotions in hand movements are recognized correctly by other

individuals (Hietanen, Leppänen, & Lehtonen, 2004; Karg, Samadani, Gorbet, Kühnlenz, Hoey, & Kulić, 2013; Wallbott, 1998).

Looking for studies on the hand or mouth movements alone, or on vividness and valence, a variety of literature can more or less be found, but as there is not much literature on vividness and valence in relation with hand and mouth movements, this research will explore the relationship of those four concepts. According to Barrett (2006), vividness and valence are valid measurements for emotion and there are several coding systems that describe the facial and bodily movements. The research question reads as follows: "**How is the vividness and valence of autobiographical memories related to features of the body language of older adults?**". It is expected that:

1. Vivid memories are related to more mouth turning up in frequency compared to non-vivid memories
2. Vivid memories are related to more expressed hand movements in frequency compared to non-vivid memories
3. Positive memories are related to more mouth turning up in frequency compared to negative memories
4. Positive memories are related to more expressed hand movements in frequency compared to negative memories

Methods

Design

This partly quantitative and partly qualitative study is part of a larger study in which a novel way of using autobiographical memories is introduced to study emotional expressions in older adults (Nazareth et al., 2019). Interviews were conducted to collect the data of the participants and they were divided into two sessions. This study focused on the second session, in which a digital life story book was used with pictures and short verbal prompts, that are related to the participants' recollected memories from the first session. Those were used to stimulate conversations and elicit emotions and expressions about their previously mentioned happy and sad memories in greater detail (Nazareth et al., 2019).

Participants

In total, 23 Dutch participants took part in the larger study. Due to time limitation, the current study is based on the data from 5 participants (4 female, 1 male). The participants were aged between 66 and 81 years (M=71.6; SD=5.39) and were recruited through advertisements in local newspapers. Inclusion criteria were the minimal age of 65 years, corrected vision and or hearing and fluent speaking and reading in Dutch. Exclusion criteria were memory problems, traumatic experiences and a pacemaker (Nazareth et al., 2019). The interviews were mostly conducted at the participants' home, in which they were expected to feel the most comfortable.

Materials/Instruments

Autobiographical Memory Test (AMT)

Before the first session, the data of the participants were collected by using a revised version of the Autobiographical Memory Test (Williams & Broadbent, as cited in Nazareth et al., 2019), which is a word association task that elicits emotional memories by using cue words. The practice words that were used before the actual start were "bread" and "grass". Then, the cue words that were used in the first session were happy and sad.

Life Story Book

During the second session, a personalized digital life story book was constructed for each participant. It included pictures and cue words from the recollected memories of the first session (Nazareth et al., 2019). A picture of a teddy bear could for example be seen, when the recollected memory from session one was about a teddy bear. The data in this current study is

based on the second session in which the life story books were used to stimulate dialogues about the emotional memories and to elaborate them in depth.

Multi-modal Recording Setup

The setup of the second session contained three microphones. Two of them separately recorded the participant and the researcher who conducted the interviews. The other shotgun microphone recorded the whole conversation. Furthermore, three Panasonic camcorders were used. The first recorded the participant's face, the second recorded the participant's body and the third camera focused on the researcher. For this research, the first camera was used to code the participants' mouth movements and the second camera was used to code the participants' hand movements. Lastly, a tablet was used to present the life story book to the participants.

Procedure

The study was approved by the BMS Ethics Committee of the University of Twente (Nr 107426). Prior to the data collection, the participants signed an informed consent form. The data collection was mainly done at the participants' home and consisted of two sessions. In the first session, participants were asked to recall three sad memories and three happy memories and in the second session, they were asked to elaborate more on those memories. Life story books in the second session were used to elicit positive and negative emotions. By using them, emotional memories could be questioned in more detail. Through video recording the participants' face and body, the emotion expression in the body language could be observed. The full procedure can be found in the paper of Nazareth et al. (2019).

Analysis

All memories were transcribed in the computer program *Praat* (Boersma & Weenink, 2011). While transcribing, the emotional memories were chunked into fragments with a specific topic. For example, if a participant recalled the sad memory of the death of a loved one, specific topics could be the news about it, the own reaction and the funeral. There were 138 fragments in total. After transcribing and fragmenting the audio files, the vividness and valence of the participants' autobiographical memories were coded based on the transcripts, with the help of the coding scheme in Appendix A (Leimkötter, 2019).

For the coding of the body language, the nonverbal expression coding scheme from Lambert (2012) was used (Appendix B). Lambert aimed to replicate the findings of Roisman, Tsai, and Chiang (2004) by using this more feasible and easily accessible, novel nonverbal

expression coding system. Compared to other nonverbal coding schemes like the Facial Action Coding Scheme (Ekman, 1997), this one does not require extensive and time-consuming training to utilize. Lambert's coding scheme does not only include facial expressions such as eyebrow movements, the direction of the eyes and the turn of the mouth, but also body expressions such as hand and arm movement, bending of the neck, movement of the shoulders and the posture (Lambert, 2012). While the nonverbal expressions are observed, the frequency can be indicated in the next column. For the sake of Lambert's study, the coding scheme is much more extensive, but due to time limitation this study only focused on two of the nonverbal expressions, namely the up and down movements of the mouth and the hand movements. The guidelines for these two nonverbal expressions can be found in Appendix C.

The coded "Mouth up", "Mouth down", and "Hand movement" were thus used and within each fragment, the mouth and hand movements were counted and then coded. Even though the hypotheses do not include mouth corners down, but only mouth corners up, the "Mouth down" movements were nevertheless coded to make a contrast between the different mouth movements. For the mouth codes, the video recordings of the participants' faces were used, and for the hand codes, the video recording of participants' hands.

Analysis with SPSS

To see whether there were individual significant differences in vividness, valence, mouth and hand movements, chi-square tests were conducted in SPSS. Also, an independent samples t-test was conducted to look at and compare the descriptive statistics of the independent variable vividness and the dependent variable body language. Then, a One-Way ANOVA was conducted to find out the descriptive statistics and if there are significant differences between valence and body language. Lastly, a Tukey post-hoc test was conducted to see where exactly the differences lie.

Results

Autobiographical characteristics

138 fragments out of 26 autobiographical memories were created. The frequency of the characteristics of autobiographical memories vividness, valence and body language is distributed in Tables 1 to 4. In Table 1 it can be seen that 98 fragments were vivid, which is the majority of the 138 fragments. Out of the five participants, participant 18 and 21 described their memories vividly more often than the other three participants. One example of a vivid coding is: *"It was in the evening after 8pm, [son] was in bed, the youngest. [Daughter] the oldest was sitting next to me on the couch and around half past eight screamed out of nowhere "Mom, Dad needs you". So, I walk upstairs, and he lies on the bathroom floor, tried to reanimate him for twenty minutes. Meanwhile no 112 was called but my family doctor and then my daughters were taken care of by the neighbor."* This example was coded as vivid, because sensorial details were described by this participant. She saw her husband in the bathroom, heard her daughter calling and felt her husband by reanimating him. Furthermore, the contextual details who, what, where and when were described.

40 out of 138 fragments were non-vivid, which are almost equally distributed across the participants. One example of a non-vivid coding is: "*No, such things I don't remember clearly, no. Most of the time my wife handles the communication about such things, she is always on the lookout. I don't remember it precisely how yes, he was born shortly before midnight. Had a message in the evening, I don't know anymore. Well, I am not sure about the time aspect no no. But I do know, when we got the message that he was born and everything was okay, yeah then you are jumping for joy as you'd say"* This fragment was coded as non-vivid, because the interviewee asked if the participant could remember the moment when the grandson of the participant was born and the moment when the participant got a call about it. The participant did not remember the exact time and said that these sorts of communications are often handled by his wife. He did remember the feeling, when he heard about the birth. As there were too little sensorial or contextual details described, the fragment was coded as non-vivid.

Table 1.

Number and Percentage of Vividness of all participants

Vividness	P18 (%)	P19 (%)	P21 (%)	P22 (%)	P23 (%)	Total (%)
Vivid	25 (18.1%)	16 (11.6%)	28 (20.3%)	16 (11.6%)	13 (9.4%)	98 (71%)
Non-Vivid	8 (5.8%)	10 (7.2%)	6 (4.3%)	9 (6.5%)	7 (5.1%)	40 (29%)
Total	33 (23.9%)	26 (18.8%)	34 (24.6%)	25 (18.1%)	20 (14.5%)	138 (100%)

Looking at valence in Table 2, about the half of the fragments, which is 70, had a negative valence, especially participant 18 and participant 21 talked about their memories with a negative valence, for example: "*Then I do see a somewhat let's say overlap with my daughter who also does not live the life she should lead. Or the life that she could live. He, of course, also suffered immensely for the last ten years.*". Here the participant was speaking about her daughter, comparing the daughter with the participant's brother. This fragment was coded as negative valence, because the participant indicated that her daughter, as well as her brother, does or did not live a good life.

28 out of 138 fragments were neutral in valence, which means that the fragments were neither clearly positive nor clearly negative. Participant 18 and 19 had the most fragments that were neutral. Lastly, 40 fragments had a positive valence of which participant 21 had the most: "*Well, then I sewed my first dress and cut it all by myself and then lined and sewed it, so it fit very well. Yes, amazing. Princess, for the first time wearing a long skirt or a long dress, it was great.".* This was coded as positive valence, because the participant was telling about her amazing experience of sewing her first dress. She emphasized two times how amazing she found this experience.

Table 2.

Number and Percentage of Valence of all participants

Valence	P18 (%)	P19 (%)	P21 (%)	P22 (%)	P23 (%)	Total (%)
Positive	5 (3.6%)	5 (3.6%)	13 (9.4%)	8 (5.8%)	9 (6.5%)	40 (29%)
Neutral	11 (8%)	9 (6.5%)	2 (1.4%)	4 (2.9%)	2 (1.4%)	28 (20.3%)
Negative	17 (12.3%)	12 (8.7%)	19 (13.8%)	13 (9.4%)	9 (6.5%)	70 (50.7%)
Total	33 (23.9%)	26 (18.8%)	34 (24.6%)	25 (18.1%)	20 (14.5%)	138 (100%)

Table 3 sums up the relationship between vividness and valence. It is notable that most of the vivid memories had a negative valence and that most of the non-vivid memories also had a negative valence. All in all, more than the half of the memories had a negative valence.

Table 3.

The relation of vividness and valence

		Vividness (%)		Total (%)
		Vivid	Non-vivid	
Valence (%)	Positive	31 (22.5%)	9 (6.5%)	40 (29%)
	Neutral	13 (9.4%)	15 (10.9%)	28 (20.3%)
	Negative	54 (39.1%)	16 (11.6%)	70 (50.7%)
Total (%)		98 (100%)	40 (100%)	138 (100%)

To check if there were significant individual differences in vividness and valence, as well as in mouth and hand movements, chi-square tests were conducted. The tests showed that there were no significant individual differences in vividness, X^2 (4, N = 138) = 4.567, p = .335, but significant individual differences were found in valence X^2 (8, N = 138) = 16.456, p = .036. Also, a significant relation was found between vividness and valence, X^2 (2, N = 138) = 10.317, p = .006.

Body language

In Table 4 it can be seen how often the mouth corners of the participants went up and down. Only 15 out of 177 mouth movements went down, in particular participant 18. For participant 19 and 22, no mouth down was coded. This means that the majority of the participants moved their mouth corners up while talking about their memories. Participant 21 and 23 moved their mouth corners up the most. Lastly, it can be seen that the hands were moved 260 times in total, mainly by participant 18 and 22. Furthermore, the movement of the participants' mouth and hands are illustrated in the photos below, that were screenshotted from the videos of the participants.

Table 4.

Number and Percentage of Mouth and Hands Movements of all participants

Body language		P18 (%)	P19 (%)	P21 (%)	P22 (%)	P23 (%)	Total (%)
Mouth	Up	22 (12.4%)	39 (22%)	42 (23.7%)	10 (5.6%)	49 (27.7%)	162 (91.5%)
	Down	10 (5.6%)	0 (0%)	3 (1.7%)	0 (0%)	2 (1.2%)	15 (8.5 %)
	Total	32 (18%)	39 (22%)	45 (25.4%)	10 (5.6%)	51 (28.9%)	177 (100%)
Hands		103 (40%)	22 (8.5%)	10 (3.8%)	123 (47.3%)	2 (0.8%)	260 (100%)

Picture 1.

Mouth corners up

Picture 2.

Mouth corners down

Picture 3.

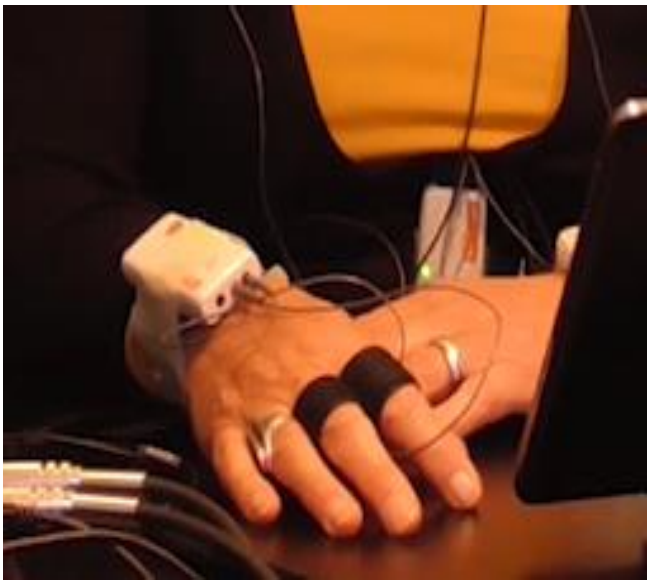
Neutral mouth corners

Picture 4.

Hand movement

Picture 5.

Neutral hand movement



The relationship between the autobiographical characteristics vividness and valence and the body language of the mouth and hands

When comparing the means of vividness and non-vividness, it can be seen in Table 5 that the mean of vividness was in every relation to the body language (for example, movements of the mouth and hands), higher than the mean of non-vividness. At the first sight, the mean score of hand movement and vividness seemed to be the highest. Table 5 also shows that there was a

significant difference in the scores for vividness and non-vividness in mouth up, $t(136)=2.35$, $p = 0.020$). Hypothesis 1 "*Vivid memories are related to more mouth turning up in frequency compared to non-vivid memories*" can thus be confirmed.

However, there was no significant difference in the scores for vividness and non-vividness in mouth down, $t(136)=1.07$, $p = 0.288$ and importantly, no significant difference in the scores for vividness and non-vividness in hand movement, $t(136)=1.23$, $p = 0.222$. Hypothesis 2 "*Vivid memories are related to more expressed hand movements in frequency compared to non-vivid memories*" is therefore rejected.

Table 5.

Comparison between vividness and non-vividness in relation to the body language

	Vividness	N	Mean	Std. Deviation	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference
Mouth Up	Vivid	98	1.38	1.73	4.585	.034	2.348	136	**.020**	.703
	Non-vivid	40	.68	1.19						
Mouth Down	Vivid	98	.13	.47	4.805	0.30	1.06	136	.288	.083
	Non-vivid	40	.05	.22						
Hand Movement	Vivid	98	2.05	2.53	.343	.559	1.22	136	.222	.576
	Non-vivid	40	1.48	2.42						

Note. Significance is indicated in bold face.

Looking at Table 6 and 7, the results show that there was a significant difference between the group means valence and mouth up, F(2, 135)=13.13; p = 0.000. Hypothesis 3 "*Positive memories are more related to the mouth turning up in frequency compared to negative memories*" can thus be confirmed.

However, there was no significant difference between valence and mouth down, F(2, 135)= 2.79; p = 0.065 and importantly, no significant difference between valence and hand movement, F(2, 135)=.190; p = .827. Therefore, hypothesis 4 "*Positive memories are related to more expressed hand movements in frequency compared to negative memories*" is rejected. To find out where exactly the difference lied between valence and mouth up, a Tukey post-hoc test was conducted. The post-hoc test showed that there was a significant difference between positive and negative valence (p = .000) and also between positive and neutral valence (p = .005), but there was no significant difference between neutral and negative valence (p = .588)

Table 6.

Comparison between positive and negative valence in relation to the body language

		N	Mean	Std. Deviation
Mouth Up	Positive	40	2.18	2.17
	Neutral	28	1.00	1.33
	Negative	70	.67	1.00
	Total	138	1.17	1.62
Mouth Down	Positive	40	.00	.00
	Neutral	28	.07	.26
	Negative	70	.19	.55
	Total	138	.11	.41
Hand Movement	Positive	40	1.85	2.71
	Neutral	28	2.14	2.48
	Negative	70	1.80	2.42
	Total	138	1.88	2.51

Table 7.

The results of analysis in variance (One Way ANOVA) for the differences in positive and negative valence in relation to the gestures

		Sum of Squares	df	Mean Square	F	Sig.
Mouth Up	Between Groups	58.608	2	29.304	13.134	**.000**
	Within Groups	301.218	135	2.231		
	Total	359.826	137			
Mouth Down	Between Groups	.927	2	.463	2.787	.065
	Within Groups	22.443	135	.166		
	Total	23.370	137			
Hand Movement	Between Groups	2.416	2	1.208	.190	.827
	Within Groups	857.729	135	6.354		
	Total	860.145	137			

Note. Significance is indicated in bold face.

Discussion

Aim of the study

The goal of this study was to research how the characteristics of autobiographical memories vividness and valence are related to features of the body language, that is mouth corners up and down and hand movements of older adults. As there is little research about the relationship between these components, this was a more explorative study, with four explorative hypotheses.

The first hypothesis "*Vivid memories are related to more mouth turning up in frequency compared to non-vivid memories.*" was **confirmed**, as there was a significant difference found between vivid and non-vivid memories in relation to the frequency of the mouth turning up. This means, that there were more mouth up movements in vivid than in non-vivid memories. The second hypothesis "*Vivid memories are related to more expressed hand movements in frequency compared to non-vivid memories.*" was **rejected**, because there was no significant difference found between vivid and non-vivid memories regarding the frequency of hand movements. This means that there were no more hand movements in vivid than in non-vivid memories. The third hypothesis "*Positive memories are related to more mouth turning up in frequency compared to negative memories.*" was **confirmed**, as there was a significant difference found between positive and negative valence in relation to the frequency of the mouth turning up. Here, there were more mouth up movements in positive than in negative memories. Additionally, the post-hoc test showed that a significant difference was found between positive and negative valence and also between positive and neutral valence in mouth up movements. Lastly, the fourth hypothesis "*Positive memories are related to more expressed hand movements in frequency compared to negative memories.*" was **rejected**, because there was no significant difference found between positive and negative valence regarding the frequency of hand movements. This means that there were no more hand movements in positive than in negative memories.

Interpretation of the results

The results suggest that vivid and positive memories have an effect on the frequency of the mouth turning up. This means that the participants turned their mouth up more often, when their memories were vivid or positive. The participants might have remembered a happy memory, which is a strong emotional memory and that led to the mouth turning up, resulting into a smile (Ekman & Friesen, 2003; Lhommet & Marsella, 2014). The result that vivid memories had an effect on the mouth turning up is in accordance with the research of Bluck and Alea (2009) and D'Argembeau, Comblain and Van der Linden (2003), in which vivid memories contained more sensorial and contextual details than non-vivid memories.

Hypothesis 2 and 4 were unexpectedly rejected and even though there were a lot of hand movements in total, this did not mean that the participants mostly used their hands while telling positive and vivid memories. While talking about negative or non-vivid memories, the hands moved a lot too. According to Beattie (2016), we are not so much aware what our hands are communicating, but they reflect our thinking. With little conscious awareness, it is as if we are programmed to make hand movements while we are talking. This might be the reason, why the participants not only moved their hands when telling happy or vivid memories, but also when telling negative or non-vivid memories. It might not make a big difference. Additionally, individuals do not use their hands only to express emotion, as for non-vivid memories, even a "I don't remember" can contain a hand movement or telling a memory with negative valence can thus be equally frequently accompanied with the hands. All of this differs from individual to individual and considering these reasons, the validity of the measures of the hands movements could have been influenced, thus leading to the rejection of hypotheses 2 and 4. To ensure a valid and reliable measure, it is important that the coder takes special care and attention to the following of the hand movements guidelines (Appendix 3) and does not misinterpret hand movements, that are not related to the coding rules.

The distribution of the results is rather skewed, the mouth corners of the participants for example, turned up a lot more than they turned down. Also, more than the half of the fragments had a negative valence as can be seen in Table 2. The individual differences are sometimes equally distributed, but there were also a few cases in which one participant in particular mainly contributed to the result, for example the mouth corners of participant 18 turned down the most, while the mouth corners of two other participants did not turn down at all, as can be seen in Table 4. The same for the hand movements of two participants, which contributed almost to the half of the total of the hand movements, while other participants contributed minimally to the total of the hand movements. These individual differences will be discussed further under the limitations of this study.

Limitations and Strengths

Limitations and improvements

One already mentioned limitation of this study is the individual differences. The individual differences are in some results huge and could therefore have had a great influence on the results. This poses a new question, that if the study was conducted again with other participants, will there still be for example more negative vivid memories than positive vivid memories? It is expected that individual differences have a great influence on what memories the individuals

have made, what memories are recalled (Bluck & Alea, 2009) and how often the individuals use their body language. This would mean that the result of this research could continuously change, depending on the individuals. It is thus recommendable to conduct this research with a greater number of participants, not only 5 participants, for a less skewed distribution and to better generalize the findings.

Another one of the main limitations is that the hands of the participants could not always be fully seen, because sometimes the life story book or the cameras would be in front of the hands. Nevertheless, if there was movement – for at least one second - the shadow or little parts of the hand could for example be seen, or other parts of the body, which were not blocked by the life story book or cameras, were moving as a consequence of the hand movement. It is thus recommended to have a different positioning of these devices so that the hands can always be fully seen. Another recommendation is to improve the current coding scheme, which should take this limitation into account, for example by coding it differently or noting that the hand could not be fully seen and that other areas had to be relied on to code the expressions (Kring & Sloan, 1991).

A further limitation is that there are different types of smiles with a different meaning (Ochs, Niewiadomski, & Pelachaud, 2010). Not every smile symbols happiness. Participants also smiled when they were talking about sad memories. This can be taken into account by studying the different types of smiles first and then improving the coding scheme with more codes in relation with the smile, for example a “sad smile”, “embarrassed smile” etc. In relation to the coding of the mouth, very little mouth down movements were found. It was easier to code the mouth turning up as that is easier and faster expressed. Mouth corners down are in contrast difficult to code, as the mouth does not necessarily move down, but when for example something sad is recalled, the participant would start to cry and the mouth corners did move a little, but not completely down. This should be taken into account by adjusting the coding scheme, for example “Mouth movements in combination with tears”.

Also, a limitation related to the characteristics of autobiographical memories is that the coding of vividness and valence happened through only one observer. The movement of the body is easier to detect, than the characteristics of a memory, which also requires interpretation and relying the interpretation on only one observer, might lead to low inter-rater reliability and less consistency. It is thus important to have more than one researcher who is interpreting the results, so the consistency of coding and interpretation of the results is not dependent on only one person.

Due to the time limitation another important emotional expression could not be focused on in this study, namely the voice. According to Ekman and Friesen (2003), the face is one of the primary emotional expressions and the voice is the other, as we rely on what we see and hear while having a conversation. By coding vividness and valence using only the text, other important nonverbal expressions might have been missed. By taking not only body gestures into account, more valid results will be achieved, as both the body gestures and voice can tell us more together than only the body gestures or only the voice.

Strengths and future research

Despite the limitations, this study covered several topics, which were not researched together before, which are vividness, valence, mouth and hand movement in autobiographical memories in older adults. These topics together are relatively unresearched, so this study could be used as a stepping stone to better understand the relationship between those topics and might be used as a basis for further research. As this study focused on healthy older adults, the results could be of interest for future research with people with dementia. A comparison could be made between healthy older adults and older adults with dementia. By observing the body language and characteristics of autobiographical memories, inferences can be made about the well-being and also enhance the well-being by reinforcing the components that lead to more well-being. Furthermore, it would be interesting to research the difference between women and men. There was one male participant and four female participants, and it was notable that the male participant barely moved his hands while talking about his autobiographical memories. Future research can explore if gender has an influence on emotion expression or autobiographical characteristics.

By researching vividness and valence in relation to mouth and hand movements of older adults, insight could be gained, especially into the hand movements in relation to autobiographical memories of older adults and how positive memories influence the mouth expressions of older adults. Nevertheless, it is scientifically relevant to further explore vividness and valence in relation to mouth and hand movements, as there is little to no literature about these four components. More insights and values about these components can be gained by studying them more intensively and also with other components, for example the voice.

Practical implications

Furthermore, the findings of this study can be used in positive psychology interventions. As the results showed, vivid and positive memories have an effect on mouth movements up. Mouth

movements up indicate most often a smile and considering the therapeutic effect of smiling (Abel & Hester, 2002) and also the different types of smiling and its effects, a recommendable follow-up research related to positive psychology and this study would thus be to research only positive memories in relation to body language. By sharing positive memories, positive emotions are promoted, and the well-being can be enhanced (Westerhof, Bohlmeijer, & Webster, 2010). Also, in connection to dementia, the positive effect can be researched of asking older adults diagnosed with dementia about their positive autobiographical memories and to investigate how this positive effect is expressed in their body language. Results that speak for sharing positive memories and expressing those through the body, can have a continuous value on the well-being. Another practical way to extend this research and also with regard to positive psychology, is the contribution of the research combined with the use of technology. With the increase of Artificial Intelligence (AI), in the range of mental health, analyzing the emotion expressions through the body language can make it easier for AI to recognize and interpret emotions correctly and therefore provide better healthcare.

Conclusion

All in all, it can be said that the vividness and valence of autobiographical memories is related to the mouth movements of older adults. There were a lot of hand movements in general, independent of the vividness and valence of autobiographical memories. This explorative study took the first step to investigate these four components together. It is important to take the limitations and improvements into account and to further research in this area. Even though we are not always consciously aware about our emotion expressions in the body language, our body does communicate a lot and it is thus important to take a closer look.

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Appendix A

Table 8

Coding scheme of vividness

Vividness		
Type	Key criteria	Example
Vivid	sensorial detail (see, hear, feel, smell) and/or contextual detail (who, what, where, when, why)	"Maar ja de vrouw die dat leidde, ja die die was daar heel coulant in en zei oké dan gaan we kijken of het tempo kunnen aanpassen en omdat we kampeerden vrij, dus we hadden geen etappes te lopen maar we konden dat ook makkelijk aanpassen. Ja was dat voor mij helemaal nieuw en als we tussen de middag als we weggingen elkaar maar door een dorpje dan gingen wij lekkere kaasjes kopen en brood en dan tussen de middag met een kleed neergelegd en iedereen nam wat uit zijn rugzak en dan was er heerlijk maaltijd en daar werd flink de tijd voor genomen en daar kon je lekker gaan liggen in de zon als het eh. En als de [plaats] dacht nu moeten we weer verder zei ze nou nu moeten we weer verder en over vijf minuten, en dat is me heel erg bijgebleven, zei niet nu moeten we ongeveer weg, nee dan zei ze over vijf minuten gaan we aanstalten maken om weg te gaan. Dus liet je eerst nog even ja je realiseren oké maar dan kon je nog even vijf minuten rustig blijven liggen en dan je gedachten zetten op verder, dus dat dat vond ik geweldig ja." (P22) "Het was 's avonds na acht uur, [zoon] lag in bed, de jongste. [Dochter] de oudste zat bij mij op de bank en die riep iets voor half negen zo vanuit het niets "Mam pap heeft je nodig". Dus ik loop naar boven en ligt die in de badkamer, heb ik nog twintig minuten geprobeerd hem te reanimeren. Inmiddels heeft er geen 112 gebeld maar m'n huisarts gebeld en dan mijn dochters opgevangen door/dat buurvrouw." (P21)

Table 9

Coding scheme of valence

Valence		
Type	Subtype	Example
Positive	Happiness	"Mijn moeder heeft wel eens verteld als de kinderen op straat speelde dat ik voor het raam mee heen en weer holde maar dat vond ze toch niet zo leuk als ik ook naar buiten ging. Dus ik heb me daar inderdaad een keer aan weten te onttrekken en was helemaal de glorie [lacht] dat weet ik wel. Ja ik geloof niet dat ze me kwalijk hebben genomen dat kan ik me niets van herinneren maar ik moet eruitgezien hebben en ik herinner me nog wel hoe verschrikkelijk zwart en vies het was dat er waren bergen met hele kleine…ja gruis. En ik kan me niet eens herinneren waren natuurlijk meer kinderen, maar dat weet ik ook niet meer [lacht] het was een gek huis [lacht]." (P19) "Nou toen heb ik mijn eerste jurk genaaid maar zelf helemaal geknipt en gevoerd en genaaid dus en daar zat ook nog goed. Ja geweldig. Prinses naartoe voor de eerste keer lange rok aan of lange jurk aan dus ja dat was geweldig." (P21)
Negative	Sadness	"[…] niet omdat het mooi, maar ik bedoel je wilt toch graag nog een aantrekkelijke vrouw zijn. Ze was een heel schattig was heel mooi ja alle jonge meisjes heel mooi maar het was een mooi meisje en met hele leven voor zich maar dat is niet gebeurt. En het ergst is, toen zei de psychiater ja maar als ze nog een jaar of 35 is dan groeit ze er wel een beetje overheen ... het wordt alleen maar erger. Ze is zo eenzaam en heeft helemaal geen vrienden […] maar die meisjes zijn zo andere levens zijn nu 47 hebben kinderen, drukke banen. Dat zijn hele andere levens, dat kan zij ook helemaal niet wisselen dan kan ze niet in mee." (P18) "Dan zie ik wel een klein beetje zeg maar een overeenkomst met mijn dochter en die ook dat leven niet heeft wat ze moet leiden. Dat ze zou kunnen leiden wat het leven wat ze nu leidt. Hij heeft natuurlijk ook de laatste tien jaar vreselijk geleden." (P18)

Appendix B

Table 10

Coding scheme body language sad and happy memories

Sad memory 1		Sad memory 2		Sad memory 3	
Observation	Frequency	Observation	Frequency	Observation	Frequency
Mouth		*Mouth*		*Mouth*	
-Turned ↑		-Turned ↑		-Turned ↑	
-Turned ↓		-Turned ↓		-Turned ↓	
Hands		*Hands*		*Hands*	
-Palm(s) ↑		-Palm(s) ↑		-Palm(s) ↑	
-Palm(s) ↓		-Palm(s) ↓		-Palm(s) ↓	
Happy memory 1		Happy memory 2		Happy memory 3	
Observation	Frequency	Observation	Frequency	Observation	Frequency
Mouth		*Mouth*		*Mouth*	
-Turned ↑		-Turned ↑		-Turned ↑	
-Turned ↓		-Turned ↓		-Turned ↓	
Hands		*Hands*		*Hands*	
-Palm(s) ↑		-Palm(s) ↑		-Palm(s) ↑	
-Palm(s) ↓		-Palm(s) ↓		-Palm(s) ↓	

Appendix C

There are two codes in total to code the mouth corners: Up and Down. Mouth corners up should approximately last at a minimum of one second and typically looks like a small or big smile, with or without visible teeth. It is difficult to code mouth corners down, as the mouth corners typically do not move down while talking. That is why I decided to code mouth corners down, when the participant is for example crying or thinking back about a painful memory and it can be seen that the participant is obviously sad. This should also last at least 1 second and a movement needs to be seen in the mouth. Neutral mouth corners are not coded, as they happen most of the time when the mouth corners are not moving up or down.

As for the hands, the coding is hand movement up and down, two codes in total. It does not matter if one hand or both hands are moving up or down, that will equally count as one movement. All of the movements should last at least one second. The hands up should be raised at least one second and hand movement down means resting of the hands. I excluded left and right hand movement, as this integrates into hand movement up and down.

It is important to note that each participant is different in nonverbal expression. Some have their mouth corners neutral most of the time, even when they smile. So, while watching their videos, I will first look at how often and big they smile (most of the time) and then decide what can count as a smile – in their case –. The same for participants who are naturally bright and smiling, even when recalling sad memories at times. As their mouth corners are thus up most of the time, I would compare how big the mouth corners look when they tell something neutral and when they really laugh or genuinely smile, and I can see a difference. This bigger laugh would count as 1 in frequency. This means that the frequency of the mouth corners up depends on how big or small their smile normally is compared to when they really need to smile, because they are happy or think of something positive. I cannot thus put every participant's mouth corner in one "category", but will look at them individually and decide individually what their mouth corners express. The same goes for the hand movements. There are hand movements, because a story is told and the hands are accompanying this story, and there are hand movements that are not related to telling the story, for example, taking a glass to drink water out of it, yawning or scratching. It is important do differentiate these movements and not code all of them.