Marina Ramos Caro, María Luján Rubio*, Konrad Rudnicki and Ana María Rojo López

Dancing with words: the emotional reception of creative audio description in contemporary dance

https://doi.org/10.1515/psicl-2024-0097
Received November 20, 2024; accepted June 27, 2025

Abstract: Recent advancements in Cognitive Translation and Interpreting Studies (CTIS) have spurred a surge in experimental research, particularly in Audio Description (AD) studies. This shift has aimed to deepen the understanding of the cognitive processes involved in both the creation of AD and its reception by visually impaired users. Research has focused on the reception of various AD types and styles, examining factors such as language type, voice, and intonation. However, most experimental studies have concentrated on AD for film. Addressing this gap, the current study introduces an experiment that investigates the cognitive and emotional effects of different AD styles in the context of contemporary dance within the performing arts. Thirty-three visually impaired participants listened to four 5-minute contemporary dance pieces with AD (2 with a descriptive version of the AD vs. 2 with a creative version of the AD). We implemented a within-subject design to control for inter-subject variability. Both self-report and physiological methods were used to measure AD reception, which involved the cognitive effort invested by visually impaired users (cardiac deceleration and self-reported effort), the pleasantness experienced (electrodermal activity and self-reported valence, arousal, sense of presence, engagement, and satisfaction), and their ability to recall AD details (a post-task tailor-made questionnaire). Although participants reported a preference for the creative version over the descriptive one, self-report measures and physiological data revealed that the emotional responses elicited by creative clips were experienced negatively. This discrepancy between retrospective interviews and momentary biomarkers of emotional experience highlights the significance of users' familiarity with the type of AD.

Keywords: audiovisual translation; audio description; accessibility; cognitive reception; emotional reception

***Corresponding author: María Luján Rubio**, University of Murcia, Murcia, Spain,
E-mail: maria.lujanr@um.es
Marina Ramos Caro and Ana María Rojo López, University of Murcia, Murcia, Spain
Konrad Rudnicki, University of Antwerp, Antwerp, Belgium

1 Introduction

According to the WHO (2023), there are an estimated 2.2 billion people worldwide with visual impairment. In Spain alone, the National Institute of Statistics (INE 2008) reports that one million people live with some form of blindness. As society ages, these figures are expected to rise.

Within Translation Studies, there has been an increasing awareness of the challenges faced by individuals with sensory disabilities in accessing communication. This awareness has spurred significant growth in the knowledge, research, and teaching of Audiovisual Translation techniques designed to provide universal accessibility, such as Audio Description (AD), a form of intersemiotic translation that transforms images into words to help visually impaired individuals construct a mental image of what they cannot see. Several guidelines have been developed to standardize the practice of AD. For instance, in Spain the UNE 153020 standard (AENOR 2005), and in the EU, the ADLAB project (2011–2014), have established recommendations for the AD creation process.

In the early decades, AD research mainly focused on the linguistic, filmic, and narrative aspects of AD products, aiming to normalize professional practices and establish guidelines for AD in different fields, such as dance (Fryer 2009), opera (Cabeza-Cáceres and Matamala 2008; Iterrugi Gallardo and Permuy Hércules 2019), and theater (Remael, Reviers and Vercauteren 2015). However, recent developments in Cognitive Translation and Interpreting Studies (CTIS) have stimulated experimental research, shifting the focus of AD studies towards understanding the cognitive processes involved in both creating AD (e.g., Jankowska 2021; Ramos and Rojo 2020) and its reception by visually impaired users (Eardley-Weaver 2013).

Some studies assessed user satisfaction with AD quality (Udo and Fels 2009, 2010), degree of presence or immersion in the plot (Fryer and Freeman 2012, 2013), level of understanding (Cabeza-Cáceres 2013) and memory recall (Fresno Cañada 2014). Recent studies also explore the audience's emotional response using self-report and physiological measures (Iturregui-Gallardo and Matamala 2021). Generally, data indicate a high level of user satisfaction with AD across various fields, including theater (Ferziger et al. 2020). Studies also show that AD can cause similar levels of immersion and emotional response as original audiovisual texts, both in terms of subjective perception and physiological activation (Fryer 2013; Fryer and Freeman 2013, 2014; Iturregui-Gallardo 2019; Ramos 2015, 2016; Walczak 2017; Wilken and Kruger 2016; Walczak and Fryer 2018). Experimental studies involving sighted participants listening to AD while blindfolded reveal similar or greater responses compared to those watching audiovisual texts (Ramos 2015, 2016; Rojo López et al. 2021; Ramos et al. 2021).

Different AD techniques have been tested, such as creative or subjective AD with metaphorical language versus standard AD with objective language (Bardini 2017; Fryer and Freeman 2013; Jankowska 2013; Romero-Fresco and Fryer 2013; Ramos 2015, 2016; Ramos and Rojo 2014; Walczak and Fryer 2017). Human-voiced AD with emphatic intonation generally produces higher levels of immersion and enjoyment than synthetic-voiced AD (Jankowska et al. 2022; Matamala et al. 2013; Szarkowska 2011; Szarkowska and Jankowska 2012; Walczak and Szarkowska 2012). Factors such as film genre (Ramos 2016; Ramos and Rojo 2014), voice type and gender (Bardini 2020), and emotional valence (Jankowska et al. 2022) influence user preferences for different AD styles. Synthetic voice remains an accepted compromise solution despite its varied impact on audience enjoyment (Maczynska and Szarkowska 2011).

Notwithstanding these significant advances, experimental research has predominantly concentrated on filmic AD, probably given its broad consumption and scope, and experimental studies on performing arts are scarce. More specifically, there are no empirical studies testing different AD types in contemporary dance, although existing proposals suggest using more metaphorical language and vocal techniques to enhance immersion and link choreography with the script (Bläsing and Zimmermann 2021; Barnés-Castaño et al. 2021; Cavallo 2015; Margolies 2015). Dance requires a more creative approach that goes beyond the objective description of movements and scenery (Cemaforre, European Centre for Cultural Accessibility) and it is therefore an ideal discipline to test the impact of a more creative AD on audience engagement and satisfaction to identify audience preferences. Understanding these preferences may, in turn, help establish professional practices that enhance the accessibility and enjoyment of dance, fostering greater involvement and attendance at contemporary dance events.

The present paper addresses some of these remaining challenges through an experimental study designed to measure the effects of different AD styles, descriptive versus creative, on the reception of a contemporary dance performance by a visually impaired audience. But before delving into the detailed description of the experiment, we will first review the existing research conducted in the field of dance audio description.

2 The AD of dance

As we have seen, dance AD has received relatively little attention within Translation and Interpreting Studies (TIS), perhaps due to its inherently visual nature. Unlike disciplines such as opera or theater, which rely significantly on the auditory and narrative information provided by dialogue, contemporary dance is conveyed almost entirely through the bodily expressions of the performers. Consequently,

blind individuals may be reluctant to attend dance performances, as their understanding normally relies exclusively on the AD and the accompanying music. While every artistic work is based on a concept, contemporary dance typically develops and transmits these concepts abstractly, primarily through the bodies and movements of the performers. Lighting, scenery, costumes, and occasionally written or spoken texts also contribute to the meaning-making process, but narrative elements are generally peripheral. In this sense, contemporary dance is more akin to abstract art than classical theater.

Existing works on dance AD highlight a critical dichotomy for audio describers: should they adhere strictly to AD guidelines that recommend objective descriptions without adding or omitting details? Authors like Snyder (2010), Fryer (2018), and Kleege (2014) address this question from various perspectives. Fryer and Snyder, drawing on their extensive professional experience in the UK and US, argue that mere objective, detailed descriptions of movements can be overwhelming and dull, failing to convey the performance's emotions. They recommend more general descriptions that capture the overall message of the creation. Kleege (2014), based on essays on dance interpretation, similarly concludes that conveying the piece's overall message often requires selective information.

Bukowski (2021), Fryer (2016), Holsanova (2023) and Snyder and Geiger (2022) provide additional recommendations from their professional experience. They advocate for close collaboration with the artistic team, especially the choreographer, and suggest complementing AD with tactile visits or dance workshops for blind spectators. They also emphasize adapting the AD to the specific style of each show. Castan (2014) echoes this recommendation, highlighting the significant differences between filmic AD and contemporary dance AD. Unlike film AD, dance AD does not need to fit into dialogue gaps, offering more freedom for synchronization with the dancers' movements. Furthermore, dance performances often feature multiple protagonists simultaneously, requiring careful selection of the most relevant details to convey the overall message effectively.

Finally, some recent contributions describe innovative techniques in contemporary dance AD projects. Barnés-Castaño et al. (2021) propose involving blind audiences in the AD creation process. Verdú (2022) applies the concept of auteur description by developing her contemporary dance piece as a choreographer, dancer, and audio describer. Carloni (2023) points out that, despite the lack of dialogue, dance performances include sound elements such as beats, gasps, and squeaks, which can assist the audio-describer in creating a more immersive experience. Additionally, Luján's (2023) Master's thesis, which includes interviews with ten professional dance audio describers from various countries, identifies the key challenges in dance AD, such as conveying abstract movements, synchronizing text with movements, selecting relevant information, and understanding the piece's

meaning and essence to describe its symbolism and aesthetics. All interviewed audio describers emphasize the use of symbolic and connotative language, including metaphors, analogies, and descriptive adjectives.

The language used in dance AD plays a vital role in engaging the audience. A purely straightforward description of movements can easily become monotonous and mechanical, potentially losing the audience's interest. To address this, the present study explores whether a more creative AD could enrich the overall audience experience. The next section outlines the linguistic techniques employed in crafting the AD.

3 Linguistic resources in AD

One of the most common yet highly debated requirements in AD guidelines is the mandate to avoid subjective information. The effectiveness of this objectivity requirement has been especially questioned in products with strong artistic or poetic content, such as experimental films (Ramos and Rojo 2014) and dance (Barnés-Castaño et al. 2021; Margolies 2015).

Various tools have been explored as alternatives to standard filmic AD, including the already mentioned use of creative AD in contrast to standard AD with objective language (Bardini 2017; Fryer and Freeman 2013; Jankowska 2013; Ramos 2016; Romero-Fresco and Fryer 2013; Walczak and Fryer 2017). These studies collectively emphasize the potential benefits of integrating creative and subjective elements into AD to enhance the viewing experience for visually impaired audiences. The use of metaphorical language, film-specific terminology, and emotive descriptions can lead to higher levels of engagement, presence, and emotional response, making the film-watching experience more immersive and enjoyable.

Metaphors are a common resource in the AD of non-mainstream artistic manifestations such as contemporary dance (Luján 2023; Ramos Caro 2025) and visual arts (Luque Colmenero 2016, 2019, 2020, 2021, 2022). The evocative power of metaphor has been tested in narrative texts through empirical studies using EEG (Hoorn 1997, 2001) and functional MRI (Bambini et al. 2011; Bohrn et al. 2012), demonstrating that metaphorical language activates different brain patterns compared to non-metaphorical language, particularly engaging the right hemisphere with novel metaphors. Additionally, Rojo et al. (2014) found that metaphorical idiomatic expressions elicit stronger emotional responses than their non-metaphorical counterparts, as indicated by heart rate monitor data. In the field of AD, Luque Colmenero has conducted extensive research on metaphors in AD, in which she identified novel, deliberate, and direct metaphors as prevalent in her AD corpus from major museums like Tate Modern and MoMA. Metaphors, consciously created by audio describers

and marked by explicit comparisons and similes (e.g., "like," "resembles"), make abstract concepts concrete and comprehensible for the audience, serving as a powerful linguistic tool capable of evoking emotions through suggestion (Oatley 2003).

In the field of AD, several experimental studies have explored the inclusion of metaphors (Jankowska 2013; Ramos and Rojo 2014; Ramos 2016; Zabrocka 2019), demonstrating that metaphorical AD, despite deviating from guideline recommendations (AENOR 2005; Dosch and Benecke 2004), can be effective and well-received by blind audiences. Another commonly used technique is the inclusion of the emotional states of characters in filmic AD (Bardini 2017; Jankowska 2013; Ramos 2016; Romero-Fresco and Fryer 2013). Results from these studies indicate that explicitly describing characters' emotional states in filmic AD generally enhances emotional engagement and creates a more immersive viewing experience. However, this approach requires a careful balance to ensure that descriptions remain clear, accurate, and accessible. Additionally, the use of a poetic register, a common feature in alternative and creative AD styles, has been extensively tested (Bardini 2017; Fryer and Freeman 2013; Jankowska 2013; Ramos 2016; Romero-Fresco and Fryer 2013; Walczak and Fryer 2017). Collectively, the results highlight the potential benefits and challenges of integrating a poetic register into filmic AD, emphasizing the need to enhance the audience's experience to evoke the desired emotional response.

The inclusion of these resources (metaphors, information on emotional states, and poetic register) can significantly enhance the AD of dance. Metaphors can help concretize abstract concepts in dance, where narrative and artistic expressions are conveyed abstractly through performers' bodies. For example, describing a dancer's leap as "soaring like an eagle" enables listeners to visualize the grace and height of the movement. Commenting on the emotional states of performers is essential for conveying the narrative and emotional depth of a dance piece, as dance often communicates complex emotions and stories through body language and facial expressions. Noting that a dancer's movements are "filled with sorrow" or "radiate joy" helps listeners connect with the emotional journey of the performance. Finally, using a poetic register enhances the emotional experience and elevates the language of the AD, making it more engaging and reflective of the artistic quality of contemporary dance. This approach involves using more evocative, imaginative and emotionally loaded language, which can enhance the aesthetic experience and align the AD with the creative and often abstract nature of contemporary dance.

In addition to the three commonly researched parameters in AD (metaphors, information on emotional states, and poetic register), we incorporated rhythmic repetitions or parallelisms, a technique that reflects the repetitive and cyclical patterns often found in dance choreography. This method, frequently used in poetry and advertising (Balint et al. 2016), can instill a sense of rhythm and flow in the

narration, making dance AD more musical and in sync with the performance's tempo. Rhythmic repetitions also help to reinforce key movements or themes, making them more memorable for the audience. For instance, repeating a phrase like "the dancers spin and spin, lost in a whirl of motion. (…). They spin and spin. (…) They spin and spin" emphasizes the continuous and dynamic nature of the dance.

Our study integrates metaphors, emotional states, a poetic register, and rhythmic repetitions to create a more immersive and emotionally impactful AD experience. This approach allows us to investigate the impact of creative language on the cognitive and emotional responses of our audience, testing its potential for optimizing the AD of contemporary dance.

4 The study

4.1 Aim, hypotheses and variables

Our aim was to test the effects of different AD styles, i.e., descriptive versus creative, on the emotional and cognitive reception of contemporary dance by a visually impaired audience. To explore reception, we operationalized the construct by defining a 'good' audio description through specific criteria: it should be easy to process, requiring minimal cognitive effort; emotionally engaging and enjoyable, to evoke feelings and enhance immersion and satisfaction for visually impaired individuals; and helpful, aiding in the recall of the described content.[1]

- Cognitive effort was evaluated through both subjective and objective measures. Subjectively, participants' perceived effort was gauged using self-reports to capture their personal assessment of cognitive load. Objectively, cardiac deceleration was monitored, with a slower heart rate serving as an indicator of higher cognitive load.
- Emotional salience and pleasantness were also evaluated using both subjective and objective measures. Subjectively, participants completed self-reports on valence and arousal to capture their emotional responses, as well as on their sense of immersion and enjoyment of the performance to gauge emotional engagement. Objectively, electrodermal activity (EDA) was measured, with higher levels indicating increased arousal, and high-frequency heart rate variability (HRV) was monitored, with higher HRV suggesting the body's response to emotional stimuli and the need to regulate arousal.

1 The operationalisation of the variables, including how each was defined and measured within the context of this study, is further detailed in Section 4.4 (Instruments and Measures for the Variables).

– The usefulness of the AD was measured by the amount of remembered details in a recall test.

Derived from these variables, five hypotheses were stated:
– H1a: Compared to descriptive AD, creative AD causes less subjective cognitive effort measured with self-report.
– H1b: Compared to descriptive AD, creative AD causes less objective cognitive effort measured with HR.
– H2a: Compared to descriptive AD, creative AD is perceived as more pleasant – measured with self-reported valence, arousal, transportation and enjoyment.
– H2b: Compared to descriptive AD, creative AD is more emotionally salient – measured with phasic skin conductance and HRV.
– H3: Compared to descriptive AD, creative AD is more cognitively engaging – measured with recall accuracy.

Table 1 (below) presents the description and values of the study variables.

Table 1: Description and values of the study variables.

Variable name	Description	Values
Age	Age of the participant	Years
Sex	Sex of the participant	0 – male, 1 – female
Impairment	Degree of visual impairment of the participant	0 – partially sighted (10% vision), 1 – total sight loss
Time	The position of a given trial (clip) in the order of the experiment. This variable approximates the fatigue of participants as time passes.	1–6
LanguageType	The type of elaboration used in the audio description of the clip	0 – descriptive, 1 – creative
SAMArousal	Self-reported arousal measured with the self-assessment Manikin (Bradley and Lang 1994)	1–9
SAMValence	Self-reported emotional valence measured with the self-assessment Manikin (Bradley and Lang 1994)	1–9
Transportation	Self-reported feelings of transportation measured with the narrative transportation questionnaire by Green and Brock (2000)	1–7
Enjoyment	Self-reported feelings of enjoyment measured with the self-report questionnaire by Barnés (2024)	1–7
CognitiveEffort	Self-reported cognitive effort measured with the mental effort rating scale (Paas 1992)	1–9
Engagement	The amount of accurate responses in the ad-hoc recall task.	0–4
PhasicEDA	Phasic EDA measured with the time integral of the phasic driver during the audio described clips according to Benedek and Karnbach (2010).	muS*s

Table 1: (continued)

Variable name	Description	Values
TonicEDA	Average tonic EDA level during the audio described clips according to Benedek and Karnbach (2010).	muS
HR	Heart rate during the audio described clips	Bpm
HRV	High-frequency heart rate variability (0.15–0.4 Hz) measured obtained with a Fourier transform of the IBI wave during the audio described clip.	ms^2
BaselinePhasicEDA	Phasic EDA during the baseline measurement that preceded the relevant audio described clip. This control variable allows to account for individual differences in general levels of EDA.	muS*s
BaselineTonicEDA	Tonic EDA during the baseline measurement that preceded the relevant audio described clip. This control variable allows to account for individual differences in general levels of EDA.	muS
BaselineHR	Heart rate during the baseline measurement that preceded the relevant audio described clip. This control variable allows to account for individual differences in general levels of heart rate.	Bpm
BaselineHRV	Heart rate variability during the baseline measurement that preceded the relevant audio described clip. This control variable allows to account for individual differences in general levels of HRV.	ms^2

4.2 Sample

Our sample consisted of 33 participants, all of whom had less than 10 % vision and no other known disabilities. The sample comprised 13 men and 20 women, with ages ranging from 16 to 80 years. Although this age range is far from ideal, it reflects the challenges of working with minority communities, where sample selection can be limited. Recruitment of participants was facilitated by the ONCE, the Spanish national organization for blind people, in both Murcia and Granada. The study was conducted in accordance with the guidelines of the University of Murcia Ethics Committee and received its approval.

4.3 Materials

We selected two 10-minute fragments from two contemporary dance choreographies. For each 10-minute fragment, we created two different versions: 5 minutes

with a descriptive style and the other 5 minutes with a creative one. The clips were presented with image and sound The AD was created by the authors of the paper, revised by the artistic creators of the dance performance and then voiced professionally using a synthetic voice. The decision to use a synthetic voice was made to ensure consistency across all clips and to avoid potential variation in vocal performance (e.g., tone, emotion, pacing) that could have influenced participants' perception of the AD. This allowed us to isolate the effect of the AD content itself, rather than voice quality or interpretation.

To elaborate the parameters that define each type of AD, we started by creating the descriptive version of the AD, in which we followed Spanish guidelines and thus described the movements objectively, but we also included three technical terms on the dance moves (cf. Table 2). The first time each term was introduced, the move was described.

For the creative AD, we used similes, descriptions on the emotional state of the performers, poetic register, and rhythmic repetitions. We included a similar number of tokens of each category in the two clips. We also maintained a consistent total number of words in each AD to ensure that the descriptions are balanced and concise. Table 3 presents a summary of the parameters included in each version.

To guarantee that both versions were of similar difficulty, we also run several readability tests on the AD scripts with the online tool https://legible.es/.

A within-subject design was implemented to control for inter-subject variability. To ensure a balanced and unbiased presentation of the AD clips, we used a counterbalanced design for the order in which participants experienced the different AD versions. Participants (P) were assigned to different sequences to control for order effects. The clips were grouped by version type. This counterbalancing approach ensured that each version of the AD was presented in every possible position across participants, minimizing the potential for order-related biases in the study results. Table 4 illustrates the presentation order.

Table 2: Stimuli design.

AD1	AD2
5 min descriptive	5 min descriptive
5 min creative	5 min creative

Table 3: Parameters for the design of the two AD versions.

Parameters (descriptive)	Parameters (creative)
Dance movements & terms:	Similes:
Cambré	*Mueven las piernas como si pedalearan.*
Ronde Jambe	['They move their legs as if they were pedalling.']
Plié	Emotional state of performers:
	Se detiene a la derecha de Ebi. Mira a su alrededor, preocupado.
	['He stops to Ebi's right. He looks around, worried.']
	Poetic register:
	Se arrastra/ Repta sigilosamente.
	['He drags himself/creeps stealthily.']
	Rhythmic repetitions:
	Giran. Paran. Giran. Paran. Giran. Paran.
	['They turn. They stop. They turn. They stop. They turn. They stop.']

Table 4: Stimuli presentation scheme and randomization pattern.

	Versions			
	1st clip	**2nd clip**	**3rd clip**	**4th clip**
P1	Descriptive AD1	Descriptive AD2	Creative AD2	Creative AD1
P2	Creative AD1	Creative AD2	Descriptive AD1	Descriptive AD2
P3	Descriptive AD2	Descriptive AD1	Creative AD2	Creative AD1
P4	Creative AD2	Creative AD1	Descriptive AD2	Descriptive AD1
…				

4.4 Instruments and measures for the variables

A comprehensive set of instruments was used to measure different aspects of the participants' reception. To assess cognitive effort, we employed the Mental-Effort Rating Scale by Paas (1992), which consists of a single item rated on a 9-point Likert scale. Emotional valence and arousal were measured using the Tactile Version of the Self-Assessment Manikin (SAM) by Iturregui-Gallardo and Méndez-Ulrich (2019), comprising two items. Engagement was evaluated with the Narrative Transportation Questionnaire by Green and Brock (2000), which includes twelve items. Enjoyment was assessed using the Aesthetic Experience Questionnaire by Barnés-Castaño (2024), consisting of ten items. The usefulness of the AD was measured in terms of cognitive engagement through a recall test with four items to determine the amount of remembered details. After completing the questionnaires for the last clip,

participants were asked in a retrospective interview which clip they liked best and why, in order to compare their responses with the results obtained from other measurements. They were also asked whether they had identified whether the voice in the study was human or synthetic and whether the fact that it was synthetic influenced their responses.

Additionally, physiological indicators were used to provide objective measures of participants' responses. The Shimmer 3 GSR + device was employed to obtain physiological measures of cognitive effort and emotional salience. Electrodermal activity (EDA) is a widely used physiological measure to assess arousal in studies examining media engagement and emotional responses to media stimuli (Ravaja 2004). This technique relies on the principle that the skin's ability to conduct electricity increases with moisture, which is controlled by the sweat glands. When individuals experience heightened emotional arousal, such as excitement, fear, or stress, their sweat gland activity rises, leading to higher skin conductance levels. By analyzing these EDA signals, researchers can infer the intensity of the participants' emotional reactions and engagement, providing valuable insights into the effectiveness and emotional impact of the media content (Gregersen et al. 2017). This method is particularly useful because it offers an objective, continuous, and non-invasive measure of arousal, complementing self-report measures and providing a deeper understanding of how media stimuli affect viewers. This is especially true for the visually impaired population whose arousal cannot be measured with another popular technique: pupil dilation (Mahanama et al. 2022). Movement artifacts were removed, and the signal was decomposed into phasic and tonic components using the Continuous Decomposition Analysis (Benedek and Kaernbach 2010). The unit of analysis over which the signal was decomposed was 1 video (5 min). Tonic EDA refers to the baseline level of sympathetic activity, which reflects the overall state of arousal or stress and changes slowly over time (as a result of, e.g., temperature in the room, chronic stress, individual differences). Phasic EDA, on the other hand, refers to rapid, transient changes in skin conductivity in response to specific stimuli or events, indicating immediate arousal or emotional reactions (as a result of, e.g., events happening in a watched movie). As such, EDA is a marker of sympathetic autonomic nervous system activity. However, its parasympathetic counterpart can also be measured in order to capture a more complete picture of emotional responses to media.

Parasympathetic activity is most often measured with high-frequency heart rate variability (HF-HRV) (Pham et al. 2021). Because it indexes the activity of the parasympathetic nervous system, researchers have found that it is predictive of participants' emotional self-regulation, sociability, and positive affect (Geisler et al. 2010; Petrocchi and Cheli 2019). This system is responsible for promoting relaxation and recovery, often referred to as the "rest and digest" state. When individuals demonstrate high HF-HRV, it indicates a greater ability to regulate their emotions

effectively, as the parasympathetic nervous system modulates heart rate in response to stress and emotional challenges (Mather and Thayer 2018). Researchers measure HF-HRV by analyzing electrocardiogram (ECG) or photopletysmograph (PPG) data. By plotting the time intervals between consecutive heartbeats and focusing on the frequency domain of that plot to isolate high-frequency components researchers are able to isolate HF-HRV – a biomarker of parasympathetic activity. In this study, photoplethysmogram was collected with the wearable Shimmer4 device at 128Hz (Consensys). Sensor was placed on the tip of the participants' index finger of the non-dominant hand. The signal was processed using Kubios HRV software version 2 (Niskanen et al. 2004). Movement artifacts were removed, and first order trend component was removed from the derived inter-beat-interval signal. Fourier transform was used to calculate the total power of high-frequency HRV in the inter-beat-interval signal. The unit of analysis over which HRV was calculated was 1 video (5 min). By examining HF-HRV, researchers can better understand how individuals manage their emotions when consuming media (Steinfurth et al. 2018). This measure offers an objective and non-invasive approach to studying (depending on the context of the study) the amount of emotional self-regulation and/or positive affect.

By integrating physiological data from the Shimmer 3 GSR+ with subjective measures, we aimed to achieve a multidimensional understanding of how different AD styles impact the reception of contemporary dance performances.

4.5 Procedure

The experiment took place in the ONCE headquarters in the cities of Murcia and Granada. In both locations, we worked in a quiet room isolated from external noise with a table and two chairs. Participants were first registered upon arrival at the study site, where they were provided with detailed information about the study's objectives, procedures, potential risks, and benefits. Informed consent was obtained to ensure that participants understood and agreed to their involvement in the study. Participants were informed that they could leave the experiment at any time. Shimmer devices were then placed on the participants wrists and fingers according to standardized protocols to ensure accurate data collection.

Electrodes were placed on the participants' middle and index fingers of their non-dominant hands. Next, participants engaged in a relaxing task that involved listening to soothing music for 5 min, during which the Shimmer devices recorded physiological data to establish a baseline. After this relaxing task, the recording was stopped, and participants completed the Self-Assessment Manikin (SAM) questionnaire.

Table 5: Study protocol.

1	Registration and informed consent
2	Electrode Placement
3	Relaxing task (music 5 min)
4	SAM questionnaire
5	10 min dance
6	Questionnaires
7	10 min dance
8	Questionnaires + retrospective interview

The study then proceeded with the listening to the first two 5-minute dance AD clips, while the Shimmer devices recorded physiological data to capture participants' physiological responses. Following this, the recording was halted, and participants completed the questionnaires designed to gather subjective data. Participants then listened to a second set of two 5-minute dance AD clips, with the Shimmer devices continuing to record physiological data. Then, the recording was stopped, and participants completed the final set of questionnaires. The study protocol can be found in Table 5.

4.6 Results

Descriptive statistics of all study variables are presented in Table 6. The basic unit of analysis were trials consisting of a single 5-minute audio described clip. Because each participant provided 4 trials, the observations could not have been treated as independent. Therefore, panel regressions were used with observations clustered on participants (xtreg in STATA 13).

Most self-reported measures of *SAMValence, SAMArousal, Transportation* and *Enjoyment* were significantly, positively correlated. This indicates that taken together they measured the overall level of positivity that a person expressed towards the clip. In contrast, self-reported *Cognitive Effort* was not related to other survey measures, indicating that effort was experienced as a separate, unrelated phenomenon. Furthermore, *Cognitive Engagement* measured with recall accuracy, was not correlated with any other self-report measure.

We also conducted correlations with physiological data to interpret this and determine whether participants in this study interpreted their arousal positively or negatively (a similar physiological arousal response can be experienced positively or negatively – e.g., a rollercoaster ride).

Table 6: Descriptive statistics of the study variables (Mean ± SEM).

	Language type	
	Descriptive	**Creative**
SAMArousal	6.54 ± 0.21	6.82 ± 0.20
SAMValence	6.39 ± 0.26	6.48 ± 0.25
Transportation	43.90 ± 1.01	44.06 ± 1.00
Enjoyment	55 ± 0.95	54.18 ± 1.10
Cognitive effort	4.33 ± 0.26	4.52 ± 0.30
Engagement	2.95 ± 0.12	3.06 ± 0.07
Phasic EDA	15.02 ± 2.54	12.83 ± 2.25
Tonic EDA	2.45 ± 0.28	2.46 ± 0.27
Heart rate	77.7 ± 1.72	77.20 ± 1.85
HRV	536.76 ± 116.47	729.07 ± 157.83

Phasic EDA and *Tonic EDA* were negatively correlated with *Transportation* and *Enjoyment.* This suggests that objective physiological arousal during the listening of the clips in this study was experienced as "negative" arousal – which could be related to the difficulty of the experience or frustration. This contrasts with the alternative, where objective arousal could have been experienced as "positive" – indicating excitement or engagement. In contrast to *EDA, Heart Rate* was positively correlated with Transportation, indicating that *Heart Rate* might have indexed the "positive" component of physiological arousal in this task. Table 7 displays the correlations between the study variables.

Together, these patterns highlight the interactions between the different variables, offering a more integrated view of participants' responses. These insights form the basis for the hypothesis testing presented in the following section (4.6.1).

4.6.1 Hypothesis testing

All hypotheses regarding the descriptive versus creative versions of the AD were tested (Hypotheses 1a, 1b, 2a, 2b, 3). The results are reported in Table 8.

Hypotheses regarding descriptive versus creative AD styles were tested (Hypotheses 1a, 1b, 2a, 2b, 3):

- H1a: Compared to descriptive AD, creative AD causes less subjective cognitive effort measured with self-report.
- H1b: Compared to descriptive AD, creative AD causes less objective cognitive effort measured with HR.

Table 7: Correlations between the study variables.

		1	2	3	4	5	6	7	8	9	
1	SAMArousal	–									
2	SAMValence	**0.86***	–								
3	Transportation	**0.47***	**0.46***	–							
4	Enjoyment	**0.54***	**0.54***	**0.60***	–						
5	Cognitive effort	−0.05	−0.05	−0.11	−0.13	–					
6	Engagement (recall)	−0.13	−0.11	0.01	−0.09	0.04	–				
7	Phasic EDA	−0.14	−0.06	**−0.27***	**−0.25***	0.07	0.18	–			
8	Tonic EDA	−0.14	0.00	**−0.27***	**−0.23***	0.08	0.03	**0.68***	–		
9	Heart rate	0.17	0.11	**0.33***	−0.05	−0.04	0.03	0.18	0.11	–	
10	HRV	−0.09	−0.07	0.02	0.05	0.00	0.11	**−0.23***	**−0.27***	**−0.61***	–

*$p<0.05$.

Table 8: Results of panel regressions analyses.

Dependent: / Independent:	H1a Cognitive effort self-report	H1b Cognitive effort heart rate	H2a SAM Valence	H2a SAM Arousal	H2a Enjoyment	H2a Transportation	H2b Phasic EDA	- Tonic EDA	H2b HRV	H3 Engagement (Recall)
Age	0.03(0.02)	−0.07(0.05)	0.00(0.02)	0.00(0.01)	0.03(0.07)	−0.07(0.07)	−0.14(0.10)	−0.01(0.01)	6.24(8.85)	−0.01(0.01)
Sex	−0.35(0.77)	−0.49(1.75)	0.34(0.76)	0.47(0.61)	**4.89(2.73)**†	2.05(2.81)	−0.33(4.75)	0.24(0.48)	−5.52(394.2)	−0.13(0.22)
Impairment	0.78(0.87)	1.09(2.23)	−0.23(0.86)	−0.05(0.70)	−4.44(3.11)	−3.36(3.20)	−10.92(5.9)†	−0.19(0.60)	−126.4(510.9)	−0.04(0.25)
Time	−0.07(0.15)	0.41(0.29)	−0.15(0.12)	0.15(0.10)	**−1.50(0.53)****	−0.82(0.52)	−0.52(1.18)	0.16(0.10)	52.34(66.88)	−0.19(0.06)**
Language type	0.19(0.20)	**−1.12(0.36)****	0.11(0.14)	**0.24(0.11)***	−0.59(0.65)	0.28(0.63)	−2.24(2.23)	−0.15(0.14)	**206.5(80.8)****	0.13(0.09)
Baseline HR		**0.83(0.11)****								
Baseline phasic EDA							**1.2(0.23)****			
Baseline tonic EDA								**0.86(0.12)****		
Baseline HRV									**1.35(0.36)****	
N	132	62	132	132	132	132	60	60	62	131
Wald Chi	4.58	**157.8****	2.65	**9.26**†	**16.84****	4.95	**38.95****	**76.84****	**26.85****	**13.96***

$^{**}p < 0.01$, $^{*}p < 0.05$, $^{\dagger}p < 0.1$.

- H2a: Compared to descriptive AD, creative AD is perceived as more pleasant - measured with self-reported valence, arousal, transportation and enjoyment.
- H2b: Compared to descriptive AD, creative AD is more emotionally salient - measured with phasic skin conductance and HRV.
- H3: Compared to descriptive AD, creative AD is more cognitively engaging - measured with recall accuracy.

Panel regressions revealed that the creative version did not affect participants' perceived *Cognitive Effort*, providing no evidence for Hypothesis 1a. However, creative AD elicited significantly lower *Heart Rate* (–1.12 [36]). This result is opposite to Hypothesis 1b, as it shows that objective cognitive effort was higher when clips were audio described creatively (19 [20]). This result is consistent with the results that follow when investigating Hypothesis 2b. The models designed showed that *HRV* (but not *Phasic EDA*) was higher for creative clips (206.5 [80.8]), which means that participants had to emotionally self-regulate when watching them. Consequently, as indicated by the correlations reported above, participants did not enjoy having to emotionally self-regulate and this can be seen in models testing Hypothesis 2a. Creative clips were not characterized by more positive reported *Valence, Transportation Enjoyment* or *Engagement.* Only self-reported *Arousal* and (24 [11]) *HRV* (206.5 [80.8]) were higher for creative clips.

Overall, the results provided no support for the hypotheses that creative AD alleviates cognitive effort and improves enjoyment of media. On the contrary, self-reported and physiological indicators taken together showed that emotional responses elicited by the creative version of the AD were experienced negatively.

Despite these results, the responses collected in the retrospective interviews showed that the majority of the participants (86 %) preferred the creative version. This was mainly due to the type of product, as they were not familiar with dance and the use of different linguistic resources helped them to create a mental image of the movements and the artistic production. As for the use of synthetic voices, 95 % of participants detected that it was not a human voice, but only 20 % of participants commented that the use of synthetic voice prevented them from enjoying the experience more.

5 Discussion and conclusions

Our results did not support the initial hypotheses. Both self-reported and physiological indicators suggest that the emotional responses elicited by the creative AD were predominantly negative. This finding indicates that, although creative AD techniques are designed to enhance engagement and immersion, they may also

provoke adverse emotional reactions in viewers. This outcome contrasts with previous findings in the context of filmic AD (Bardini 2017; Fryer and Freeman 2013; Jankowska 2013; Romero-Fresco and Fryer 2013; Walczak and Fryer 2017), which highlighted the benefits of incorporating creative elements – such as metaphorical language, film-specific terminology, and emotive descriptions – to foster greater engagement, presence, and emotional resonance, ultimately enriching the viewing experience for visually impaired audiences. However, it is important to note that these studies focused on film, not dance. Moreover, engagement and immersion are not synonymous with positive emotional reactions. Viewers can be highly engaged or immersed in a performance while experiencing discomfort, tension, or other negatively valenced emotions. Our findings support this distinction and underscore the need for further research into the interaction between immersion and emotional valence, particularly in non-verbal and abstract art forms like dance.

The specific features of dance, such as the emphasis on movement, rhythm, and physical expression, present unique challenges for audio description. Unlike films, where narrative and dialogue play significant roles, dance relies heavily on non-verbal cues and the visual interpretation of movement to convey meaning and emotion. This intrinsic difference may explain why the creative AD techniques, effective in filmic contexts, may not translate so straightforwardly to dance performances. Additionally, the kinesthetic nature of dance, where the audience is expected to feel the movement viscerally, might not be effectively conveyed through audio description alone. The lack of visual context in dance could result in a disconnect for visually impaired audiences, making it difficult for them to fully appreciate the performance.

Despite these findings, our participants reported in retrospective interviews their preference for the creative version of the AD. Whereas thirty participants reported better understanding of the message with the creative AD, only three participants preferred the descriptive AD over the creative AD, something which shows a discrepancy between their subjective preference and their measured reception. One explanation for this could be related to participants' familiarity with a more descriptive AD style, which aligns with current AD guidelines in Spain and is more common in filmic AD. Users accustomed to conventional AD may find creative approaches, necessary for dance AD, disorienting, resulting in negative emotional experiences.

There are contradictory results regarding the influence of familiarity on the reception of novel AD styles. Our findings align with previous studies (Bardini 2017; Fryer and Freeman 2014), which also highlight familiarity as an important factor in AD reception. Bardini (2017) found that users who are not typically accustomed to listening to AD tend to accept creative AD styles more readily compared to standard AD users. Standard AD users might be more conservative regarding AD style changes,

whereas new users are more open to different approaches. The study by Fryer and Freeman (2014) also found that the innovative style was confusing for some participants, likely due to the unexpected use of emotional language and cinematic terminology. Participants familiar with traditional AD might not have anticipated such creative language, leading to potential disorientation. However, Walczak and Fryer (2017) observed that the preference for creative AD over standard AD was not related to participants' prior familiarity with AD. Data from their experiment showed that participants accustomed to listening to AD did not necessarily prefer the conventional style over the creative one. Among those who reported being used to listening to AD, there was a strong preference for the creative AD style, independently of their familiarity with traditional AD styles. Additionally, in their study, the creative AD was perceived as significantly less confusing and elicited higher levels of spatial presence compared to the standard AD. Therefore, further research is needed to fully understand the factors influencing the reception of novel AD styles and to reconcile these contradictory findings.

Our study significantly advances the field by presenting the first experiment on dance AD, addressing the unique requirements of this art form. However, several limitations should be considered when interpreting our results. Firstly, there were instances of malfunction with the Shimmer 3 GSR device, resulting in the loss of data from 10 participants, thus limiting our sample size. Recruiting participants from the blind population presented considerable obstacles, which in turn affected both the overall number of participants and the variety within the sample. Moreover, one limitation of the study is the lack of data regarding the onset of blindness, which may influence participants' visual memory and, consequently, their reception of dance AD. These challenges were likely due to the unique communication needs, accessibility requirements, and potentially limited availability of individuals who were willing and able to participate in the study. As a result, achieving a sufficiently large and diverse sample became a significant hurdle, impacting the generalizability of the findings. Furthermore, conducting the experiment in a lab environment rather than a real theater setting may have influenced the participants' responses, potentially not accurately reflecting their experiences in a natural environment. Additionally, the emotional valence of the clips was not pre-rated, which may have influenced participants' reception of the ADs and their alignment with the content, as previous studies (e.g., Walczak 2017) have shown that affective congruence between AD style and film content can impact audience response. Lastly, some participants expressed a lack of interest in contemporary dance, which could have affected their engagement and overall experience with the AD clips.

Our pioneering work underscores the necessity for developing tailored AD strategies that consider the distinct features of dance, such as its emphasis on movement, rhythm, and physical expression, as well as varying levels of user

familiarity. While creative AD techniques have shown promise in enhancing the film-watching experience for visually impaired audiences, their application to dance presents unique challenges that warrant further research. Our results suggest a complex interaction between preference and emotional response, with unfamiliarity with creative AD possibly contributing to its negative reception. Additionally, the limited availability of dance AD in Spain indicates that our participants are not accustomed to listening to dance AD, nor are they familiar with the linguistic tools employed in real practice. Therefore, embracing a multidimensional approach that integrates user feedback, artistic intent, and empirical research will be essential in crafting AD experiences that genuinely resonate with and enrich the lives of visually impaired dance enthusiasts.

Research funding: This work was supported by the Fundación Séneca (22028/PI/2).

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