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APPLIED COGNITIVE PSYCHOLOGY DOCTORAL SCHOOL

Summary of Ph.D. THESIS

ECHOES IN THE MIND: THE ROLE OF AUDITORY IMAGERY IN POETRY-ELICITED EMOTIONS

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TABLE OF CONTENTS

1. INTRODUCTION

Although poetry was spoken and listened to for most of its history, our typical encounter with it today is a silent one. Without implying that meaning-making isn't important, the present thesis will focus on the sound of poetry, how we access it in silent reading (i.e., as auditory images), and its emotional consequences.

1.1. How Are Emotions Elicited?

Appraisal theories contend that emotions are consequences of evaluating events on several dimensions (e.g., relevance, congruence, effort, controllability, etc.) and in relation to current goals (for an overview, see Moors et al., 2013). These offer an elegant explanation for how most of our day-to-day emotions arise, as well as suggest a possible function of emotion: when something happens that challenges or facilitates our goals, emotional responses (i.e., physiological, cognitive and behavioural changes) prepare us to take necessary action. If we presume that imagined situations are appraised in a similar fashion (Gross, 2014), they additionally explain why we feel emotions in response to the memory of an event or the imagined development of an event. Appraisal models are, however, less useful in explaining other instances. Empathy begins and ends with an emotion: we empathise with someone when we recognise what they feel and consequently have a similar emotion to theirs (the most conservative definition of empathy, as per Cuff et al., 2016). A case for appraisal mechanisms here can be made only if we stretch what we mean by "relevant" or "current goal". Since empathy is often described as "putting yourself in another person's shoes", it may occur because we are temporarily borrowing their goals and assumptions to evaluate the situation that they are in. But what about instances where there is no discernable situation to appraise? Ample empirical proof that instrumental music induces emotions in listeners (for a

review, see Eerola & Vuoskoski, 2013) can only be partially explained by empathising with the performer or composer (e.g., Miu & Balteş, 2012) and models of music-elicited emotions need to appeal to other eliciting mechanisms to interpret these results (e.g., the BRECVEMA framework; Juslin, 2013). Some ascribe to Zajonc's view that sensory stimulation can be sufficient to trigger an emotional response (Zajonc, 1984). One example is emotional contagion: unknowingly and unintentionally "catching" another person's affective state, here thought to rely on copying sensori-motor representations underlying speech prosody that musical instruments mimic (Juslin, 2013).

1.2. How Does Language Elicit Emotions?

Neither psycholinguistics nor affective sciences have taken, traditionally, a particular interest in studying how language elicits emotions. Studies are few and largely use single-word stimuli, such as taboo or reprimand words (e.g., Harris et al., 2003) or short, isolated sentences (e.g., Bayer et al., 2010). The young field of affective neurolinguistics has yielded mixed results so far, which is partially symptomatic of an urgent need for cohesive theoretical models to guide research. To the author's knowledge, the Affective Language Comprehension Model (ALC) is the only comprehensive framework that aims to explain how natural language evokes emotions (Van Berkum, 2018, 2020). It proposes that an utterance can generate emotional responses on multiple, nested levels: (1) when recognising and parsing signs (i.e., recognising words, idioms and prosodic cues, semantic parsing), (2) when interpreting the speaker's referential intention (i.e., what is the situation the speaker is referring to?), stance (i.e., what does the speaker think and feel?) and social intention (i.e., what does the speaker want me to know or feel?), and, finally, (3) when inferring "bonus" meaning from the utterance (i.e., meaning that the speaker did not explicitly convey). Consequently, emotions elicited at one stage might inform those elicited at a later stage. The

model does not make a separate case for reading, but a few assumptions can be made. In a text, prosodic information is absent, as well as many other non-verbal cues not previously discussed (e.g., facial expressions, touching). At first glance, this could make it more difficult to assign stances and intentions, lessening the emotional impact. But only if readers do not fill in these gaps themselves. As will be discussed further, individuals are capable of creating auditory and visual images in the absence of external simulation. Several theories make a strong case for the importance of mental simulation during reading.

1.3. How Does Poetry Elicit Emotions?

Some models of fiction-elicited emotions (Mar et al., 2011; Oatley, 2002) contend they are prompted by mental simulation of the described events, empathy (i.e., emotions congruent to those of the characters) or sympathy (i.e., other emotions regarding the characters), autobiographical memory for similar events and aesthetic appraisals of the literary work. Poetry would make no exception, as it also features events and characters, may prompt autobiographical memories, and is subject to aesthetic evaluation. However, Johnson-Laird and Oatley (2022) point out that poetry may elicit another kind of emotionally potent simulation via prosodic cues (e.g., metre, rhythm and rhyme), mimetic of vocal expressions of emotion.

1.4. An Integrative Model

Both the ALC framework and fiction models of Marr, Oatley and Johnson-Laird draw attention to the importance of mental simulation and identify two powerful sources of emotion: of what is said and how it is said. The first is a multimodal simulation of the content of the text. Here, appraising the imagined events and feeling empathy, sympathy or antipathy for the characters can elicit an emotional response. Should the content prompt multimodal

simulations of autobiographical memories, they too would be the subject of appraisal. The second is the auditory simulation of the written text, where prosody elicits emotions through mechanisms analogous to music, such as emotional contagion, but also through empathy, sympathy or antipathy for the authorial voice, as it is informing the multimodal representations of the author or speaking characters.

This model is not a prescription of what a poem should be; some might only feature the authorial voice and no other speaking characters, others might focus on describing complex series of events, etc. It is also not a description of what necessarily occurs in every reader's mind; individuals vary in their ability to create mental simulations, which can interfere with the eliciting mechanisms. Instead, it offers a simple framework for studying sources of variation of poetry-elicited emotions, especially with regards to individual differences.

1.5. Auditory Imagery in Reading

Behavioural, neuroimaging and electrophysiological data, as well as lesion and stimulation studies (McNorgan, 2012; Pearson & Kosslyn, 2015; Proverbio et al., 2023) strongly suggest the existence of mental imagery. The partial neural overlap between imagery and perception networks gives credence to subjective reports of "seeing with the mind's eye" or "hearing with the mind's ear". Whether imagery, like perception, is a multimodal experience as some argue (Nanay, 2018) is still under debate, as most experimental studies require participants to generate unimodal images. Nevertheless, different kinds of imagery (e.g., visual, auditory, motor, etc.) can be measured and investigated independently. People report various, and relatively stable levels of ability to generate mental imagery, ranging from none (i.e., aphantasia; Monzel et al., 2022) to one of exceptional likeness to perception (i.e., hyperphantasia; Monzel et al., 2022).

If fiction requires a "mental simulation of experience" (Mar & Oatley, 2008), then mental images in virtually any modality could arise during reading (Starr, 2023). Very few studies have investigated this hypothesis directly (for a review, see Mak & Willems, 2021), but there is some evidence that readers can "see" the objects, people and places they read about, "feel" as if they are actually navigating these places (Magyari et al., 2020; Mak & Willems, 2019), and "hear" particular voices for the characters (Alderson-Day et al., 2017; Alexander & Nygaard, 2008). What arguably sets auditory imagery apart from other modalities during reading, however, is that it might be elicited more consistently during reading. Reading can prompt visual images, but how often this happens seems to depend on authorial choices (e.g., using depictive vs. enactive style; Magyari et al., 2020). At the same time, a reader might persistently "hear" the words they are reading, since the medium delivering the content relies on sound.

Auditory images are sounds one hears in the absence of any external acoustic stimuli, and are sometimes described as "perceptual-like" experiences (Hubbard, 2010). Individuals vary greatly in their general ability to imagine sound (i.e., trait auditory imagery), some even reporting to lack this ability altogether (i.e., anauralia, Hinwar & Lambert, 2021). Although virtually any object capable of producing a sound can also inform an auditory image (for a review, see Hubbard, 2010), one of the most ubiquitous and best documented aspects of this phenomenon is that of the "inner voice". It shares many similarities with overt speech: the voices people hear in their minds can have various identities and convey a wide range of emotions (Hurlburt et al., 2013), although there is some evidence that inner speech can be sometimes condensed and elliptical (e.g., Korba, 1990). In silent reading, orthographic information is translated into phonological information (i.e., phonological recoding; Leinenger, 2014), giving rise to a subjective experience of hearing the words you are reading (Vilhauer, 2016). Strong evidence for this phenomenon comes from behavioural studies. For

example, reading is disrupted when words from a limerick don't rhyme in the participant's regional accent (Filik & Barber, 2011). When presented with words of equal orthographic length, it takes readers longer to make decisions about those which would take longer to pronounce (Abramson & Goldinger, 1997). Enhancing prosodic cues by manipulating letter cases improves participants' text comprehension (Gross et al., 2014). Moreover, there is ample proof that the inner voice during reading takes on various features, akin to real speech. People adjust their reading rate to the characters, parsing the text slower if they believe the character is a "slow talker" (Gunraj & Klin, 2012; Kurby et al., 2009). Authors and characters are often assigned distinctive and sometimes emotive voices (Alderson-Day et al., 2017; Alexander & Nygaard, 2008; Gunraj & Klin, 2012; Vilhauer, 2017). In sum, there is converging evidence that silent reading engages complex verbal imagery.

1.6. Empirical Studies

Empirical aesthetics have been traditionally more interested in what individuals think about poetry than how it makes them feel. Many studies focus on aesthetic judgement (e.g., Kraxenberger & Menninghaus, 2017; Obermeier et al., 2016) or perceived rather than felt emotions (e.g., Auracher et al., 2010; Gafni & Tsur, 2021). Several recent studies offer proof that emotions are not just expressed by poetry, but also felt in response to it.

Obermeier et. al (2013) manipulated rhyme, metre and lexicality to observe their effects on arousal and valence. Emotions were less intense when the stimuli lacked rhyme, metre or meaning, and more negative when they lacked rhyme or meaning. In addition, the impact of rhyme on both arousal and valence was stronger for pseudo-word than real-word stanzas, suggesting that meaning could interfere with its effects. A similar manipulation of metre and rhyme was applied in a later study (Menninghaus et al., 2017) to explore its impact on general arousal and valence, and also on a few discrete emotions: being moved, joy and

sadness. Controlling for age, sex, personality, liking of and familiarity with prose and poetry, findings of Obermeier et al. (2013) were replicated: the unaltered versions induced, overall, emotions that were more intense and more positive. In addition, they elicited stronger emotions of being moved, sadness (sad poems) and joy (joyful poems). It is worth noting that positive associations were found between extraversion and overall arousal, being moved and sadness: this offered novel proof that dispositional traits can impact poetry-elicited emotions. Wassiliwizky et al. (2017) investigated emotional peaks (i.e., chills) during poetry listening. On average, self-reported chills occurred roughly once every minute, and 40% of participants also showed signs of piloerection on the video footage consistently. Additional text analyses revealed that chills tended to cluster near the end of lines, stanzas and poems, and near instances of social address (addressing other people or personified entities). Poetry-elicited chills recruited the posterior area of the cingulate, insula and caudate nucleus, while music-elicited chills recruited the medial areas of the same structures. They also recruited the precuneus and the superior medial gyrus, indicative of visual imagery and socio-affective processing during the heightened emotional experiences.

2. OBJECTIVES

The main aim of the present thesis is to explore (1) the mechanisms underlying poetry elicited emotions and (2) the role of individual differences in poetry-elicited emotions. Neither have been systematically investigated in prior studies and, although theoretical models insist on the importance of mental simulation for poetry-elicited emotions, the contribution of imagery has never been tested empirically. Although mental images can arise in many modalities during reading, they are probably generated the most consistently in the auditory modality as an 'inner voice' acquired through phonological recoding. For this reason, the focus falls on the role of auditory imagery both as a psychological process (auditory images of words evoked during reading), and as an individual trait (a general ability to imagine auditory images). Auditory images of words likely play a mechanistic role on two accounts. First, if strongly patterned language translates into strongly patterned auditory images, poetry could engage mechanisms analogous to music to elicit emotions (Johnson-Laird & Oatley, 2022). Second, if the inner voice retains features of real speech, such as affective prosody, this might cue the reader into the inner states of the author (i.e., the speaker stance; Van Berkum, 2020) and prompt empathy, sympathy, compassion or even antipathy. After all, speech and music share many psychoacoustic features crucial for emotion expression (e.g., loudness, tempo/speech rate, melody/prosody and certain timbre characteristics; Coutinho & Dibben, 2013). Prosodic cues seem to be as useful as semantic cues for emotion identification (Pell et al., 2011) and their manipulation impacts the emotional response in participants (Petrone et al., 2016). Furthermore, reader-response theories regard the individual as an active participant in the reading process, suggesting that reading outcomes (e.g., emotions) are influenced not only by their previous experiences with reading, but also by their traits (Hanauer, 2001). Given that the auditory images of words evoked during reading depend on the reader's more general ability to imagine sound, it is

likely that individual differences in trait auditory imagery will impact poetry-elicited emotions.

A secondary aim is to provide more insight into the diversity of poetry-elicited emotions. In order to capture and describe a wider range of emotional experiences, larger and more heterogeneous sets of stimuli are needed. Often, stimuli used in prior research had low ecological value (when using stanzas, not complete poems; Obermeier et al., 2013) or were restricted to a few poems (Wagner et al., 2021; Wassiliwizky et al., 2017) covering mainly the works of 18th, 19th and early 20th century German poets (Menninghaus et al., 2017; Obermeier et al., 2013; Wassiliwizky et al., 2017).

Study 1 examines the contribution of several psychological processes (i.e., empathy for the author and characters, visual, movement and auditory images evoked during reading) and individual differences (i.e., reading experience, trait empathy, trait visual, movement and auditory imagery, proneness to fantasising) to poetry-elicited emotions. **Study 2** investigates if the well-established mnemonic effects of rhyme can be partially explained through emotion, and whether trait auditory imagery potentiates this effect. **Study 3** examines in-poem variability of arousal and valence, the contribution of text characteristics (i.e., rhyme) and reader characteristics (i.e., reading experience, trait auditory imagery, personality) to this variability. It also explores links between granular measures (i.e., line-level) of emotion and global measures (i.e., poem-level) of liking. **Study 4** introduces a novel approach to studying the relevance of auditory imagery to poetry-elicited emotions by exploring them in hard of hearing individuals.

3. ORIGINAL CONTRIBUTIONS

3.1. STUDY 1. Mental Simulations in Poetry-Elicited Emotions: Individual Differences and Psychological Mechanisms

3.1.1. Introduction

Empirical research has explored little of poetry-elicited emotions until very recently. So far, studies have found that the emotions elicited by stanzas (Obermeier et al., 2013) and poems (Menninghaus et al., 2017) are less intense if formal features such as metre and rhyme are altered, and that poetry can elicit chills (Wassiliwizky et al., 2017). While these results are an important step in legitimising a new field of study, they leave many questions unanswered. What kind of emotions does poetry elicit? What are the underlying mechanisms of poetry-elicited emotions? And how do these emotions differ between individuals?

The goal of this study was to investigate the effects of reading experience on poetry-elicited emotions, and the role of empathy, imagery, and proneness to fantasise in the relation between the two. Our first research question was whether reading experience increases the intensity of poetry-elicited emotions. In line with our Integrative Model, our second research question was whether trait empathy, imagery (visual, motor, auditory), and proneness to fantasise impact poetry-elicited emotions. We also expected empathy, imagery, and proneness to fantasise to moderate the relation between reading experience and emotion intensity (i.e., a more positive association between reading experience and emotional responses in individuals with higher levels of each trait). Our third research question was whether empathy and imagery qualify as mechanisms underlying poetry-elicited emotions. We hypothesised that poetry-related empathy and poetry-related imagery (i.e., visual, motor and auditory) would play a mediator role in the relation between reading experience and emotion intensity, with reader experience contributing to emotion intensity via higher

poetry-related empathy and higher poetry-related imagery. Although not the focus of our main analyses, we also aimed to describe the motivations behind reading poetry and see whether emotion regulation occurs while reading. Finally, we explored the diversity of poetry-elicited emotions investigating patterns in readers' responses.

3.1.2. Methods

3.1.2.1. Participants

A total of 437 participants (88.6% women), aged between 12 and 83 (M = 33.89; SD = 12.28), completed the study on-line.

3.1.2.2. Procedure

To minimise participant fatigue, the study was split into two equal-length sessions. The first session focused on measuring reading experience and dispositional traits, while the second focused on measuring emotional responses immediately after reading poetry. During the latter, participants were asked to read for thirty minutes. They were free to choose what poems they would read but were also provided with a large collection we had prepared from which they could make their selection. All poems from this collection were in Romanian and established translations were used in the case of foreign authors. At the end of the reading session, participants reported what poems they had read.

3.1.2.3. Measures

Reading experience. We measured reading experience by taking three characteristics of the participants' reading history into account. First, we asked them to remember what they considered to be the longest period of having read poetry on their own initiative, and not out of obligation. Second, they specified the age at which this period occurred. Third, they

indicated how often they had read poetry during the last six months, by choosing between "never / almost never", "once every few months", "each month", and "each week".

Dispositional traits. Trait empathy was measured with the Toronto Empathy Questionnaire (TEQ; Spreng, McKinnon, Mar, & Levine, 2009). TEQ items cover emotional contagion, emotion comprehension, sympathetic physiological arousal, and conspecific altruism. Trait visual imagery was measured with the Visual Vividness of Imagery Questionnaire (VVIQ; Marks, 1973). VVIQ items use short vignettes describing visual scenes (e.g., a sunrise) for which respondents report their vividness as new elements are added (e.g., a rainbow appears). Trait movement imagery was measured with the revised version of the Vividness of Movement Imagery Questionnaire (VMIQ-2; Roberts, Callow, Hardy, Markland, & Bringer, 2008), which asks respondents to think about enacting a set of movements (e.g., throwing a rock) from an internal perspective (i.e., as if they are looking through their own eyes), from an external perspective (i.e., as if they are watching themselves performing the movement) and to imagine feeling doing the movement. Two characteristics of trait auditory imagery, vividness and controllability, were assessed with Bucknell Auditory Imagery Scale (BAIS; Halpern, 2015). BAIS items ask respondents to imagine certain sounds (e.g., the sound of a gentle rain) and rate how vivid these auditory images are evoked in their mind, and how easily they can change them (e.g., the rain turns into a violent thunderstorm). Proneness to fantasising was assessed with the Imaginative Fantasy subscale of the Fantasy Questionnaire (FQ-IF; Weibel, Martarelli, Häberli, & Mast, 2018), which provides a self-report measure by asking respondents about their engagement with fantasies, daydreams and mind-wandering, in general.

Reading session. Participants reported which poems they had read, their familiarity with them (i.e., whether all were familiar, only some were familiar, or none were familiar), the

total number of minutes they had spent in the reading session, and whether they were interrupted or not.

Mechanisms. Based on the dispositional measures, we derived a set of questions to assess poetry-related empathy, visual imagery, movement imagery and auditory imagery immediately after the reading session. Poetry-related empathy items covered two facets of this construct as defined by de De Vignemont and Singer (2006), also covered for trait empathy by the TEQ. Participants rated how much they had tried to adopt the author or characters' perspectives or "put themselves in their shoes", experienced the emotions expressed by the authors or characters featured in the poems, considered these emotions to be similar with those expressed by the author or characters, and were aware, during reading, that their emotions were related to those of the authors or characters. A total score, reflecting poetry-related empathy, was calculated as the sum of these ratings. All imagery items were created by adapting instructions and using the scales featured in their corresponding dispositional self-report questionnaires (i.e., VVIQ, VMIQ, BAIS). Participants rated the vividness of their mental images during reading: visual, motor and auditory. It must be noted that we chose to measure poetry-related auditory imagery separately for words and sounds, asking participants how clearly they had heard the words they were reading in their mind, and how clearly they had heard other sounds suggested by the poems.

Affect. We measured participants' emotional responses to the poems using the Aesthetic Emotions Scale (AESTHEMOS; Schindler et al., 2017). The instrument consists of statements pertaining to 21 discrete emotions, covering four broad categories: aesthetic emotions (e.g., being moved), pleasing emotions (e.g., joy), epistemic emotions (e.g., interest) and negative emotions (e.g., sadness). Participants rated the extent to which they had felt each emotion described in the statements during reading. Mood was assessed before

reading the poems, with the Positive and Negative Affect Schedule Scales (PANAS; Watson, Clark, & Tellegen, 1988). To assess whether participants engaged in emotion regulation while reading, we asked them to report how often they had tried to increase or decrease poetry-elicited emotions.

3.1.2.4. Analyses

Spearman correlations were calculated to explore associations between reading experience, dispositional measures and poetry-elicited emotions. A five-step hierarchical multiple regression was run to investigate whether reading experience and dispositional measures predicted poetry-elicited emotions. To control for potential confounding effects, age, sex, education, and occupation were included in the first step of the regression. Variables measuring reading experience (i.e., longest period reading, reading age and present reading) were added in the second step. TEQ empathy, VVIQ visual imagery, VMIQ movement imagery, BAIS-V auditory imagery vividness, BAIS-C auditory imagery control and FQ-IF imaginative fantasy were added in the third. PANAS positive mood and negative mood, measured before reading, were added in the fourth. Poem categories (i.e., self-selected, researcher-selected, and both), participants' familiarity with the poems, total time spent reading and interruptions were added in the fifth. Two-way interactions between predictors were added in the sixth.

TEQ empathy, VVIQ visual imagery, VMIQ movement imagery, BAIS-V auditory imagery vividness, BAIS-C auditory imagery control and FQ-IF imaginative fantasy were separately tested as moderators between reading experience and emotion intensity. To control for confounding effects, every other predictor included in the multiple regression analysis was added as a covariate in the moderation analysis.

Poetry-related empathy, visual imagery, movement imagery and auditory imagery for words and for sounds were tested simultaneously as mediators in the relation between reading experience and emotion intensity. We tested these mediators simultaneously as they had been measured relative to the same event (i.e., the reading session) and we were interested in finding whether each effect was independent of the effects of the other mediators. For each of these variables, two moderated mediation analyses were used to determine whether the corresponding trait (e.g., TEQ empathy) moderated the relation between reading experience and the mediator (e.g., poetry-related empathy) and between the mediator and emotion intensity.

3.1.3. Results

3.1.2.1. Do reading experience and dispositional traits predict poetry-elicited emotions?

We investigated if reading experience and dispositional measures predict emotion intensity using a hierarchical multiple regression. The model explained, in total, 39% of the variation in emotion intensity. In step one, age and education contributed significantly to the model, $F(4,418) = 4.452$, $p = .002$, accounting for 4.1% of the variation. In step two, only one of the three variables measuring reading experience, the longest period of time reading poetry, contributed significantly to the model, $F(3,415) = 6.590$, $p < .001$, explaining 4.4% additional variation in emotion intensity. In step 3, BAIS-C auditory imagery control and FQ-IF imaginative fantasy (but not TEQ empathy, VVIQ visual imagery, VMIQ movement imagery and BAIS-V auditory imagery vividness), were significant predictors, $F(6,409) = 16.726$, $p < .001$, accounting for an additional 18% of the variation in emotion intensity. In step four, including PANAS positive and PANAS negative mood, measured before reading, explained an additional 8.7% of the variance in emotion intensity, contributing significantly to the

model, $F(2,407) = 27.228$, $p < .001$. In step five, familiarity with the poems and emotion up-regulation were significant predictors (and not type of poems, total reading time, interruptions, and emotion down-regulation), $F(6,401) = 4.444$, $p < .001$, accounting for an additional 4% of the variance. In the final model, education, occupation, BAIS-C auditory imagery control, FQ-IF imaginative fantasy, PANAS positive mood before reading, emotion up-regulation while reading and familiarity with poems were significant predictors of emotion intensity.

Given that, out of the three different measures of reading experience, only the longest period of time reading poetry was a significant predictor of emotional intensity in Step 3 of the regression analysis, in the subsequent moderation and mediation analyses this particular measurement was used as a predictor. Hence, for the rest of this section, we will use "reading experience" as shorthand for the longest period of time reading poetry.

3.1.2.2. Do dispositional traits moderate the relation between reading experience and poetry-elicited emotions?

We next aimed to investigate the interactive involvement of reading experience and traits on emotions. We thus tested whether trait empathy, imagery, and proneness to fantasise played a moderator role in the relation between reading experience and emotion intensity. Moderation analyses did not reveal any significant interaction effects between reading experience and TEQ empathy, VVIQ visual imagery, VMIQ movement imagery, BAIS-V auditory imagery vividness, BAIS-C auditory imagery control, or FQ-IF imaginative fantasy on emotion intensity, when controlling for all other predictors we had added in every step of the regression analysis (i.e., sex, age, education, occupation, reading experience, dispositional traits, PANAS scores, types of poems, total time spent reading, interruptions, familiarity with poems and emotion regulation).

3.1.2.3. What are the mechanisms underlying reading experience and poetry-elicited emotions?

The final objective of the present study was to investigate the mechanisms underlying poetry-elicited emotions. A mediation analysis with reading experience as predictor and emotion intensity as outcome revealed significant indirect effects for poetry-related empathy (B = 2.00, CI [1.08, 3.07]), visual imagery (B = 0.58, CI [.18, 1.10]) and auditory imagery for words (B = 0.42, CI [.07, 0.91]), but not for poetry-related movement imagery and auditory imagery for sounds.

We were also interested to find whether dispositional traits might modulate some of these associations. Moderated mediation analyses were conducted separately for each mediator using their corresponding trait as moderator. The only significant moderated mediation models were found for poetry-related auditory imagery for words, with BAIS-V auditory imagery vividness and BAIS-C auditory imagery control as moderators between reading experience and the poetry-related auditory imagery for words. The relation between reading experience and poetry-related auditory imagery for words was significantly stronger for participants with high (b = 2.39, CI [1.25, 3.68]) and medium (b = 1.26, CI [.52, 2.11]) BAIS-V auditory imagery vividness, but was not significant for participants with low vividness scores. Likewise, it was significantly stronger for participants with high (b = 1.97, CI [.93, 3.01]) and medium (b = 1.20, CI [.46, 1.98]) BAIS-C auditory imagery control, but not significant for participants with low control scores.

3.1.4. Discussion

The present study is the first to identify reader characteristics that predict poetry-elicited emotions and underlying mechanisms. We found that participants who reported reading poetry for a longer period of time in the past, who had better control of their auditory imagery

and who were more prone to fantasise felt more intense emotions while reading poetry. We also found that reading experience contributed to emotion intensity via high empathy for the author and characters, vivid visual imagery and vivid auditory imagery for words. Furthermore, the link between reading experience and auditory imagery for words was stronger for participants with better trait auditory imagery vividness, and for participants with better trait auditory imagery control. It is also the first to show that poetry elicits a wide range of emotions: pleasing, negative, aesthetic and epistemic, and the first to indicate that readers actively increase the intensity of these emotions. Further studies could clarify how emotion regulation occurs during reading by looking at different emotion regulation strategies: perhaps individuals modulate their emotions by selecting what poems they read, how they read them (e.g., by skipping or re-reading passages) and by changing the way they appraise their content.

Generalisability of our results are limited in three major ways. First, most participants in our sample were women, university graduates and regular poetry readers. Second, we did not control for text characteristics, hence our results cannot be generalised for different poetry genres. Third, retrospective measures of emotions may be prone to memory biases; future studies should find ways to measure emotions more granularly, without interfering too much with the act of reading.

There are practical implications to our findings: how could readers harness the identified psychological mechanisms (i.e., empathy, imagery) to enhance their emotional responses to poetry? The present results suggest that the longer people read poetry for, the more they are going to benefit from each of these mechanisms (i.e., the more they would empathize with characters and author, the more vivid their visual and auditory images would be). We have good reason to assume that this is the case, as the direction of the relation between the

variables we tested for was theoretically grounded, but longitudinal studies are needed to clarify this issue.

Towards the end goal of understanding how emotions arise at the intersection between the text and the reader, we argue that future studies should aim to clarify the relations between the two. Specifically, to examine whether poetry-related empathy, visual imagery, and auditory imagery for words also play a mechanistic role in the relation between certain features of the poems and emotions, and whether dispositional traits modulate this relation. For instance, some genres might engage empathy more than imagery (e.g., by illustrating thoughts and feelings to a greater degree), and their emotional consequences could be stronger for more empathetic readers. On a more granular level, we believe it is also worth examining whether some poetic devices enhance these mechanisms, such as whether metaphor increases the vividness of imagery, or whether parallelistic features (e.g., metre, rhyme) increase auditory imagery.

3.2. STUDY 2. The Mnemonic Effects of Rhyme: The Role of Emotions and Auditory Imagery

3.2.1. Introduction

Poetry is easier to remember than prose (Rubin, 1995; Tillmann & Jay Dowling, 2007). Many empirical studies reinforce the mnemonic function of poetry (for a review, see Blohm et al., 2021; Hanauer, 2001), finding that it can buffer against the decline of verbatim memory over time (e.g., Tillmann & Jay Dowling, 2007). To explain this effect, researchers have turned to what most obviously distinguishes poetry from prose and ordinary speech: systematic patterns of sound repetition (Hopkins, 1959; Rubin et al., 1997).

Rhyming typically involves a pairing of words that end similarly but usually begin differently (Fabb, 2022). Thus, the *pre-rhyme*, i.e., the initial word of the rhyme pair, pre-activates the actual *rhyme*, i.e., the closing word of the rhyme pair, which, in turn, re-activates the recently processed pre-rhyme (Pilkington, 2014). Note that this incremental view of rhyming implies a directional asymmetry: Pre-rhymes merely activate a cohort of possible rhyme words (phonological priming), whereas the actual rhymes additionally resonate with a recently processed word and with the memory trace associated with it, e.g., with the entire line wrapped up at the pre-rhyme position. Perhaps counter-intuitively, then, this resonance account predicts that rhyming improves memory for pre-rhyme lines but not for the closing rhyme lines. Whether there is indeed such a directional asymmetry in rhyme's mnemonic effect remains unexplored.

In addition, we propose that recipients' emotional response is another determinant of memory for poetry. Boosting effects of arousal have been found for a wide range of stimuli, including for verbal content: word recognition and recall has been shown to improve with greater emotion intensity (e.g, Kensinger & Corkin, 2003). Overall, negative and positive

valence seem to have comparable effects on memory, with the caveat that their effects are dependent on stimuli characteristics, such as personal relevance (Kensinger & Schacter, 2008). Whereas different experimental paradigms can induce either positive or negative biases for pictorial stimuli, positive valence seems to better increase the salience of verbal stimuli (Kauschke et al., 2019). Since recipients' emotional responses are key to the enjoyment of poetry (Downey, 1915; Menninghaus et al., 2017; Wassiliwizky et al., 2017), we argue that emotion is also likely to contribute to the memorability of verse: lines which induce more intense emotions might be remembered more accurately.

There is some evidence suggesting that mnemonic effects of rhyme also depend on readers' familiarity with conventional poetic forms. Specifically, Rubin and collaborators (1993) found that verbatim recall of a ballad could be improved by simply familiarizing literary novices with the structure of the English ballad. Genre knowledge gained through reading poetry might make rhyme more predictable, and thus offer an encoding advantage. Moreover, given that reading experience seems to improve memory in the verbal domain (Peng et al., 2018), it is also possible that seasoned readers of any genre perform better than novices. This poses a more general question about individual differences: Apart from reading experience, are there other traits that offer such advantages to readers? We argue that auditory imagery is a likely candidate, since silent reading depends on phonological representations and auditory imagery (for a review, see Blohm et al., 2021; Hubbard, 2010). In this view, the effectiveness of rhyme as a mnemonic device during silent reading depends on readers' ability to generate detailed and accurate auditory images of the verses they encode.

The main aim of the present study was to investigate the effects of rhyme and emotion on memory. First, we hypothesized that (H1.1.) lines from the rhyming versions and lines which elicit stronger emotions were more likely to be remembered. We expected lines from the

original rhymed versions to be remembered better, possibly dependent on their position in the rhyming pair (pre-rhyme vs. rhyme). Second, based on the observation that emotional experiences are remembered better (Kensinger & Schacter, 2008), we also expected verbatim memory to be more accurate for lines with high arousal ratings. Finally, we examined interaction effects of rhyme position (pre-rhyme vs. rhyme) and arousal. Specifically, we expected verbatim memory to be most accurate for high-arousal lines that close a rhyme pair. We further hypothesized that (H1.2) arousal mediates the relation between rhyme and memorability, as previous studies have shown parallelistic features to enhance emotion intensity (Menninghaus et al., 2017; Obermeier et al., 2013) and given that emotion intensity improves the recognition and recall of verbal material (Kensinger & Corkin, 2003).

A secondary aim was to study the impact of reader characteristics on memory. We expected (H2.1.) participants with greater reading experience and higher auditory imagery to have better average memory accuracy. First, based on the results of a recent meta-analysis suggesting that reading improves working memory in the verbal domain (Peng et al., 2018), we hypothesized that participants with greater reading experience would have an encoding advantage and generally remember lines more accurately. Second, we hypothesized that participants with better auditory imagery encode more detailed and accurate representations of phonetic surface form during reading, and that this encoding advantage would result in more accurate retrieval. Furthermore, we expected (H2.2) the link between rhyme and memorability to be stronger for participants with better trait auditory imagery. The effects of rhyme on memory could be particularly pronounced in participants with higher levels of trait auditory imagery, given both their presumed encoding and retrieval advantages and recent evidence of increased arousal during reading (Pițur & Miu, 2022).

3.2.2. Methods

3.2.2.1. Participants

A total of 185 participants (83.78% women), aged between 18 and 68 ($M = 33.41$, $SD = 12.08$) completed both parts of the study. Our a priori estimated sample size was 162 participants, necessary for .8 power to detect a medium-size mediation effect as per Fritz & MacKinnon (2007).

3.2.2.2. Procedure

To minimize participant fatigue, the study was split into two equal-length sessions, each lasting approximately 40 minutes and occurring one week apart. For the first part of the study, subjects filled in a set of on-line questionnaires measuring reader characteristics: sex, age, socio-economic status, reading experience and trait auditory imagery. For the second part of the study, participants completed an on-line experiment consisting of a reading task with subsequent rating and discrimination task.

3.2.2.3. Materials

We chose sixteen poems from poetry anthologies (see Supplementary Table 1) and selectively modified them to remove end-rhyming. To this end, we replaced all pre-rhyme words with a prosodically equivalent synonym or, when no adequate synonym was available, by inverting word order. A synonym was deemed adequate if it retained the number of syllables and stresses of the original word, as well as its denotative and connotative meanings. This allowed us to isolate effects of rhyme while preserving the original meaning of the lines and keeping other crucial structural features (e.g., meter) intact. Similar procedures have been used in previous research (e.g., Menninghaus et al., 2017; Obermeier et al., 2013). The text selection balanced rhyme schemes (AABB/ABBA; ratio = 8:8)

3.2.2.4. Experimental task

Each participant read all 16 poems, 8 in the original, rhyming version and 8 in the modified, non-rhyming version. Poems were distributed across four blocks, balanced with respect to rhyme scheme (AABB/ABBA; ratio = 2:2) and poem type (rhyming versions vs. non-rhyming versions; ratio = 2:2); the order of blocks and the order of poems within blocks were randomized. After reading a poem, participants indicated whether they had been familiar with the text (yes / no) prior to the experiment. Subsequently, the poem was shown again, and participants rated the emotions they felt reading each line using continuous ratings with a 0.1 step for valence ("Please indicate to what extent the emotions you felt were negative or positive from 1- very negative to 5 – very positive") and arousal ("Please indicate the intensity of the emotions you felt, from 1 – low intensity to 5 – high intensity"). After each 4-poem block, participants were presented with a series of 24 line pairs, each consisting of a target line from a previous poem and a plausible foil (see Supplementary Figure 1); participants were required to identify the target line they had just read in the preceding block of poems. The foils were modified versions of the target lines that preserved the original prosody and meaning. If the line was a pre-rhyme, the foil was the homologous line from the other available version of the poem. If the line was a rhyme, the foil was created by replacing one word with a synonym. The order of the pairs and the order of lines in a pair were randomized.

3.2.2.5. Measures

3.2.2.5.1. Reader characteristics

Reading experience. We collected self-report data to assess three different aspects of our participants' experience with literature (Pitur & Miu, 2022): the longest stretch of time they had been reading literary texts regularly (never, a few days, a few months, a few years), the

age at which they started reading self-selected literary texts, and how often they had read literature over the past 6 months (never, every week, every month, every few months); we asked each of these questions separately for poetry, fiction, and non-fiction. We summed responses across genres to create three total composite scores. We also measured print exposure as a proxy for reading experience using an adapted version of the Author Recognition Test (ART; Stanovich & West, 1989), which presents participants with a mixed list of author names and foils, and requires them to identify as many real authors as they can; test scores reflect the number of correctly identified authors and a penalty for false alarms. The rationale behind the ART is that a greater interest in reading as a pastime increases the chance of recognizing authors (Moore & Gordon, 2015).

Trait auditory imagery. The Bucknell Auditory Imagery Scale (BAIS; Halpern, 2015) was used to measure trait auditory imagery. This questionnaire prompts participants to imagine certain sounds, and to consciously manipulate these auditory images (e.g., to imagine the sound of gentle rain and turn it into a violent thunderstorm), thus measuring two aspects of auditory imagery: vividness and control.

3.2.2.5.2. Experimental task

Poem ratings. Line-level arousal ratings (1 – low, 5 – high) and centered line-level valence ratings (-2 – very negative, 2 – very positive) were averaged across poems and across participants. Average memory accuracy was computed as the mean of correct answers per participant. All levels were used in the analyses. Familiarity ratings were only used to exclude familiar poems.

Text variables. Poem type (non-rhyming / rhyming) and rhyme position (pre-rhyme / rhyme) were extracted from the stimuli database and used in the analyses. Line position (line

index divided by the total number of lines in the poem) and encoding time (time spent in the memory trial divided by two) were also calculated and used as covariates in the analyses.

3.2.2.6. Statistical analysis

Prior to data analysis, we removed all data from participants who performed poorly in the memory task, who showed signs of inattention or non-compliance. We also excluded familiar poems. The final database contained 28,754 cases (out of which 10,418 lines were tested in the memory task) pertaining to 172 participants (90.12% women), aged between 18 and 68 ($M = 33.55$, $SD = 12.19$).

To investigate the effects of rhyme and emotion on memory, trial-level data were analysed using logistic mixed-effects regression with crossed random effects for subjects and items (Baayen, Davidson, & Bates, 2008). Odds ratios (ORs) are reported as effect size estimates of logistic regression models. We used pairwise comparisons of estimated marginal means to resolve interaction effects, and conducted a mediation analysis to test whether arousal carried the effect of rhyme on memory. To investigate the effects of reader characteristics on average memory accuracy, we analysed participant-level data using linear mixed-effects regression. To test whether trait auditory imagery modulated the effect of rhyme on memory accuracy, we ran a moderation analysis on line-level data in which we simultaneously tested the effects of both vividness and control.

3.2.3. Results

3.2.3.2. Effects of rhyme and arousal on memory

We tested for fixed main and interaction effects of poem type (non-rhyming, rhyming), rhyme position (pre-rhyme / rhyme) and arousal on memory task responses (correct / incorrect). Several additional covariates and two-way interactions improved the base model,

but adding three-way interactions did not. The final model (conditional R2 = .07) confirmed our predictions. The main effect of poem type (95% CI [1.29, 2.23], *OD* = 1.70, p < .001) indicated that participants performed more accurately when lines were selected from rhyming poems. The main effect of rhyme position (95% CI [1.18, 1.87], *OD* = 1.47, p = .001) indicated that their memory was more accurate for the second rather than the first members of the prototypical rhyme pairs, irrespective of whether the poem had been shown in its original version (the lines rhymed) or modified version (the lines did not rhyme). The main effect of arousal (95% CI [1.03, 1.17], *OD* = 1.10, *p* = .002) reflected a memory bias for lines which had elicited more intense emotions. As expected, the interaction between poem type and rhyme position was also significant (95% CI [.34, .70], *OD* = 0.49, *p* = .003); we compared rhyme positions within rhyme conditions to resolve this interaction. In rhyming poems, pre-rhyme lines were remembered more accurately than rhyme lines (Pre-rhymes – Rhymes, Δ = .30, SD = .07, *p* < .001), but the pattern was reversed in non-rhyming poems (Pre-rhymes – Rhymes, Δ = -.40, SD = .06, *p* < .001). It is worth noting that two of the included covariates, namely line index and line encoding time, also significantly predicted memorability; lines which appeared earlier in a poem (95% CI [.97, .99], *B* = - .01, *p* = .002), and lines which were likely read for longer (95% CI [1.24, 1.55], *B* = .33, *p* < .001) were remembered more accurately.

As previous studies have shown parallelistic features to enhance emotion intensity, we expected arousal to mediate the relation between poem type and memorability. In line with our hypothesis, mediation analysis revealed a positive total effect of poetry type on memorability (*B* = .061, 95% CI [.04, .08], *p* < .001), a positive direct effect (*B* = .058, 95% CI [.04, .07], *p* < .001), as well as a positive indirect effect through arousal (*B* = .004, 95% CI [.00, .01], *p* < .001). A small proportion (6.2%) of the total effect of poem type on memorability was carried by arousal.

3.2.3.3. Effects of reader characteristics on memory

Contrary to our expectations, participants' average memory accuracy was not significantly improved by any of the measured reader characteristics.

3.2.3.4. Exploratory analyses

Since previous research found that participants with higher trait auditory imagery felt more intense emotions reading poetry (Pițur & Miu, 2022), we investigated whether this reader characteristics amplifies the effect of rhyme on arousal. To this end, we ran a moderation analysis with trait auditory vividness and control as concurrent moderators. While we did not find any interaction effects, it is noteworthy that trait auditory vividness significantly predicted emotion intensity ($B = .026$, 95% CI [.14, .38], $p < .001$). We also explored if valence mediated the effects of rhyme on memory. Mediation analysis revealed a positive direct effect ($B = .058$, 95% CI [.04, .07], $p = .012$), as well a positive indirect effect through valence ($B = .002$, 95% CI [.00, .00], $p = .012$). A small proportion (3.5%) of the total effect of rhyme on memorability was carried by valence.

3.2.4. Discussion

Our findings expand previous research into what makes poetry memorable, providing novel evidence for a mechanism underlying the link between rhyme and memory: emotion. Results confirm not only that rhyme and emotion had specific effects on line memorability, but also that arousal and valence partially explained the effect of rhyme.

The present research both reinforces and refines current knowledge about the mnemonic advantages of rhyming. On the one hand, consistent with prior evidence (Tillmann & Jay Dowling, 2007), lines from original rhyming poems were remembered more accurately than lines from modified non-rhyming poems. On the other hand, rhyme did not affect pre-rhymes

and rhymes equally in terms of memorability. Contrary to our expectations, reader characteristics did not directly influence memory accuracy or modulate the effects of rhyme. However, exploratory analyses replicated a previously discovered association with emotion (Pițur & Miu, 2022), hinting at a more complex contribution of auditory imagery.

To our knowledge, this is the first study to examine the potential impact of emotion on memory for verse. We found that lines which elicited more intense emotions were remembered more accurately, in line with the well-established effect of arousal on memory (Kensinger & Schacter, 2008). Given emerging evidence that poetry can elicit intense (Wassiliwizky et al., 2017) and varied emotions (Haider et al., 2020; Pițur & Miu, 2022), this result incentivizes exploring the mnemonic effects of any poetic devices that are emotionally potent. Furthermore, mediation analyses revealed that arousal carried a small proportion of the effect of rhyme on memory. Notably, while Menninghaus et al. (2017) and Obermeier et al. (2013) found evidence of rhyme affecting emotion, this specific hypothesis has not been tested before. In tandem with other prosodic elements, rhyme might elicit emotions through mimicking emotional voices (Johnson-Laird & Oatley, 2022; Kraxenberger et al., 2018), akin to music (Menninghaus et al., 2018). This, in turn, could make verse easier to remember.

Study findings should be interpreted with a few important limitations in sight. First, our sample consisted mostly of women of high socio-economic status, and we therefore suggest replicating these findings in a more balanced sample. Second, a larger and more diverse stimuli set could improve the generalizability of results. Although rhyme scheme (ABBA vs. ABAB) was not a significant predictor of memorability in this study, varying the distance between rhyming words by including more rhyming patterns could test the specificity of our findings. Other confounding variables could be related to our manipulation: since we only altered pre-rhymes, it is possible that our choice of synonyms and, less often, inversions

affected the memorability of these lines in the non-rhyming versions. Moreover, the difference between targets and foils was in the ending word more often for pre-rhymes than it was for rhymes, by virtue of how we constructed the test stimuli. Lastly, we did not control for other poetic devices that have been shown to have mnemonic effects, such as alliteration or meter (Blohm et al., 2021) when selecting the stimuli, as well as for word frequency and emotionality. Future studies should address these issues by modifying both pre-rhymes and rhymes.

3.3. STUDY 3. Variation Within: A Line-by-Line Investigation of Poetry-Elicited Emotions

3.3.1. Introduction

People report reading poetry because it makes them feel intense, special emotions (Piţur & Miu, 2022). Not much is known, however, about the dynamics of these emotions: participants are often asked to give affective ratings that summarise rather than describe their emotional responses during reading or listening to poetry (Menninghaus et al., 2017; Obermeier et al., 2013; Piţur & Miu, 2022). There are a few reasons to believe emotions vary moment-to-moment when reading poetry, just as they would do in any social interactions that require communication.

First, variability is inherent to communication. We can experience different, sometimes even contradictory emotions as language comprehension unfolds. The Affective Language Comprehension model (ALC; Van Berkum, 2018, 2020) argues that a single utterance may elicit affective changes at multiple levels, as one takes turns to appraise what they're being told (e.g., the situation the speaker is talking about) and the internal state of the speaker (what are they thinking and feeling, and want me to think and feel?). Each new utterance has the potential to change these appraisals and, consequently, the associated emotional responses. This is true for both verbal and written language. Obermeier et. al (2013) found that removing the rhyme scheme, while keeping the meaning intact, had effects on both valence and arousal: the emotions elicited by the original, rhyming versions of quatrains from German ballads were more intense and more positive than those elicited by the altered, non-rhyming versions. Later, Menninghaus et al. (2017) altered entire poems instead of isolated stanzas with similar results. Taken together, these findings confirm that sound parallelisms impact poetry-elicited emotions in a general sense (Johnson-Laird & Oatley,

2022), but raise questions about their precise timing. For instance, whether this is a result of systematic (i.e., comparable each time they occur) or rather cumulative (i.e., increase with each occurrence) line-level effects.

Second, the readers themselves also contribute to this variability. Although the author has considerable control over the timing and nature of the emotions of the reader by choosing what to say and when to say it, readers differ in their experience and abilities; this makes them more or less susceptible to feeling what the author intended them to. Reading outcomes can be influenced by the individual's previous experiences with literature and by their dispositional traits (Hanauer, 2001). Several studies have found this to be true for global measures of poetry-elicited emotions. Participants who have read more in the past report more intense emotions during poetry reading via greater empathy for authors and characters and more vivid mental images (Pițur & Miu, 2022). Furthermore, those with a greater general ability to imagine sounds and to 'hear' the words they are reading vividly in their mind also report greater arousal reading poetry (Pițur & Miu, 2022). A plausible, but yet unexplored explanation for this result involves interactions with text characteristics: if individuals with greater trait imagery are more adept at translating orthographic to phonological information, this might make them more susceptible to the emotional effects of sound parallelisms (e.g., rhyme). Apart from reading experience and trait auditory imagery, personality might also play an important part in poetry-elicited emotions. Openness to experience has been repeatedly associated with more intense emotions within other art domains (McCrae, 2007; Silvia et al., 2015) such as music, with which poetry might partially share eliciting mechanisms (Johnson-Laird & Oatley, 2022).

In summary, when emotions vary during language comprehension, both features of the message (e.g., the poem) and of the receiver (e.g., the reader) may contribute to this

variability. The present research is the first to examine the dynamics of poetry-elicited emotions using subjective, line-level measures. We aimed to examine in-poem variability of arousal and valence, and to what extent text characteristics (i.e., rhyme) and reader characteristics (i.e., reading experience, trait auditory imagery, personality) explain this variability. A secondary objective was to explore links between granular measures (i.e., line-level) of emotion and global measures (i.e., poem-level) of liking.

3.3.2. Methods

3.3.2.1. Participants

A total of 185 participants (83.78% women), aged between 18 and 68 ($M = 33.41$, $SD = 12.08$) completed the study and were included in the final analyses.

3.3.2.2. Procedure

The study was split into two equal-length sessions in the interest of minimising participant fatigue. First, subjects filled in a set of on-line questionnaires measuring reader characteristics: sex, age, socio-economic status, reading experience and trait auditory imagery. Second, they completed an on-line experiment consisting of a self-paced reading task and a subsequent rating task in which we assessed poetry-elicited emotions and liking.

3.3.2.3. Materials

Sixteen poems were selected from various anthologies (see Supplementary Table 1); modifiability was a key criterion during text selection. We removed a rhyme scheme following a similar procedure to Menninghaus et al. (2017) and Obermeier et al. (Obermeier et al., 2013). We replaced the pre-rhymes with a prosodically equivalent and semantically adequate synonym (i.e., equal number of syllables, similar stresses, similar denotative and

connotative meanings of the original word). When no adequate synonym was available, we inverted word order. This manipulation allowed us to isolate the effects of rhyme while keeping all other structural features (e.g., metre) and original meaning of lines intact. The text selection balanced rhyme schemes (AABB/ABBA; ratio = 8:8).

3.3.2.4. Experimental task

The sixteen poems were presented in four blocks, balanced with respect to rhyme scheme (AABB/ABBA; ratio = 2/2) and poem type (original rhyming versions vs. modified non-rhyming versions; ratio = 2/2). After reading a poem, participants indicated how much they liked it (1 – not at all, 5 – very much). Subsequently, the poem was shown a second time, and participants rated the emotions they felt reading each line using continuous ratings for valence (1- very negative, 5 – very positive) and arousal (1 – low, 5- high). The order of the blocks and the order of the poems within the blocks were randomised.

3.3.2.5. Measures

3.3.2.5.1. Reader characteristics

Reading experience. Three aspects of our participants' experience with literature (Pitur & Miu, 2022) were assessed: the longest time they had read for (never, a few days, a few months, a few years), the age at which they started reading, and how often they had read over the past 6 months (never, every week, every month, every few months). Each of these questions was asked separately about poetry, fiction, and non-fiction. We summed responses across genres to create three total composite scores. As a proxy for reading experience, we also measured print exposure using our recently adapted version of the Author Recognition Test (ART; Stanovich & West, 1989).

Trait auditory imagery. The Bucknell Auditory Imagery Scale (BAIS; Halpern, 2015) was used to assess participants' trait auditory imagery. This instrument measures two aspects of auditory imagery, vividness and control, by asking participants to imagine certain sounds and to manipulate them (e.g., to imagine the sound of gentle rain and turn it into a violent thunderstorm).

Personality. Five personality dimensions were assessed with the Big Five Inventory (John et al., 1991). Participants read 44 assertions and reported to what extent each could be applied to themselves (e.g., 'I see myself as someone who is talkative') on a scale from 1 (disagree strongly) to 5 (agree strongly). We averaged across each subscale to create five distinct scores for each dimension: extraversion, agreeableness, conscientiousness, extraversion and openness to experience.

3.3.2.5.2. Experimental task

Poem ratings. Line-level arousal ratings (1 – low, 5 – high) and centred line-level valence ratings (-2 – very negative, 2 – very positive) were averaged across poems and across participants. Poem-level arousal and valence ratings were calculated by averaging ratings per poem. Participant-level arousal and valence ratings were calculated by averaging ratings per participant. Using poem-level liking data, we also created participant-level liking scores by averaging liking ratings per participant. All levels were used in our analyses.

Text variables. Poem type (rhymed / non-rhymed) and line type (pre-rhyme / rhyme) were extracted from the stimuli database and used in the analyses. Line position was calculated as the line index divided by the total number of lines in the poem.

3.3.2.5.3. Statistical analyses

Prior to data analysis, we removed all data from participants who showed signs of inattention. The final database contained 42,546 cases pertaining to 173 participants (90.17% women), aged between 18 and 68 ($M = 33.52$, $SD = 12.1$). We analysed line-level and poem-level data using linear mixed-effects regressions with crossed random effects for subjects and poems (see Baayen, Davidson, & Bates, 2008).
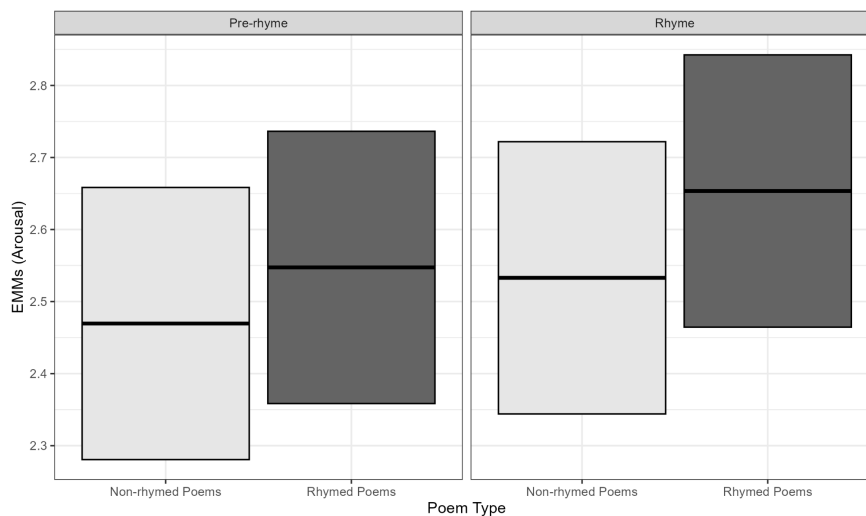
3.3.3. Results

3.3.3.2. Predictors of emotion

First, we focused on line-level measures of arousal. We tested for these fixed effects using a linear mixed-effects regression with crossed random effects for subjects and poems. Three-way interactions, rhyme scheme (AABB / ABBA) of the source poem and its interaction with poem type (non-rhymed / rhymed) did not improve the base model. The final model (conditional $R = .40$) confirmed the expected main effects of line position ($B = .01$, $p < .001$), rhyme ($B = .05$, p $< .001$) and trait auditory imagery (BAIS-V; $B = .20$, $p = .028$) on arousal. Effects of reading experience and openeness to experience were not significant. We also found interaction effects between rhyme and line type ($B = .01$, $p = .010$), and between rhyme and trait auditory imagery ($B = - .01$, $p = .000$) and ran pairwise comparisons of estimated marginal means to resolve them (see Fig.1 and Fig 2.). We observed a potentiating effect of rhyme on arousal for both line types (Pre-rhymes: Non-rhymed – Rhymed, $\Delta = -.08$, $SD = .02$, $p < .001$; Rhymes: Non-rhymed – Rhymed, $\Delta = -.12$, $SD = .02$, $p < .001$) but a small, significant difference between these contrasts ($\Delta = .04$, $SD = .02$, $p = .046$) suggested that rhymes benefited slightly more than pre-rhymes from the rhyming condition. Furthermore, we found that, contrary to our expectation, the effect of rhyme on arousal did not increase, but rather decrease with higher trait auditory imagery (Low BAIS-V:

Non-rhymed – Rhymed poems, Δ = -.25, *SD* = .05, *p* < .001; Average BAIS-V: Non-rhymed – Rhymed poems, Δ = -.10, SD = .01, *p* < .001; High BAIS-V: Non-rhymed – Rhymed poems, Δ = -.03, *SD* = .02, *p* < .001). Secondary pairwise contrasts revealed that rhyme was significantly more effective in increasing arousal in participants with low compared to average trait auditory imagery (Δ = .15, *SD* = .04, *p* < .001), and with average compared to high trait auditory imagery (Δ = .01, *SD* = .02, *p* < .001). While the final model explained 40% of the variation in arousal, it is worth noting that fixed factors accounted for only 6% (marginal *R* = .06). Furthermore, the two crossed random factors had unequal contributions to explaining the residual variance, with subjects accounting for much more (31.27%) than poems (4.97%).

Figure 1. Interaction Effects of Poem Type and Line Type on Arousal

Note. Pairwise comparisons of estimated marginal means (abbr. EMMs) to resolve interaction effects between (A) poem type (non-rhymed / rhymed) and line type (pre-rhyme / rhyme) and (B) on line-level arousal measures.

Figure 2. Interaction Effects of Trait Auditory Imagery and Poem Type on Arousal
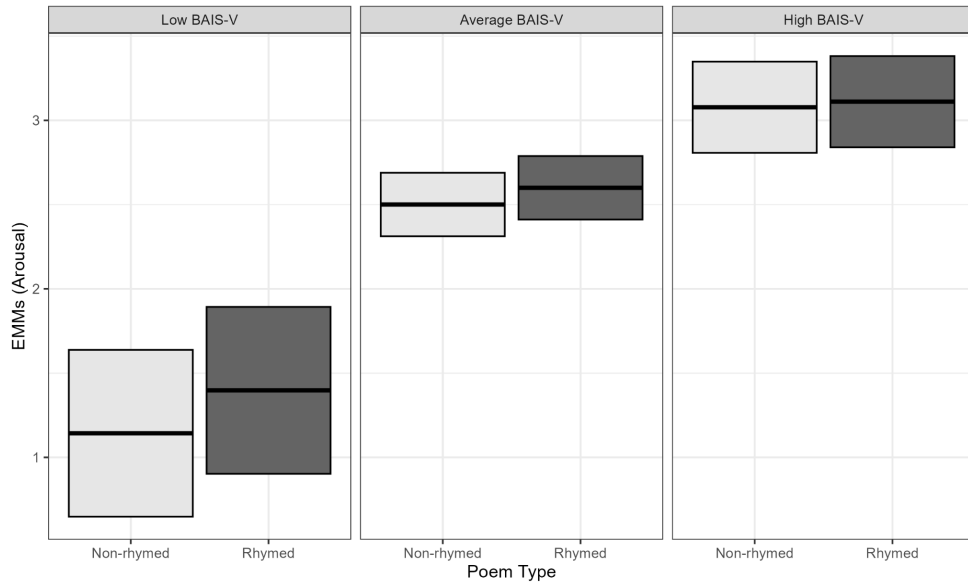
Note. Pairwise comparisons of estimated marginal means (abbr. EMMs) to resolve interaction effects between three levels of trait auditory imagery vividness and poem type (non-rhymed / rhymed).

Next, we focused on line-level measures valence. We tested for these fixed effects using a linear mixed-effects regression with crossed random effects for subjects and poems. Our model was improved by controlling for the rhyme scheme (AABB / ABBA) of the source poem and its interaction with the poem type (non-rhymed / rhymed) of the source poem. The final model (conditional R = .25) revealed a negative main effect of line position (B = .01, p < .001) and rhyme (B = .07, p < .001). It also revealed a small, positive effect of reading experience as measured with the ART total score (B = .002, p < .001), but no significant effects of other reader characteristics. No interaction effects between rhyme and line type were found. While the final model explained 25% of variation in valence, fixed factors accounted for only 1% (marginal R = .01). The two crossed random factors had unequal contributions to explaining the residual variance, with subjects accounting for less of the residual variance (9.41%) than poems (14.15%).

3.3.3.2. Predictors of liking

A secondary objective was to investigate links between granular measures (i.e., line-level) of emotion and global measures (i.e., poem-level) of liking. Specifically, we explored how in-poem variability of arousal and valence impact liking. We used a linear mixed-effects regression with crossed random effects for subjects and poems to investigate main effects of average arousal and valence, and of variance of arousal and valence. The final model (conditional $R = .61$) explained 61% of variation in liking, of which fixed factors accounted for 41% (marginal $R = .41$). It revealed that participants preferred poems that overall elicited stronger ($B = .54$, p < .001) and more positive ($B = .33$, p < .001) emotions, and poems with a greater degree of line-by-line variability of arousal ($B = .13$, $p < .001$), but not of valence.

Finally, we explored line-by-line changes in arousal and valence. Plotting averages by line positions revealed that both varied in a seemingly cyclical manner throughout the poems, alternating between low and high arousal and negative and positive valence (see Fig. 3).

Figure 3. Average Arousal and Valence Ratings for Lines Within a Poem
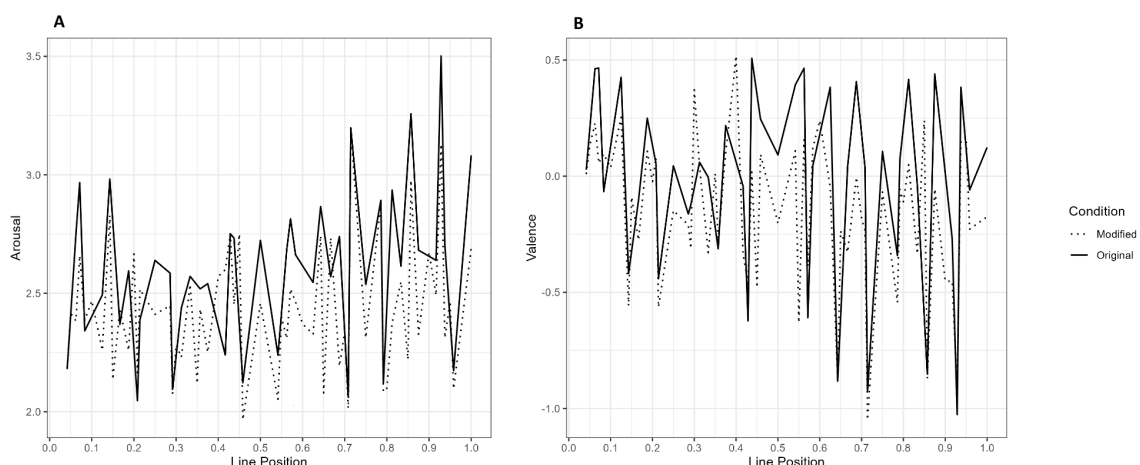
Note. Given that poems varied in length, we divided the line number by the total number of lines to indicate the position of a line within a poem (i.e., line position). (A) and (B) illustrate line-by-line changes in arousal and valence for original and modified poems averaged across each line position.

3.3.4. Discussion

Using subjective, line-level measures of arousal and valence, the present study is the first to describe the dynamics of poetry-elicited emotions. It also offers novel evidence for complex interactions between text and reader characteristics, as well as insights into readers' preferences for within-poem variability of emotions.

3.3.4.1. Arousal

We found an overall small, but significant increase of emotion intensity with each line; we interpret this as a possible consequence of the cumulative effects of sound parallelisms, among other factors (e.g., building up ideas or scenes slowly across over the course of a poem). We must note, however, that plotting average line-by-line changes across poems revealed that this increase was not steady, but marked by peaks and drops. Further studies should aim to clarify which poetic devices might contribute to this pattern.

Using more granular measures of emotions, we replicated the previous finding (Pițur & Miu, 2022) that individuals with greater trait auditory imagery report greater arousal reading poetry. We also explored if these individuals are more susceptible to the emotional effects of rhyme, and found a surprising interaction: we expected the effect of rhyme to be stronger for readers who were more apt at 'hearing' the words in their mind, but the pattern was, in fact, reversed. Rhyme was significantly more effective in increasing arousal in participants with low, compared to average and high trait auditory imagery. One possible explanation could be that sound parallelisms might in fact help readers 'hear' the words more vividly during silent reading, an effect that would be naturally more evident in a group with low trait auditory imagery. Future studies could test this hypothesis by also measuring the auditory images evoked during reading (see Pițur & Miu, 2022).

Reading experience (assessed with questions about reading history, reading habits, and the ART questionnaire) was not a significant predictors of arousal, although reading history was previously found to have a small, positive effect on the intensity of poetry-elicited emotions (Pitur & Miu, 2022). Given that our sample was rather heterogeneous in terms of reading experience, this result cannot be attributed to an over- or under-representation of leisure readers. Openness to experience was not a significant predictors of arousal, suggesting that effects of personality on emotions found for some art stimuli cannot be readily generalized to others.

3.3.4.2. Valence

No previous studies have looked at in-poem variation of valence; we explored whether emotions remained similarly positive or negative throughout a poem. We found an overall small, but significant decrease of valence with each line: emotions became more negative as the poems went on. As in the case of arousal, plotting valence averages by line position revealed that this decrease was not steady, but marked by sharp peaks and drops. Participants also reported more negative emotions reading lines from rhyming poems, opposite to findings of Menninghaus et. al (2017) and Obermeier et al (2013).

Without knowledge of the discrete emotions our participants felt, it is difficult to offer a confident interpretation of these results: negative emotions could be content-related (e.g., feeling sad through empathizing with the authorial voice) as well as process-related (e.g., feeling bored or confused with the poem). If the first were more often true for our participants, this would indicate a selection bias: although we explicitly included poems that touched upon different themes (love, death, nature, identity, etc.), the selection may have been unintentionally skewed towards poems that primarily induced negative emotions. However, this does not explain why rhyme increased negative valence, given that participants

of Menninghaus et. al (2017) and Obermeier et al (2013) reported more positive affect in the rhyming condition irrespective of poem type (sad or joyful). We argue that our line-by-line measures of emotion might have captured something global measures previously did not; perhaps, when asked to summarize emotions elicited by a poem, participants are inclined to remember the positive peaks, which in our data often alternated with strongly negative ratings. There is also the question of enjoying negative emotions: the Distancing-Embracing Model (Kraxenberger & Menninghaus, 2017) theorizes that art stimuli may elicit negative and positive emotions simultaneously, something that bipolar ratings of valence cannot document. In summary, this question can only be resolved by assessing the progression of discrete emotions during reading and by classifying stimuli with regards to content type.

Lastly, participants with more reading experience, as measured with the ART total score, felt more positive emotions. Perhaps individuals who are more inclined to enjoy reading are naturally drawn to reading more; perhaps reading develops skills that gradually make the activity more enjoyable for the individual. If the latter were true, and given that reading experience was not a significant predictor of arousal, print exposure might change the quality rather than the intensity of poetry-elicited emotions.

3.3.4.3. Liking

Participants preferred poems that, overall, elicited stronger and more positive emotions, but also when arousal varied more during reading. These results indicate that emotion dynamics also inform aesthetic liking. A discrete approach to measuring emotions could provide more insight into whether what readers actually prefer is variation within the same category (e.g., pleasing, negative, epistemic, aesthetic; Schindler et al., 2017). Future studies may also look into whether these preferences are linked with individual differences in reading

experience or personality, or depend on reading goals or mood. Literacy programs may benefit from such insights about what makes reading poetry enjoyable.

3.3.4.4. Limits

There are a few limits to the generalisability of our results. First, measures of emotions were retrospective, even though we aimed to minimize recall bias by asking participants what they felt reading each line immediately after finishing the poem. Continuous measures, implemented in such a way that does not distract from reading (see Wagner et al., 2021), would be preferable. Second, more balanced samples would be needed: most participants in our study were female professionals.

3.4. STUDY 4. Poetry-elicited Emotions: Contributions of Auditory Imagery in the Hard of Hearing

3.4.1. Introduction

Although language has been shown to evoke images in different sensory domains (e.g., Johnson et al., 2013) and despite converging evidence that silent reading engages complex vocal imagery (Alexander & Nygaard, 2008; Gunraj & Klin, 2012; Hubbard, 2010), emotional responses to literature are rarely examined in relation to auditory imagery. This omission is especially surprising in the case of poetry, as one of its defining features is the abundant use of sound similarities and recurrences (e.g., alliteration, assonance, consonance, rhyme, meter, etc.). The strongly patterned auditory images poetry can evoke might be particularly potent in eliciting emotions.

There is recent empirical evidence for links between auditory imagery and poetry-elicited emotions (Piţur & Miu, 2022). Provided that sensory deprivation impedes the development of auditory imagery, could it also make individuals with hearing loss less susceptible to the emotional effects of poetry? Our main aim was to investigate differences in auditory imagery and poetry-elicited emotions between hard of hearing and hearing individuals. First, we expected the hard of hearing group to report lower levels of trait auditory imagery, and less vivid auditory images of words and other sounds while reading. Second, given the link between auditory imagery and poetry-elicited emotions (Piţur & Miu, 2022), and considering the possibility that phonological knowledge deficits associated with hearing loss alter the processing of parallelistic features, we also expected the hard of hearing group to report less intense emotions during reading. A secondary aim was to investigate a possible mediator role of auditory imagery. Given that the vividness of the words readers hear in their mind has been found to predict the intensity of poetry-elicited emotions (Piţur & Miu, 2022), we

hypothesised that auditory imagery for words during reading would be a mediator in the relation between hearing loss on arousal. Finally, we explored links between hearing loss and other dispositional traits (trait empathy, visual and movement imagery, proneness to fantasising) and psychological processes (empathy for author and characters, vividness of visual and movement imagery during reading) relevant to poetry-elicited emotions (Pițur & Miu, 2022). We also looked at different aspects of hearing loss (diagnosis, rehabilitation, communication preferences) to find more specific associations with arousal and auditory imagery.

3.4.2. Methods

3.4.2.1. Participants

Twenty-one participants were assigned in the hard of hearing group based on their answers to questions regarding their diagnosis; only individuals who had been officially diagnosed with hearing loss and self-reported good reading and writing abilities were included. Twenty-one controls, matched for sex, age and education, were selected from a large pool of healthy recruited participants. In total, 42 participants (85.71% women), aged between 17 and 73 (M = 34.07; SD = 17.63), completed the study on-line.

3.4.2.2. Procedure

To minimize fatigue, the study was split into two equal-length sessions that participants completed within two weeks. First, they filled reading experience and dispositional traits questionnaires (i.e., trait empathy, trait visual imagery, trait movement imagery, trait auditory imagery, proneness to fantasize). Second, they were asked to spend thirty minutes reading from a set of poems made available by the researchers. They were told they could read any of the poems, in any order, and were provided with an interactive table of contents to facilitate

their navigation through the large collection. The set was created and used in a previous study on Romanian participants to elicit a wide range of emotions (Pițur & Miu, 2022). After the reading session, participants retrospectively rated the intensity of the emotions they felt during reading. They also answered a few other questions about psychological processes during reading: to what extent they empathized with the author and characters, and to what extent they experienced visual images, motor images, auditory images for words and auditory images for other sounds. For hard of hearing participants, we also collected data about their diagnosis, hearing aids or cochlear implants, and preferences for using sign language or lip reading.

3.4.2.3. Measures

3.4.2.3.1. Reader characteristics

3.4.2.3.1.1. Reading experience

We measured reading experience by asking a few questions about participants' reading history and habits (Pițur & Miu, 2022). First, they indicated what they considered to be the longest period of having read poetry on their own initiative ("none", "several days", "several months" or "several years") and the age at which this period occurred. Second, they indicated how often they had read poetry during the last six months ("never / almost never", "once every few months", "each month", and "each week").

3.4.2.3.1.2. Dispositional traits

Trait empathy was measured with the Toronto Empathy Questionnaire (TEQ; Spreng et al., 2009). The TEQ includes items pertaining to emotional contagion, emotion comprehension, sympathetic physiological arousal, and conspecific altruism.

Trait visual imagery was measured with the Visual Vividness of Imagery Questionnaire (VVIQ; Marks, 1973). The VVIQ presents vignettes describing visual scenes to which new elements are added. Participants rate the vividness of these scenes as they imagine them.

Trait movement imagery was measured with the revised version of the Vividness of Movement Imagery Questionnaire (VMIQ-2; Roberts et al., 2008). The VMIQ prompts participants to imagine executing a set of movements from an internal perspective (i.e., as if they are looking through their own eyes), from an external perspective (i.e., as if they are watching themselves performing the movement) and to imagine what doing the movement feels like.

Trait auditory imagery was assessed with the Bucknell Auditory Imagery Scale (BAIS; Halpern, 2015). BAIS items cover two aspects of auditory imagery: vividness and control. Respondents are asked to imagine certain sounds (e.g., the sound of a gentle rain) and to rate how vivid the auditory images are and how easy it is to change them (e.g., the rain turns into a violent thunderstorm).

Proneness to fantasising was measured with the Imaginative Fantasy subscale of the Fantasy Questionnaire (FQ-IF; Weibel et al., 2018), which asks respondents about fantasies, daydreams and mind-wandering.

3.4.2.3.2. Poetry-elicited emotions

We used the Aesthetic Emotions Scale (AESTHEMOS; Schindler et al., 2017) to assess participants' emotional responses to the poems. Participants rated the extent to which they felt each of the 21 discrete emotions described in the questionnaire, covering four broad categories: aesthetic emotions (e.g., being moved), pleasing emotions (e.g., joy), epistemic

emotions (e.g., interest) and negative emotions (e.g., sadness). A total AESTHEMOS score was created as an indicator of emotional arousal in our analyses.

3.4.2.3.3. Psychological processes during reading

We asked participants several questions about empathy and imagery during reading (for more details about item creation and scoring, see Pițur & Miu, 2022). They rated to what extent they experienced poetry-related empathy and how vivid their visual imagery, movement imagery, auditory imagery for words and auditory imagery for other sounds had been during reading.

3.4.2.4. Statistical Analyses

We explored correlations between reader characteristics, psychological processes during reading, and emotions in the entire sample. For our confirmatory analyses, we first compared reader characteristics, psychological processes, and poetry-elicited emotions between the two groups using independent two-sample t-tests. Then, we investigated the mechanistic role of auditory imagery for words: we estimated a causal mediation effect, having fitted a model for the conditional distribution of auditory imagery for words given hearing loss, and a model for the conditional distribution of arousal given auditory imagery for words and hearing loss. For our planned exploratory analyses, we further used t-tests and correlation analyses to investigate links between hearing loss and other reader traits and psychological processes, and between certain aspects of hearing loss, arousal and auditory imagery.

3.4.3. Results

3.4.3.1. Auditory Imagery and Poetry-Elicited Emotions

Our principal aim was to investigate differences in auditory imagery and poetry-elicited emotions between the two groups. As hypothesised, we found that hard of hearing participants reported lower levels of both trait and process imagery. They scored significantly lower on both subscales of trait imagery (BAIS-V: $t(34.92) = 3.69$, $p < .001$; BAIS-C: $t(29.57) =$, $p < .001$) than controls (BAIS-V: $M = 5.31$, $SD = 1.09$; BAIS-C: $M = 5.68$, $SD = .78$). When asked about auditory images evoked during the reading session, they reported hearing words less vividly in their mind ($M = 2.86$, $SD = 1.74$, $t(39.34) = 2.92$, $p = .005$) than controls ($M = 4.33$, $SD = 1.53$), but not other types of sound ($t(36.80) = 1.76$, $p = .086$). Contrary to our expectations, we did not find any significant differences in the intensity of poetry-elicited emotions between hard of hearing and control participants ($t(37.29) = .56$, $p = .578$).

A secondary aim was to explore relations between hearing loss, auditory imagery and arousal. Although a significant, negative association was found between hearing loss and auditory imagery for words during reading ($B = -1.48$, $p = .006$), the latter did not predict arousal and was not a significant mediator (see Figure 1). Contrary to our hypothesis, the weaker auditory images of words in the hard of hearing did not impact the intensity of their emotions.

3.4.3.2. Exploratory Analyses

We further examined other possible differences regarding dispositional traits and cognitive mechanisms between the two groups. The hard of hearing group reported significantly lower levels of trait visual imagery ($t(37.41) = 3.14$, $p = .003$), compared with the control group,

and significantly lower levels of proneness to fantasize ($t(38.62) = 2.63$, $p = .012$). No significant differences were found regarding trait empathy and trait movement imagery, nor regarding processes empathy, visual or movement imagery during reading. Mediation analyses were run to investigate mechanisms alternative to auditory imagery for words: neither poetry-related empathy, nor visual imagery, nor movement imagery mediated the relation between hearing loss and arousal (all $ps > .05$).

It is noteworthy that, apart from trait movement imagery, all reader traits showed significant, moderate and positive correlations with their homologous processes: trait empathy with empathy for authors and characters, trait visual imagery with visual images while reading, and trait auditory imagery with auditory imagery for words and other sounds while reading.

Lastly, we explored possible links between specific aspects of hearing loss and arousal, on the one hand, and auditory imagery, on the other. First, lower arousal was associated with later adoption of correction devices: the age at which participants started using a hearing aid correlated negatively with the intensity of poetry-elicited emotions (rho = -0.48, p = .040). Second, weaker auditory imagery was linked to certain communication preferences. Trait auditory imagery scores were lower for participants who use sign language in social interactions (BAIS-V; M = 2.08, SD = 1.32, t(4.927) = 2.72, p = .042) than not (BAIS-V; M = 4.12, SD = 1.47), and for those with at least one signing parent (BAIS-V: M = 1.50 , SD = .71, t(2.189) = 4.04, p = .048; BAIS-C: M = 1.179, SD = 0.25, t(10.085) = 8.91, p < .001) than none (BAIS-V: M = 3.96 , SD = 1.52; BAIS-C: M = 4.28 , SD = 1.30). During reading, auditory imagery for words was less vivid for participants who use lip reading in social interactions (M = 2.35, SD = 1.50, t(8.616) = 4.84, p = .001) than not (M = 5.00, SD = .82).

3.4.4. Discussion

The present study investigated whether hard of hearing individuals present atypical auditory imagery and experience poetry-elicited emotions differently. As hypothesized, the hard of hearing group reported lower levels of trait auditory imagery and less vivid auditory imagery for words during reading. However, the emotions they felt during reading were not significantly less intense than those of hearing participants. We did not find any compensatory mechanisms.

To our knowledge, these results are the first to show that, despite known risks for a detrimental effect on language development (Duchesne, 2016; Fagan, 2016; Most, 2016), hearing loss does not make individuals significantly less receptive to the emotional effects of poetry. Exploring which characteristics of hearing loss were associated with lower levels of auditory imagery, we found several small and seemingly contradicting associations with communication preferences. Since most participants reported lip-reading and not signing in day-to-day life, a more heterogeneous sample would be needed to clarify the relations between auditory imagery and the two. However, we believe there could be one plausible explanation for the latter finding: if visual cues are used more than auditory cues in lip-reading, it is possible that auditory representations of words weaken in time. Future studies could also investigate if specific abilities are affected by hearing loss and impact auditory imagery for words.

There are several limits to the generalizability of our results. Our sample was small and showed low heterogeneity for a few variables (i.e., socio-economic status, diagnosis, rehabilitation, communication preferences). Second, in the interest of reducing participant fatigue, we did not control for the actual time spent in-task, order effects or selection biases, all of which may have consequences on emotion. Third, we did not measure any text

characteristics, hence we cannot estimate to what extent levels of poetry-related empathy, visual imagery, or motor imagery depended on characteristics of the reader rather than on the content of the poems. If developed in the future, datasets providing such information, as well as normative emotion ratings, would prove extremely valuable to disentangling the effects of text and reader characteristics on poetry-elicited emotions. Lastly, to avoid recall biases, measuring emotions after each poem rather than at the end of a reading session in future studies would be a much-needed methodological improvement.

4. GENERAL DISCUSSION

4.1. Overview of Major Findings

Examining the role of individual differences in poetry-elicited emotions, the four studies presented in this thesis are the first to offer empirical proof that auditory imagery contributes to arousal, both as a psychological process that occurs during reading (i.e., auditory imagery of words) and as an individual trait. They also provide novel insights into the diversity of poetry-elicited emotions and their dynamics. We briefly review the major findings below.

4.1.1. Mechanisms and Individual Differences

'Hearing' the words more vividly while reading increases emotion intensity. Auditory imagery for words is one of several mechanisms underlying poetry-elicited emotions (i.e., empathy with the author and characters, visual images prompted by the text). Results of **Study 1** indicate that verbal images acquired through phonological recoding do engage emotion-eliciting mechanisms, in line with the Integrative Simulation Model. However, **Study 4** suggests that there are other, unidentified, mechanisms that may compensate for low imagery: hard of hearing individuals experienced similar poetry-elicited emotions to hearing controls, despite significantly weaker auditory images.

Readers with greater trait auditory imagery feel more intense emotions. Participants who scored higher on a trait auditory imagery measure reported greater arousal both when it was measured globally (i.e., at the end of a reading session; **Study 1, Study 4**), and granularly (i.e., for every line in every poem; **Study 2, Study 3**). The most straightforward explanation would be that individuals who are generally more apt at imagining sound are also more able to 'hear' the words vividly when reading. However, this isn't fully supported by our data, as trait-process correlations of auditory imagery were modest across our studies.

Moreover, in **Study 3**, rhyme increased arousal significantly more for readers with weaker auditory imagery than for those with greater auditory imagery. Clearly, sound parallelisms have the potential to help readers engage in mental simulations better than their general abilities might dictate.

4.1.2. Diversity of Poetry-Elicited Emotions

Study 1 provides novel evidence for poetry-elicited emotions during silent reading, and shows that poetry can elicit a wide range of emotions: pleasing, negative, aesthetic and epistemic. **Study 3** further shows that arousal and valence changed within poems, following subtle trends marked by sharp peaks and drops. Both text and reader characteristics explained a proportion of this variation, but the largest effect was of trait auditory imagery on arousal.

4.2. Future Directions

Based on our findings, we offer a few recommendations for future research into poetry-elicited emotions. (1) Whenever possible, measure auditory imagery during reading. Trait-process correlations were only moderate for auditory imagery across our studies, and it is likely that some poetic devices help readers 'hear' the words they are reading above what could be considered their baseline abilities. (2) Examine text and reader characteristics in interaction. Even beyond the auditory modality, it is plausible that poetic devices in general facilitate the generation of mental imagery. To study such interactions, however, text characteristics must be assessed in systematic ways. Research on prose offers some methods for quantifying the occurrence of visual, auditory or motor descriptions in a text (Mak & Willems, 2019, 2021). (3) Consider interactions between mechanisms. In line with the Integrative Simulation Model, the auditory simulation may elicit emotions via two routes. The first is self-sufficient: prosody can directly induce emotions through emotional contagion. The second, however, implies that one mechanism engages another: the auditory

simulation of the 'voice' is integrated in multimodal simulations of the author or characters in the poem, informing the reader's empathy, sympathy or antipathy. We recommend assessing several mechanisms besides auditory imagery whenever possible, in order to clarify their interactions. (4) Explore other dimensions of auditory imagery. Reading engages complex verbal imagery. Therefore, other dimensions of auditory imagery might be relevant and should be investigated, besides vividness and control. (5) Interfering as little as possible with the reading act, measure discrete emotions. Emotions that arise while reading a poem might not be the consequence of appraising its content, but of appraising one's overall experience of reading. Some emotions might be content-related (e.g., feeling sad through empathizing with the authorial voice), as well as process-related (e.g., feeling bored or confused with the poem). Future studies should aim to be clear as to what emotions they are really measuring. (6) Granular measures of emotion are desirable, but global measures are also useful. Reading a poem is not a linear emotional experience and moment-to-moment measures clearly capture readers' affective changes more accurately. However, one of our most important findings was replicated in studies with different levels of granularity (i.e., session-level, line-level). This suggests that participants are able to retrospectively summarize their emotional experience accurately enough.

4.3. Concluding Remarks

This line of research is new and conclusions should be drawn cautiously. In isolation, the findings presented in this thesis will not make better writers or better readers. They do, however, offer some empirical proof for old intuitions about poetry and emotion, as well as new findings that will hopefully incentivise others to continue looking into individual differences. They mainly draw attention to an aspect that has been overlooked: reading is not a silent act. We hear the words in our mind, we hear the poet speaking as themself or another.

This is what Robert Pinsky describes as an act of great intimacy (1999): unlike painting, music or dancing, the artwork is created in the mind of the reader. We are the medium of poetry.

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