

Research Note

Comparing Emotional Facial Expressions Produced During Personal Narrative Discourse by People With and Without Aphasia

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ABSTRACT

Purpose: This preliminary study aimed to (a) determine whether the frequency and intensity of emotional facial expressions during personal narrative discourse are different for people with aphasia (PWA) than for adults without aphasia and (b) explore the relationship between the frequency and intensity of emotional facial expressions and aphasia severity.

Method: Fifty-two participants, including 26 PWA and 26 control participants, were randomly selected from Aphasia Bank, a protocol database with video recordings of both people with and without aphasia. Two video-recorded narrative discourse samples, a stroke/illness story and an important life event story, from each participant were used. Two human coders were trained utilizing a modified Facial Expression Coding System to identify emotional facial expressions according to valence (positive/negative) and intensity (perceptual scale from 1 to 4). Dependent variables included the frequency and intensity of positive and negative facial expressions.

Results: Linear mixed-effects models revealed that female participants produced more positive facial expressions per minute than did male participants. Overall, PWA produced less intense positive facial expressions compared with control participants. Pearson correlational analyses revealed no statistically significant correlation between the severity and frequency or intensity of emotional facial expressions.

Conclusions: During discourse, PWA may produce less intense emotional facial expressions compared with their peers due to allocating more attentional resources toward language production or simply as the result of left-hemisphere damage. Future research should replicate and expand on these findings while integrating tasks specifically designed to elicit emotional facial expressions during discourse.

Emotion, described as “a complex response pattern that is experienced subjectively and most often accompanied by physiological and behavioral changes” (American Psychological Association, n.d., Emotion section), is also a critical aspect of day-to-day communication. Whether recounting a

fun family vacation or describing the heartache of losing a loved one, emotion and language are interconnected. Given this connection, more research is needed to understand how emotion is impacted in people with aphasia (PWA). The present study aimed to determine the impact of aphasia on emotional facial expression during discourse.

Emotional expression has been shown to manifest through different channels, which have been investigated in healthy adults and PWA. These channels include words, prosody, gestures, and facial expressions. In relation to words, both PWA and neurotypical adults have been shown to have more difficulty finding words or naming pictures that elicit an emotional response (Harmon et al.,

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2022, 2023; Schwen Blackett et al., 2017, 2024). Specifically, their lexical retrieval becomes less accurate and slower. For PWA, this interference seems to be especially robust for negatively valenced words or pictures (Harmon et al., 2022; Schwen Blackett et al., 2024). A second channel in which emotion can be expressed is through affective prosody. Leung et al. (2017) found that participants with more severe aphasia were less likely to correctly identify and produce affective prosody. In discussing these findings, they suggested that language deficits caused participants with aphasia to direct cognitive resources toward speech and language production rather than prosody production—a phenomenon referred to as the “distraction defect” (Leung et al., 2017, p. 27). Extralinguistic channels, such as gestures and facial expressions, can also be used to express emotion. Often, these extralinguistic channels of expression are considered a relative strength for PWA (Feyereisen & Seron, 1982). One common explanation for this is the right-hemisphere hypothesis, which argues that PWA maintain their ability to produce facial expressions because emotional processing is right-hemisphere dominant.

Undoubtedly, each of the aforementioned channels of emotional expressivity is important, and all interact in complex ways during everyday communication (Straulino et al., 2023). Understanding a person’s emotional state likely requires information from multiple channels. This may be particularly important for communication partners of PWA who rely on information beyond lexical production to make inferences about the emotional state of their partner with aphasia. Collignon et al. (2008) found that neurologically healthy adults identified emotions better during an experimental task when both dynamic facial expressions (visual) and nonverbal vocalizations (auditory) were available compared with only one of these sources of information. Additionally, if emotional auditory and visual stimuli did not match, partners relied more on visual information to identify the emotion being expressed. Thus, facial expressions may be integral in determining emotion during communication opportunities and should be investigated more thoroughly.

Production of Emotional Facial Expressions in PWA

Perception and/or expression of emotional facial expressions has been shown to vary among several populations. For example, males and females have been shown to differ in their emotional facial expressivity. Specifically, females cry more, smile more, and produce more intense facial expressions overall (Fischer & LaFrance, 2015). Facial expressivity has also been compared between people with right-hemisphere damage and people without brain damage in both posed (e.g., on demand) and spontaneous (e.g., in response to external stimuli) contexts (Borod, 1993;

Borod et al., 1986, 1988). Overall, it has been found that individuals with right-hemisphere damage demonstrate deficits in the frequency and appropriateness of facial expressions produced compared with control groups (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998). People with left-hemisphere damage and subsequent aphasia have been included in many of these studies (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998), but sample sizes have been small (i.e., ranging from seven to 15 participants with aphasia), methods varied, and PWA are generally combined with control groups in analyses to contrast results from a group with right-hemisphere brain damage. Furthermore, emotional facial expressions have rarely been investigated during tasks wherein the participant is actively communicating such as discourse.

The limited evidence available about facial expression in populations with left-hemisphere damage is primarily derived from descriptive statistics about posed facial expressions (e.g., a participant is asked to elicit a specific emotional facial expression such as “sadness”) and spontaneous facial expressions (e.g., a participant’s facial expressivity is observed while reacting to positive and negative picture scenes). This distinction is important as research suggests that emotional facial expressions that are produced spontaneously are likely modulated by the right hemisphere and are less intense and more subtle, whereas those that are posed are likely modulated by the left hemisphere and are more intense and explicit (Ross & Pulusu, 2013; Straulino et al., 2023). This suggests that PWA may show deficits in posed facial expressions but demonstrate relatively intact spontaneous facial expressions. Further investigation is required, however, as participants with right-hemisphere damage have been shown to exhibit less appropriate facial expressions compared with participants with left-hemisphere damage in both spontaneous and posed contexts (Borod et al., 1986, 1988). Furthermore, whether the upper or lower face is involved and which side of the face initiates movement might also provide important information about the intent of emotional facial expressions (Gazzaniga & Smylie, 1990; Ross et al., 2007; Straulino et al., 2023). Overall, there is a need to investigate spontaneous facial expressivity in more naturalistic settings such as during real-life communication (Straulino et al., 2023). This may be especially important for understanding the interaction between language and facial expression production in aphasia.

To our knowledge, only one study has investigated the production of emotional facial expressions of PWA during discourse (Blonder et al., 1993). In this study, seven males with aphasia, seven males with right-hemisphere damage, and eight neurotypical controls were asked to answer various emotional discourse prompts in their homes (e.g.,

“the effects of their illness on mood and communication,” “the importance of religion in your life,” etc.). Participants’ responses were video-recorded, segmented into 10-s clips, and then rated for facial expressivity by three female raters using a 7-point Likert scale (i.e., 1 = *absent* to 7 = *extreme laughs, cries, or fearful yells*). Results showed that participants with right-hemisphere damage exhibited less positive facial affect (i.e., smiling and laughing) compared with the control group. PWA, on the other hand, showed no statistically significant differences from the control group but produced a higher number of laughs (9.05 for PWA and 4.67 for controls) and a lower number of smiles on average (24.38 for PWA and 30.62 for controls). These results suggest that PWA produce positive facial expressions at a similar frequency compared with control groups, but differences in number of laughs and smiles may indicate more nuanced differences between PWA and controls, which warrant further investigation. For instance, it is possible that, although the frequency of positive emotional facial expressions may be similar to controls, PWA may produce more intense displays of positive emotion (e.g., laughs are more intensely positive than smiles). For PWA, emotional language can be difficult (see, e.g., Harmon et al., 2022; Schwen Blackett et al., 2024), perhaps prompting greater reliance on other channels of emotional expression. For example, Borod et al. (1988) found that mean intensity (7-point Likert scale) during a spontaneous facial expression task was higher numerically for PWA ($M = 3.62$, $SD = 0.65$) than for controls ($M = 3.19$, $SD = 0.56$), but the study may have lacked adequate power to identify a statistically significant difference between these groups (15 participants with left-hemisphere damage, 16 controls). Additional research is needed, therefore, to determine whether PWA rely on higher intensity of facial expressions to compensate for verbal language deficits.

Purpose of the Study

Previous research indicates that PWA have spared nonverbal communication, which includes the capacity to produce posed and spontaneous emotional facial expressions in isolation and during discourse (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998). As such, it is possible that PWA use emotional facial expressions to compensate for their verbal language deficits in order to convey emotion. However, more information is needed to understand both the presence and strength of emotional facial expressions exhibited by PWA during emotional storytelling. Thus, the primary aims of the present study were to (a) determine whether PWA exhibit more frequent facial expressions during personal narrative discourse compared with adults who do not have aphasia and (b) determine whether emotional facial expressions produced by PWA during personal narrative discourse are

perceived as more intense than those produced by adults who do not have aphasia. We hypothesized that emotional facial expressions exhibited by PWA might be more frequent and intense to compensate for diminished emotional expression through verbal language. Alternatively, emotional facial expressions might be less frequent and intense due to PWA allocating attentional resources toward verbal production. A secondary aim was to determine whether the severity of language impairment for PWA relates to the frequency and intensity of emotional facial expressions during personal narrative discourse. We suspected that PWA would compensate for language deficits by using emotional facial expressions, and therefore, more severe language impairments would be associated with more frequent and intense facial expressions. It is also possible, however, that severe language deficits require more attentional allocation toward verbal expression, resulting in lower frequency and less intense facial expressions.

Method

The present study used a group experimental design to investigate emotional facial expressions produced during discourse production by adults with and without aphasia. Study procedures were approved by the Brigham Young University Institutional Review Board (IRB) in March 2023 (IRB No. IRB2023-082).

Participants

Video samples from 52 participants were used in the present study. This included 26 PWA and 26 control participants (participants with no diagnosis or history of aphasia) who were randomly selected from AphasiaBank, a protocol database with video recordings of both people with and without aphasia (MacWhinney et al., 2011). AphasiaBank samples were collected by authors who had their own established IRBs and who obtained informed consent from participants, which included their agreeing to have their data shared with the AphasiaBank corpus. Among other tasks, each participant completed two narrative discourse samples, which we judged as likely to contain emotional content: the story of their stroke/illness and the story of an important life event. According to the AphasiaBank protocol, these samples were obtained during a structured interview in which the interviewer asked participants with aphasia to tell about their stroke and recovery (i.e., stroke story) and control participants to tell about a time when they were sick or hurt and how they recovered (i.e., illness story). Subsequently, all participants were asked to share about something important that had happened in their life (i.e., important life event). Interviewers were asked to make the interview natural and conversational but to stick to a script.

This resulted in personal narratives with only occasional follow-up questions or prompts from the interviewer (i.e., more monologic than conversational). The interviewer was, nevertheless, present and engaging with the participant throughout each sample.

Samples were randomized, checked, and excluded if they met any of the following exclusionary criteria: (a) video quality insufficient for visualizing facial expressions due to low pixelation, (b) glass glare, (c) hands covering part of the speaker's face, (d) quality of lighting insufficient to clearly visualize all facial structures, (e) part of the face not visible due to the angle of the camera, (f) video less than 1 min, (i) video not containing one of the two emotional discourse prompts, and (j) significant facial drooping/paralysis or groping due to apraxia interfering with natural facial expression. Facial drooping or paralysis was identified when facial expressions predominantly involved one side of the face rather than occurring symmetrically. Video samples were independently reviewed for the exclusion criteria by both the first author and a research assistant. If either the first author or the research assistant identified any exclusionary criteria in either discourse sample, the associated participant was excluded. This process continued until 26 PWA (13 female, 13 male) and 26 control participants (13 female, 13 male) were included.

The average age of PWA was 61 years, and the average age of control participants was 62 years. A two-way analysis of variance that included group (PWA vs. control) and sex (male vs. female) factors showed no statistically significant difference for age between the aphasia and control groups, $F(100) = 0.08$, $p = .778$, or between male and female participants, $F(100) = 0.002$, $p = .968$. According to Western Aphasia Battery–Revised (WAB-R; Kertesz, 2007) scores, most participants with aphasia had anomic or conduction aphasia and were mild or moderate in severity. Average years of education was 16. Table 1 summarizes demographic and test information for each participant group.

Procedure

Emotional facial expressions during the two narrative discourse samples for each participant, a total of 104 samples, were analyzed using a structured coding process that was based on the Facial Expression Coding System (FACES; Kring & Sloan, 1991, 2007). The FACES protocol is designed for human coders to identify facial expressions according to valence (positive/negative), intensity (scale from 1 to 4), and duration (time start until time end; Kring & Sloan, 1991). The original FACES protocol was intended for coding facial expressions of participants who were performing an observation task (i.e., not talking). Our modified protocol was designed to apply this coding system to emotional facial expressions produced during discourse.

Specifically, modifications included operationalizing what constituted different intensity levels of emotional facial expression and adding “pensive” under positive affect descriptors when determining valence. The full protocol is included as online Supplemental Material S1. Although duration is included in the FACES protocol, it was used as a marker for the beginning and end of each facial expression rather than as a dependent variable.

Using the modified FACES protocol, two female undergraduate research assistants were trained as emotional facial expression coders. Prior to beginning analysis, these two coders were required to reach 70% reliability on practice files. Practice coding was compared with coding completed collaboratively by the first author and two additional research assistants, all who had helped develop the coding protocol. During analysis, coders viewed the video clips through a 27-in. (2,560 × 1,440) Apple computer, a Dell S2421NX 24-in. (1,920 × 1,080) display, a Dell U2410 24-in. (1,920 × 1,200) display, a 15-in. MacBook Pro, or a Dell U2715H 27-in. (2,560–1,440) display. Coders opened the videos through VLC media player (www.videolan.org) and utilized the time extension to code duration up to the millisecond. Coders viewed muted videos in a quiet environment to prevent emotional language from influencing how facial expressions were perceived and coded, which has previously been referred to as “the language context effect” (Liu et al., 2019). Coders were asked to use noise-canceling headphones and were allowed to turn on white noise to eliminate distractions.

De-identified files were randomly ordered and assigned to coders who were blind to the neurological status of the participant and which narrative discourse task they were producing. A checklist was created to help guide coders through the coding process and is included as online Supplemental Material S2. Coders first watched the initial 30 s of each video clip to establish the participant's baseline facial expression. This segment included the moment when the interviewer introduced the discourse topic, which typically provided the clearest example of a neutral or baseline facial expression. Observing this portion allowed coders to calibrate to each participant's unique baseline expression before coding. Coders then coded for 20 min before taking a mandatory 5-min break. After the break, coders watch 30 s of the video again before coding for another 20 min. This cycle repeated for however long their coding session took place (typically about an hour).

Dependent Variables

Dependent variables included the frequency and intensity of both positive and negative facial expressions. Frequency of positively and negatively valenced facial expressions was counted and then divided by sample time to normalize across samples (i.e., number of facial expressions

Table 1. Demographic information.

Neurologic status	Sex	n	Age (years)		Education		Race/ ethnicity	AQ		WAB-R						Word string task	
			M (SD)	Range	M (SD)	Range		M (SD)	Range	Types	Severity	Fluency		Naming			
												M (SD)	Range	M (SD)	Range	M (SD)	Range
Aphasia	Male	13	61 (14)	30–84	17 (3)	12–22	12 WH, 1 HL	70.86 (17.06)	36.8–90.4	4 anomic 1 Wernicke 6 conduction 2 Broca	5 mild 6 moderate 2 severe	14.54 (3.14)	9–19	6.82 (2.76)	0.2–9.3	3.31 (1.76)	1–8
	Female	13	61 (11)	46–90	15 (2)	12–18	12 WH, 1 AA	79.61 (11.62)	64.5–95.0	7 anomic 2 conduction 1 Broca 1 TransSensory 1 TransMotor 1 NABW/latent	1 very mild 6 mild 6 moderate	16.08 (2.58)	11–19	7.26 (2.23)	2.6–9.3	1.62 (.75)	1–3
Control	Male	13	61 (19)	31–86	16 (3)	12–21	13 WH	/	/	/	/	/	/	/	/	/	/
	Female	13	62 (14)	41–87	16 (3)	12–20	13 WH	/	/	/	/	/	/	/	/	/	/

Note. The word string task is included as part of the Aphasia Bank Protocol and accounts for the length (in words) of a word string that the participant can successfully repeat (up to 8). Education = years of education; WAB-R = Western Aphasia Battery–Revised; AQ = Aphasia Quotient; WH = White; HL = Hispanic/Latino; AA = African American; TransSensory = transcortical sensory; TransMotor = transcortical motor; NABW = nonaphasic by WAB-R; / = not applicable or not tested.

produced per minute). In addition to being tagged for valence, each facial expression was rated for intensity on a 4-point scale (1 = *low*, 2 = *medium*, 3 = *high*, 4 = *very high*), which was operationalized based on how many facial units (e.g., eyebrows, lips, teeth) were involved in the facial expression per the FACES protocol. Average intensity was measured by averaging all positive or negative valence ratings per sample.

Reliability

To obtain interrater and intrarater reliability results, 11% or more of the samples were recoded by the original coder and the other undergraduate student coder. Interrater and intrarater reliability results were obtained across the four dependent variables (positive frequency, negative frequency, positive intensity, and negative intensity) using the single-measure intraclass correlation coefficient. Both interrater and intrarater reliability results were good for both measures of frequency ($> .75$). For positive intensity, reliability was moderate to good (between .683 and .786). For negative intensity, reliability was consistently lowest, ranging from poor to moderate reliability. Given this finding, we decided to only analyze and report results for the other dependent variables (i.e., positive frequency, negative frequency, positive intensity). Table 2 contains all reliability results.

Data Analysis

Although duration data were not analyzed statistically, descriptive statistics are reported in the Results section. Linear mixed-effects models were used to predict the frequency of both negative and positive emotional facial expressions (i.e., positive frequency, negative frequency) and the intensity of positive emotional facial expressions (positive intensity). Analyses were completed using RStudio (Version 2025.05.1+513). Models were built using the lme4 package (Bates et al., 2015), with normality and homoscedasticity of residuals checked visually. Visual inspection showed normal distributions and homoscedasticity for positive frequency. Negative frequency and positive intensity, on the other hand, showed violations of slightly skewed distributions, mild heteroscedasticity, or both. We therefore

tested these variables using cluster robust standard errors (CR2) using coefficient tests from the clubSandwich package (Pustejovsky, 2025). Fixed-effects factors included group (i.e., PWA and control) and sex (i.e., male and female) as the factors of primary interest with story (i.e., stroke/illness and important event) included as a control variable. Participant was included as a random effect factor. Significant interaction effects were followed with pairwise comparisons using the emmeans package (Lenth, 2025). Pearson r correlational analyses were used to explore whether aphasia severity was related to the frequency of negative and positive emotional facial expressions, and Spearman rho was used to explore whether aphasia severity was related to the intensity of positive facial expressions. The R script used for analysis is included as online Supplemental Material S3.

Results

The average duration of each facial expression was 2.44 s ($SD = 4.06$ s) across all participants. This average was similar when investigated by group and sex (control: $M = 2.53$ s, $SD = 3.63$; aphasia: $M = 2.23$ s, $SD = 3.95$; male: $M = 2.55$ s, $SD = 5.15$; female: $M = 2.36$ s, $SD = 3.06$). There was also no correlation between duration and intensity ($r_s = -.017$, $p = .903$). Overall, female participants used more positive facial expressions than did male participants, and participants with aphasia produced less intense positive facial expressions than did control participants. Online Supplemental Material S4 includes a coefficient table for linear mixed-effects regression models across all dependent variables.

Frequency

Results showed that, across the aphasia and control groups, female participants used more positive facial expressions per minute than did male participants, $F(1, 47.29) = 6.77$, $p = .012$, $\eta^2 = .13$. No main effect of aphasia or interaction effect was found, indicating no difference in positive facial expressions per minute between the aphasia and control groups. For negative facial expressions per minute, coefficient tests showed no main or interaction effects. These findings are illustrated in Figure 1.

Intensity

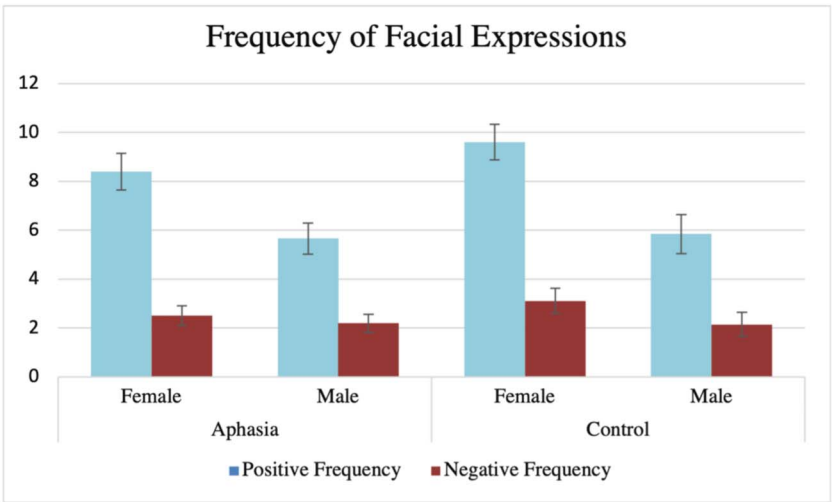
For positive intensity, coefficient tests showed a statistically significant main effect of aphasia, $t(22) = 2.67$, $p = .014$, $b = .25$. Specifically, across male and female participants, control participants produced positive facial expressions that were rated as .25 more intense (scale of 1–4) than did participants with aphasia. No main effect of sex or

Table 2. Interrater and Intrarater reliability results using the single-measure intraclass correlation coefficient.

Reliability	Frequency		Intensity	
	Positive	Negative	Positive	Negative
Interrater	.756	.918	.725	.623
Intrarater (Coder 1)	.931	.955	.786	.639
Intrarater (Coder 2)	.836	.834	.683	.149

Note. Frequency = total number of facial expressions divided by sample time; Intensity = average intensity per sample.

Figure 1. Average frequency of positive and negative facial expressions per minute by male and female participants within the aphasia and control groups. Error bars represent the standard error of the mean.



interaction effect was found for positive intensity. These findings are illustrated in Figure 2.

Severity Correlation

Correlational analyses revealed no statistically significant correlation between the severity of aphasia (WAB-R AQ scores) and any of the three dependent variables: positive and negative frequency and positive intensity. Table 3 contains statistical information for severity correlation.

Discussion

The central purpose of this study was to investigate both the positive and negative frequency and intensity of emotional facial expressions between PWA and control participants during narrative discourse. Previous literature has predominantly focused on the differences in emotional facial expressions between participants with right-hemisphere damage, participants with left-hemisphere damage, and controls. These studies generally showed no difference between

Figure 2. Average intensity of positive facial expressions for the aphasia and control groups. Error bars represent the standard error of the mean.

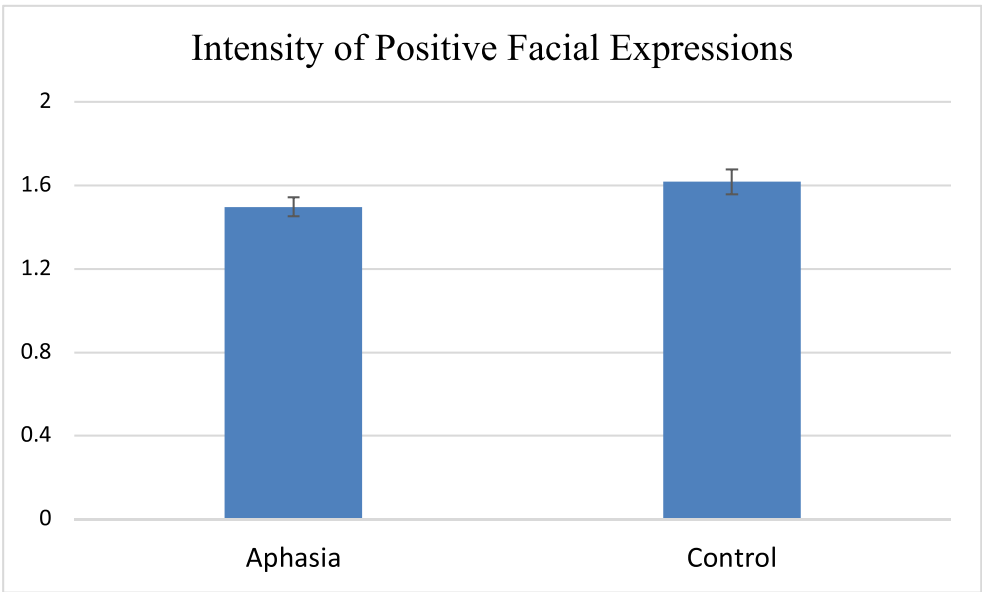


Table 3. Correlational analysis results.

Variable	WAB-R AQ	
	<i>r</i>	<i>p</i>
Positive frequency	-.109	.443
Negative frequency	.025	.859
Positive intensity	-.180	.205

Note. Pearson correlations were used for frequency data, and the Spearman correlation was used for intensity data. WAB-R AQ = Western Aphasia Battery–Revised Aphasia Quotient.

participants with left-hemisphere damage (most of whom also had aphasia) and control participants (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998). Like previous studies, we found that PWA and control participants produced a similar frequency of emotional facial expressions, contributing to the long-standing notion that PWA have spared emotional processing (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998). Contrary to this notion, however, we found that PWA exhibited a dampened intensity of positive facial expressions compared with the control group.

PWA Produce Less Intense Positive Facial Expressions

The less intense positive facial expressions produced by PWA compared with controls suggests that, despite PWA demonstrating relatively spared emotional processing overall (e.g., Blonder et al., 1993; Borod, 1993; Lorch et al., 1998), their language disorder might still interfere with emotional expressivity during discourse. One hypothesis for this is what has been referred to as the “distraction defect” (Leung et al., 2017, p. 27). It is possible that, due to their language deficits, PWA allocate a large amount of cognitive and attentional resources to language production, which, in turn, inhibits the intensity of their facial expressions. This possibility is further highlighted by research showing that left-hemisphere stroke survivors (most of whom had aphasia) experienced reduced emotional expression in word naming and affective prosody (Harmon et al., 2022; Leung et al., 2017; Schwen Blackett et al., 2024). In other words, the dampened intensity of positive facial expressions produced by PWA compared with controls may be specific to linguistic context. Previous research indicating that PWA produce typical emotional facial expressions has mostly focused on posed or spontaneous facial expressions (Borod et al., 1986, 1988; Lorch et al., 1998). For example, previous research investigated facial expressions of PWA either in response to picture scenes that were designed to elicit positive or negative emotions (i.e., spontaneous facial expressions) or when PWA were asked to

deliberately produce specific positive or negative expressions such as “happiness” or “sadness” (i.e., posed facial expressions). Findings from this previous work showed that average intensity as measured by observers who rated each facial expression on a 6-point scale from “minimal” to “maximal” intensity was slightly higher than in controls numerically but not statistically different (Borod et al., 1988; Lorch et al., 1998). In contrast, the present study analyzed spontaneous emotional facial expressions during naturalistic discourse tasks, which may have revealed linguistic interference that had not been shown previously because facial expressions were evaluated during speaking rather than nonspeaking tasks. A related possibility is that, given their language deficits, PWA had more difficulty engaging in the narrative discourse task, which likewise might have decreased the intensity of their facial expressions. Regardless, it seems that PWA have the ability to produce emotional facial expressions (Blonder et al., 1993; Borod, 1993; Borod et al., 1986, 1988; Lorch et al., 1998) but may experience interference in this ability when language is embedded within the emotional facial expression production task.

An alternative explanation is that PWA produced less intense facial expressions because of left-hemisphere damage rather than impaired language. Previous work has suggested that spontaneous facial expressions tend to be less intense and controlled by the right hemisphere and that voluntary facial expressions tend to be more intense and controlled by the left hemisphere (Ross & Pulusu, 2013; Straulino et al., 2023). Although we suspected that the discourse task used in the present study would primarily elicit spontaneous facial expressions, our results may reflect the integration of voluntary facial expressions by control participants throughout the task, which boosted their overall intensity. To experimentally determine whether dampened intensity was caused by PWA experiencing a language deficit or left-hemisphere damage, future research should compare the intensity between left-hemisphere stroke survivors with and without aphasia. It is also possible that impaired motor control could have impacted the intensity of facial expressions. Although we excluded participants with obvious facial asymmetry or weakness, it is possible that some participants with aphasia had impaired oral motor control that contributed to their decreased intensity. Although there was a statistically significant difference in that controls produced .25 more intense positive facial expressions (on a 4-point intensity scale), it is also important to consider the clinical significance of this change. Given the paucity of research in this area, it is difficult to determine what magnitude of change is needed for a difference in facial expression intensity to be detected by a communication partner, making this a potentially fruitful area for future investigation.

Females Produce More Positive Facial Expressions Than Males

The higher frequency of positive facial expressions produced by females provides some preliminary validation of our modified FACES protocol (Kring & Sloan, 1991). Although the FACES protocol was originally designed for human coders to identify facial expressions during an observation task, our modifications applied this procedure to narrative discourse tasks. While using this modified FACES protocol, our findings of higher positive frequency for females compared with males is consistent with previous literature (Brody & Hall, 1993; Fischer & LaFrance, 2015). Females have been shown to be more emotionally expressive, specifically smiling and crying more frequently. This has been explained as being consistent with social display rules that align with gender expectations (Fischer & LaFrance, 2015).

Although the finding that females across groups produced more positive facial expressions than males is consistent with previous literature, the absence of a group difference between sexes for negative frequency was contrary to previous research (see, e.g., Fischer & LaFrance, 2015). It is interesting that this trend held even for PWA who were telling their stroke story, which we anticipated would elicit negative emotions. It is possible that having told the stroke story multiple times or being less vulnerable with an interviewer who they did not know reduced the frequency of negative facial expressions produced by PWA. Given that negative facial expressions were less common, it is possible that a discourse task specifically designed to elicit negative emotional facial expressions could reveal significant differences between sexes, as this would provide a more representative sampling of negative emotional facial expressions. For example, a picture description or story retell task using stimuli that have been validated to elicit negative emotion may be used to examine negative emotional facial expressions more in-depth. This may be especially important in future work as negative displays of emotion tend to be less common than positive displays because they are deemed less socially acceptable (Kauschke et al., 2019).

Despite sex differences, there were no differences between PWA and controls in regard to the frequency of facial expressions produced. This is consistent with previous research, which has found that participants with left-hemisphere damage show no difference in the frequency or appropriateness of emotional facial expressions compared with controls (Borod et al., 1988; Lorch et al., 1998). This is generally consistent with the right-hemisphere hypothesis, which would indicate that PWA have spared emotional processing because it is right-hemisphere dominant. As discussed previously, while overall emotional processing may be spared for this population, they may still experience dampened emotional

expressivity during discourse due to either the demands of emotional processing or cortical control of facial expression intensity (Leung et al., 2017; Ross & Pulusu, 2013; Straulino et al., 2023).

Aphasia Severity and Other Limitations

This study found no correlation between aphasia severity and any of the dependent variables measured (see Table 3). This aligns with frequency findings, which showed no difference in facial expressions per minute for participants with and without aphasia. For intensity, this suggests that, even though the presence of aphasia may reduce the intensity of positive facial expressions, the severity of aphasia was not associated with intensity. Methodological considerations may have influenced these results by unintentionally excluding participants with the most severe aphasia profiles. Specifically, two of the disqualifying criteria when selecting video samples were significant facial groping and video samples that were less than 1 min, which resulted in the majority of our participants falling in the mild-moderate severity range, with most (19/26) presenting with anomic or conduction aphasia. Perhaps changing these criteria would increase the number of participants with severe aphasia and the variety of aphasia types represented, providing more variability in facial expressivity data and increasing power to detect severity correlations.

In addition to criteria that may have excluded some participants with severe aphasia, additional limitations provide insights that could guide future research. First, adequate reliability was not achieved for negative intensity. Upon inspection of the data, we learned that low reliability in negative intensity (especially for Coder 2) was driven by samples that contained very few negative facial expressions, thus making the weight of each rating more influential than for positive intensity ratings. Adjustments should be made to the modified FACES protocol to better operationalize negative intensity ratings for higher reliability within and between coders (Kring & Sloan, 1991). For example, a smile with teeth was identified as a positive 3 intensity; however, no equivalents were made for negative intensity. Relatedly, given the time demands associated with the coding procedure, we only obtained 11% overlap or more for reliability analysis. This also contributed to some of the low reliability values, as there were few samples for comparison. Future research would benefit from 20% overlap or more to better represent reliability data. Second, participants for this study exhibited a wide range of both aphasia type and severity, which introduced higher variability within our sample. It is possible that our results would have been different if sampling were more homogeneous, as specific types or severities of aphasia would have introduced less variability.

Conversely, increased homogeneity in our sample would also limit generalizability. Future research could consider (a) including more participants with severe or nonfluent aphasia types to increase generalizability or (b) focusing on a specific type or severity of aphasia to understand implications for a more specific group. Either of these approaches could result in different outcomes from those of the present study. Third, this study utilized discourse samples taken from AphasiaBank. A strength of this approach was that it provided an opportunity to investigate facial expressions in a naturalistic communicative context, which is needed across facial expression research more broadly (Straulino et al., 2023). This approach also led to multiple challenges. First, because an interviewer was present and engaged during each narrative discourse sample, facial mimicry and emotional contagion may have influenced our findings (Hirsch et al., 2023). Relatedly, rather than attempting to determine the intent of each expression coded (e.g., emotional or communicative/pragmatic), we considered all emotional facial expressions as having an inherently communicative function (Scarantino, 2017). It is possible, nonetheless, that some of the coded facial expressions were communicative but not emotional (for different perspectives on this topic, see Parkinson, 2005; Scarantino, 2017). Second, although these discourse tasks were thought to contain some degree of emotional content, the tasks were not necessarily designed to be emotional. Although the personal nature of a stroke story may elicit more emotional responses than other discourse tasks (e.g., picture description), future research is needed to validate findings in a variety of contexts. Because this study demonstrated less negative frequency, higher negative frequency data overall would create a better detailed understanding of negative intensity. As such, future studies should consider collecting emotional discourse samples (e.g., tasks specifically designed to elicit positive or negative emotional facial expressions) to gather more detailed information about how emotional discourse impacts emotional facial expressivity in aphasia. Fourth, future research should move toward understanding emotional expression in more ecologically valid contexts. One consideration is how closely the samples observed mimic everyday communication contexts. For example, it is likely that a structured interaction between a clinician/researcher and a participant would lead to more measured emotional responses compared with an unstructured or spontaneous interaction between a participant and a familiar communication partner. Future work, therefore, should investigate emotional facial expressions during conversations between PWA and a spouse, friend, or family member. An additional consideration is the various channels used to produce emotional expression (see, e.g., Feyereisen & Seron, 1982; Leung et al., 2017). Although we intentionally isolated facial expressions in the present study because we were interested in understanding the

unique impact of this channel, emotional expression during everyday communication relies on the combination of multiple channels (e.g., word production, prosody, facial expressions, and gestures). Future work is needed to understand the impact of each of these channels in isolation and combined.

Conclusions

This study found that female participants used more positive facial expressions than did male participants and that participants with aphasia produced less intense positive facial expressions than did control participants. These preliminary findings suggest that PWA allocated more attentional resources toward language during emotional discourse tasks, resulting in less intense facial expressions when compared with control participants. Although aphasia is a language impairment, other aspects of communication beyond language might be impacted, including the intensity of positive facial expressions, which could have important implications for both how PWA are perceived by communication partners and holistic communication assessment. Collignon et al. (2008) argued that communication partners judge emotions more by facial expressions than by words—especially if the two are incongruent. It is possible that this is even more likely in PWA due to impaired word retrieval. Thus, if their facial expressions are less intense, it could be easier for communication partners to assume that they are less sad or excited than they are. Additionally, holistic assessment may include at least informal observation of extralinguistic communication such as gestures and facial expressions (Doedens & Meteyard, 2020). This is appropriate as PWA continue to use both positive and negative emotional facial expressions when communicating, which can supplement their overall communication. Clinicians, however, should be aware of a potential trade-off between verbal expression and facial expression intensities.

Data Availability Statement

This study utilized video samples of aphasia and healthy adults from AphasiaBank (<https://aphasia.talkbank.org/>). Facial coding data sets are available upon reasonable request to the corresponding author.

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