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Technical analysis of ballet in the roles of principal dancer and female soloist

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ABSTRACT

The aim of this study is to analyse the technical behaviour of the roles of principal dancer and female soloist in Ballet. For this purpose, a non-participant observational analysis of the motor praxis of the technical dimension of five works from the classical ballet repertoire was carried out (balances, transitions, small jumps in displacement, preparations, poses and *pas de bourrée*), as well as both frequently perform turns, large jumps in displacement, leg lifts and transitional steps and poses. In contrast, less complex gestures (*port de bras* and *pas de vals*) are scarce and are mostly performed by the corps de ballet. Differences between the two roles include the performance of pirouettes and *fouettés* by the principal dancer, as well as the significant predominance of leg throws, drumming, short and quick steps for the soloist dancer. It should be noted that, regardless of the external logic, each role performs the same technical behaviours in all the works. This indicates the importance of their knowledge for the selection in each of them, as well as the specific training and profile for their selection.

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Introduction

Dance can be studied from historical, artistic, cultural, and therapeutic perspectives. According to Mateu and Antonio Coelho Bortoleto (2011), it can also be analyzed from its internal logic as it involves motor praxis in which dancers experience different types of interaction.

Praxeology, as a normative science that deals with the systematic study of the conditions of human action that govern its rational development, allows the development of guidelines for evaluating these actions and improving their effectiveness. Its general objective is the action of human intentionality, i.e. deliberate and conscious action in all activities carried out by human beings, covering the whole range of practical activities that they perform. Praxeological analysis contributes to increasing the effectiveness and

efficiency of human intentional action in general, regardless of the field of application in which it is applied. Therefore, it encompasses the entire scope of human practical activities, including dance (Lawler 2017).

Connecting Dance with Motor Praxeology allows us to contemplate it from a unique perspective, given that the systemic concept of motor behavior demonstrates the inseparability of cognitive, affective, relational, and social fields. Therefore, when a person dances, they do so with their entire being. Each intentionality unfolds a set of emotional and meaningful implications (Parlebas 2001). This concept is essential to define it because without motor behavior, Dance would not exist.

In accordance with J. Hernández and Ribas (2004), we understand motor behavior as meaningful motor actions when dancers perform them with a defined intentionality. Thus, similar to other motor situations, such as sports, games for developing motor skills, introjective activities, and adaptation to the physical environment, Dance can be studied from a praxeological perspective. Placing Dance within Motor Praxeology provides it with epistemological relevance and conceptual coherence (Mateu Serra and Martín 2012).

However, Mateu and Antonio Coelho Bortoleto (2011) argue that Dance, as a Motor Situation of Expression, serves both a poetic and referential function. As such, its conception is closely linked to the study of artistic theories, providing the necessary tools to approach these functions. Dance is closely related to artistic, plastic, musical, and literary expressions, all of which contribute to the aforementioned functions. Furthermore, it is not exclusively limited to the motor situations studied in Motor Praxeology. In other words, to connect with the true essence of Dance, we must understand its relationship not only with other artistic expressions that share similar functions but also with the motor praxes with which it shares the motor action.

From this perspective, and in line with Torrents Martín and Balcells (2008), we emphasize that technique is one of the defining features of motor praxes. In the case of Dance, technique holds aesthetic and symbolic value, transforming specific motor skills into codes of expression. Consequently, the technical dimension, which is the primary focus of this study, is performed with a particular aesthetic and cannot be separated from the dancer's communicative intention [temporarily suppressed information to ensure author anonymity]. Castañer Balcells et al. (2009), Cuellar-Moreno (2016) and Mateu Serra (2010) have conducted similar studies on observation of teaching, technique and choreography in the field of dance, body expression and circus, considering that the aesthetic and symbolic value of dance technique includes the dancers' gestures, postures, attitudes, energetic deployment and virtuosity, beyond mere biomechanics to obviate its registration (Ameri 2013).

This study focuses on Ballet and the distinctive aesthetic characteristics of its technique, as highlighted by Taccone (2016). These characteristics encompass delicacy, elegance, alignment, hieratism, pointe technique, ballon, fluidity, a sensation of weightlessness and constant elevation, pursuit of virtuosity and perfection, external rotation of the lower limbs, synchronization with music, and body expression. However, it must be noted that incorporating said characteristics into the observation instrument has proven challenging as aesthetics are implicitly present in the dancer's bodily attitude throughout their dance, from the simplest to the most complex motor behavior. Therefore, according to Castañer (1999), and Castañer and Andueza (2008),

aesthetics are always present and do not require recording when observing a single Dance style.

Based on the aforementioned, this study presents the results concerning the specific motor skills for the roles of principal dancer and female soloist in Ballet.

Furthermore, Ameri (2013) highlights the relevance of applying the concepts of semiotricity and referential metacommunication to the analysis of classical ballet, considering that each technical gesture transmits metamessages that transcend physical execution and are inscribed in a shared artistic narrative. These contributions solidify the idea that ballet, as a motor practice, can and should be approached from a scientific perspective that encompasses both its technical structure and its expressive dimension.

In line with other studies on the praxeological analysis of ballet, specific observation instruments have been proposed to explore the technical, expressive, and interactive roles within this discipline. Technique in ballet not only responds to an internal motor logic but can also be understood as a system of signs loaded with aesthetic and symbolic meaning, which reinforces its expressive and communicative dimension from the perspective of motor praxeology (Troya Montañez 2016).

Moreover, recent studies acknowledge that ballet promotes the integral development of the individual by articulating cognitive, affective, social, and motor dimensions, which demonstrates its relevance from both an artistic and educational perspective.

Along these lines, Gastélum Morgan (2011) conducted research in a dance school with the aim of delving into classical ballet's contribution to the holistic development of students between 4 and 6 years of age. Her study shows how this discipline, increasingly present as an extracurricular activity, has managed to establish itself in private elementary schools as part of a pedagogical proposal for holistic education. Ballet, in this context, is perceived as a practice that simultaneously fosters socialization, self-esteem, and discipline, aspects identified through an ethnographic methodology based on non-participant observation and semi-structured interviews. These dimensions, fundamental for early childhood education, position ballet as a privileged means for the integral development of the individual, while reinforcing its analysis as an aesthetic, technical, and formative motor praxis, where intentionality, symbolism, and educational experience converge.

In this context, ballet is consolidated as a privileged object of study within the field of motor praxeology, not only due to its high technical demands and codified nature, but also because of its profound symbolic and expressive dimension. Its analysis allows for an approach to a form of motor praxis in which conscious intentionality, the aesthetics of movement, and non-verbal communication converge.

As Parlebas (2001) states, every significant motor action is imbued with meaning, and in ballet, this meaning is amplified by the deliberate pursuit of beauty, emotion, and perfection. From this perspective, dance technique constitutes a system of signs that transforms gestures into expressive and cultural codes, as demonstrated by the works of Torrents Martín and Balcells (2008), thus reinforcing the importance of its analysis as a vehicle for referential metacommunication (Ameri 2013).

Consequently, this research is based on the premise that ballet, as an intentional motor praxis, offers fertile ground for understanding the interaction between technique, aesthetics, and symbolism within the framework of deliberate human action.

The objectives of this research are as follows: 1) To understand the technical motor behaviors of the principal dancer and female soloist roles; 2) To determine if there are technical differences between the principal dancer and female soloist roles; and 3) To analyze if Ballet works that appear to be quite distinct also differ in the technical behavior of the principal dancer and female soloist roles.

Method

Sample

The study population of this research is Ballet. To examine it, five works were sampled, analyzing the technical dimension of the principal dancer and female soloist roles. The principal dancer, characterized by exceptional virtuosity and skill, is the dancer who best executes the various techniques. She is assigned the most complex choreographies and holds the most prominent symbolic role, receiving the highest level of importance within the production. The female soloist role can be performed by one or several dancers who are assigned intricate choreographies, either performing solo or in small groups. Symbolically, some soloists take on a prominent role (not only due to their technique), while others are exclusively recognized for their technical proficiency.

The works were selected due to their renowned tradition within the Classical Ballet Repertoire. They are performed by esteemed ballet companies in internationally acclaimed theaters such as the Kirov, the Mariinsky Theater, the Bolshoi Theater, La Scala in Milan, the Paris Opera, the Royal Opera House in London, and the Teatro de la Zarzuela. The chosen companies consist of both male and female dancers, totaling 160 professional dancers. Professional dancers were selected as they showcase the possibilities of Ballet to its fullest potential on stage, professionalizing their expressive-motor actions for the audience.

The five selected works belong to the Classical Ballet Repertoire and are as follows: *La Bayadère* (Paris Opera Ballet, 1995), *Don Quixote* (Mariinsky Ballet, 2006), *The Sleeping Beauty* (Kirov Ballet, 1989), *Swan Lake* (La Scala Ballet, 2001), and *Paquita* (Paris Opera Ballet, 2014). The videos used for analysis were downloaded from the YouTube platform. The analyzed works and their corresponding URL links are as follows:

- (1) *La Bayadère*, complete version – Paris Opera Ballet (1995). It can be found at the following URL: <https://youtu.be/ntpiUa4JgBk>.
- (2) *Don Quixote*, complete version – Mariinsky Ballet (2006). It can be found at the following URL: https://youtu.be/Zf_n5bATF9w.
- (3) *Swan Lake*, complete version – La Scala Ballet, Milan (2001). It can be found at the following URL: <https://youtu.be/6LKyWPmtX7Y>.
- (4) *Paquita*, complete version – Paris Opera Ballet (2014). It can be found at the following URL: <https://youtu.be/a0lNtrbsA5A>.
- (5) *The Sleeping Beauty*, complete version – Kirov Ballet (1989). It can be found at the following URL: <https://youtu.be/7OUfTgFrg6w>.

The selection of the works is based on their differences in external logic. We aimed to capture the heterogeneity concerning the apparent distinctions among them. [Table 1](#)

Table 1. Duration of the studied works and the time invested in analyzing the technical dimension for the principal dancer and female soloist roles.

Works	Duration of the work (in minutes)	Study time of the principal dancer and female soloist roles (in minutes)
La Bayadère	122.99	154.13
Don Quixote	110.23	123.89
Swan Lake	124.04	173.65
Paquita	96.01	37.12
The Sleeping Beauty	122.79	183.96
Total	452.02	672.76

Source: Research data.

shows the duration of each of the studied works and the time invested in their analysis. Collectively, they have an average duration of two hours and thirty minutes. Each work begins with a prologue and is divided into a series of acts that correspond to the narrative intended for the audience. This division pertains to the symbolic or expressive aspect of Ballet.

Instruments

The data collection required the development of a non-standard instrument consistent with the theoretical framework, based on motor praxeology (Parlebas 2001), and the specific situation (Table 1). Regarding the observation instrument, it is a field format comprising a catalogue of mutually exclusive codes. By its own definition, it is not exhaustive, thus representing an open-ended list in a constant state of construction. The observational methodology, without the evaluator's intervention to induce behaviours, is particularly suitable for the study of spontaneous activities in natural contexts (Anguera 2004).

The data collection technique employed was direct observation and non-participant research, with a complementary approach that combined qualitative and quantitative methods. On one hand, we developed the problem statement, designed the study, constructed an ad hoc observation instrument for analyzing the technical dimension, and recorded the data. On the other hand, we obtained the parameters, conducted data quality control, and performed an analysis of the data extracted from the recordings.

The data was recorded through an ideographic analysis of the selected Ballet works. Professional television cameras were used for the recordings. In most cases, the camera footage covered the entire surface of the stage. However, at certain moments during the performance, the cameras focused on specific motor behaviors that held particular symbolic or technical importance. The recordings were done continuously as they were live performances.

In order to study the technical behavior of the principal dancer and female soloist roles in Ballet, we conducted an objective, systematic, and specific recording of the dancers' technical actions. Furthermore, we ensured that their behavior was habitual, as it had been rehearsed to become so. The study took place within the natural context of their performances, capturing the spontaneity of their movements performed within the framework of their everyday professional lives. We delimited the observed behavior into identifiable observation units, allowing for consistency across different observers

Table 2. Inter-observer reliability of the ad hoc observation instrument for the study of the technical dimension.

Roles	Agreement (%)	Kappa (%)
Principal dancer	95,54	95,20
Female soloist	95,11	95,01

(Villaseñor, Losada, and Anguera 2001). This approach facilitated the assessment of reliability at both the intra-observer and inter-observer levels, by another ballet expert trained for this task (Table 2). We conducted an intrasessional recording, selecting dances or variations from each act for each role, focusing on the different technical gestures performed by the dancers, which were categorized using the ad hoc observation instrument.

To ensure data control and agreement among the observers, *observer training* was conducted (Villaseñor, Losada, and Anguera 2001), enhancing the reliability and accuracy of the recordings (Mateu Serra and Martín 2012).

The intra- and inter-observer reliability was assessed using Cohen's Kappa coefficient (Cohen 1960). The intra-observer reliability was calculated with a three-month interval between the analyses, using the agreement index. The obtained percentage exceeded 95%, indicating high reliability. A third viewing found the average of the three results to determine the most reliable one. Table 2 shows the inter-observer reliability, specifying the sampled time to determine this reliability for each role. For the role of principal dancer, 7:40 minutes were sampled, and for the role of female soloist, 5:93 minutes were sampled. Therefore, the total sampled time is 13:33 minutes. The agreement between observer one and observer two is 96.97%, with a Kappa coefficient of 0.97. These findings confirm the reliability of the ad hoc observation instrument.

Table 3 presents the intra-observer reliability of the observation instrument, specifying the sampled time for each role to determine this reliability. For the role of principal dancer, 7:13 minutes were sampled, and for the role of female soloist, 7:49 minutes were sampled. The total sampled time is 14:61 minutes. The agreement between the first and second recordings by the observer is 96.64%, and the Kappa coefficient is 0.96. Therefore, we can verify that the ad hoc observation instrument is reliable. The Kappa coefficient for data quality control was calculated using the *psych package* (Revelle 2019).

Regarding observation biases, the *reactivity* bias is nonexistent since we analyzed videos of past performances, and the dancers had no knowledge of the future research. Moreover, there are no biases generated by the use of *technical instruments*, as the dancers are accustomed to performing in front of an audience and being filmed by media professionals.

The potential *variability* regarding the observers' perception was reduced due to a clear definition of objectives and prior training in recording the observed reality. The

Table 3. Intra-observer reliability of the ad hoc observation instrument for studying the technical dimension.

Roles	Agreement (%)	Kappa
Principal Dancer	97,28	0,970
Female Soloist	97,49	0,971

observation of the data was supported by our theoretical framework, nullifying any possible biases stemming from the observer's own *personality projection* onto the observed. The lack of contextualization would lead to a distorted interpretation of the studied reality. Moreover, it was also important to take into account the need to adapt the observers' prior knowledge to the requirements of the research process in order to nullify any expectations and a lack of critical thinking.

Considering the parameters of temporality, observed participants, and dimensionality, the observational design is punctual (a single performance per company is studied), nomothetic (multiple individuals or groups are analyzed independently), and unidimensional (technical dimension). This facilitated the structuring and systematization of data collection, as well as the organization and management of the information obtained for analysis.

Analysis

Regarding data management, frequency, order, and duration were all taken into account. The duration was subsequently recorded as the execution of a technique lasts only an instant and its analysis lacked significance. Afterwards, data quality control and analysis were carried out, culminating in the graphical presentation of the results.

Based on the above, the unit of analysis is the Ballet performance, and the studied dimension is technique. This aligns with the theoretical framework of the study, as technique is one of the defining features of motor praxis. Furthermore, it is susceptible to analysis following the postulates of observational methodology (Anguera 2004).

The units of registration are defined by the mutually exclusive codes that make up the field format of the ad hoc observation instrument for the study of Ballet technique.

The units of observation are the dances or variations. These represent pieces of particular technical significance performed by dancers who assume the studied roles. Their duration is determined by the time between the beginning and the end of a piece of music.

The software programme LINCE (Soto et al. 2019), which is an automated tool for observational data, was used for *Technological and Methodological Advances in Automating Observational Studies in Sport* (Barcelona, Spain) (Gabín Moreira 2011). Once the different recordings were completed, they were exported to Excel® (MICROSOFT, 2010).

A statistical analysis of binomial hypothesis testing (Howell 2007) was conducted using the *R Core Team* software programme (2015). The codes and acronyms created for the analysis of the technical dimension can be found below. Their creation was based on both practical experience and the research of Bernal (2009), A. Hernández (2009, 2014), Howse (2003), and Torrents, Hristovski, and Balagué (2013). The ad hoc field format for analyzing the technical dimension is as follows:

- Ports de bras (PBR) Motor actions in which the fluid and harmonious movement of the arms visually predominates.
- Balances (BAL) Gestures in which the dancer stands for a few seconds on one supporting leg, while the other leg is in the air (*en l'air*), or both feet are in demi-pointe or en pointe position.

- Leg extensions (LEX) Quick extension of the leg in an energetic, ‘whip-like’ manner. The other leg remains in contact with the ground. The point of extension often coincides with a musical accent.
- Leg lifts (LLI) Slow extension of the leg, which is then held in the air. The other (supporting) leg remains firmly on the ground, maintaining balance. These techniques are known as *developpés* and are frequently performed in *adagios*.
- Short, quick steps (SQS). Techniques in which there is a rapid movement of the feet, changing position and shape. They are frequently used in *allegros*.
- Small vertical jumps (SVJ) Vertical jumps. They are usually executed when the musical tempo is fast, so following the rhythm prevents gaining much height.
- Big vertical jumps (BVJ) Vertical jumps characterized by a moment of flight or *ballon* (a momentary sensation of being suspended in the air).
- Small traveling jumps (STJ) Horizontal jumps or those with a parabolic trajectory that are not very high. They are usually performed when the musical tempo is fast, so following the rhythm prevents gaining much height.
- Big traveling jumps (BTJ) Horizontal jumps or those with a parabolic trajectory characterized by a moment of flight or *ballon*.
- Batterie (BAT) Techniques in which the legs cross or collide one or more times during the suspension phase of a jump (*entrechattrois*, *entrechatquatre*, *entrechat-cinq*, *entrechatsix*, *entrechathuit*, *cabriole*, *assemblebattu*, etc.).
- Pirouettes (PI) Techniques in which one or multiple turns are performed on the longitudinal axis, supported by one leg which serves as the base. The other leg is usually in *passé*, *à la seconde*, *arabesque*, or *attitude* position.
- Traveling turns (TT) Turns that are linked one after another, allowing the dancer to move through space while turning. This is achieved by placing the foot initiating the turn further ahead in space each time. This category includes techniques such as *piqués en dedans* and *en dehors*, *soutenus*, and *deboulés*.
- Theater (TEA) Motor actions in which there is a predominance of theatrical gestures over Ballet technique.
- Walking (WAL) Movement across the stage by walking. The aesthetic of Ballet is maintained, so their way of walking is distinctive and in line with the aesthetic characteristics of the style.
- Running (RUN) Movement across the stage by running. The Ballet aesthetic is maintained, so their way of running is distinctive and in line with the aesthetic characteristics of the style.
- Initial pose (IPOS) Positions or postures, characterized by their static or semi-static nature, that precede the start of the musical piece to be danced. Therefore, the initial pose serves as the beginning of the motor actions or techniques of the dance in question.
- Final pose (FPOS) Positions or postures, usually of a static or semi-static nature, with which the dancer concludes the dance in question.
- Pose (POSE) Static or semi-static positions or postures that are performed during a dance. They are executed after performing a complex technique (a big jump, a series of pirouettes, or a turn in the air) as an elegant way to stop or conclude it.
- Preparation (PRE) Positions that aid in the execution of a subsequent technique (facilitating the inertia of the movement). They usually precede the execution of

a complex technique. Typically, there is a waiting time to perform the technique at a specific point in the music. Therefore, preparations are also made to ‘enter with the music’.

- Pas de bourrée (PBOU) Techniques involving a shift of weight and support between both feet, alternating between the fifth and first position of the legs. These techniques can be performed with coupé or while turning. The pas de bourré couru involves a displacement in the fifth or first position of the legs while being en relevé (in demi-pointe or en pointe). It is performed by taking small steps (alternately flexing and extending the knees) while keeping the same leg in front, unless performed en avant or en arrière. In these cases, both legs are alternated to move forward.
- Transition (TRAN) Techniques that can be considered intermediate steps, as they serve as momentum for performing certain jumping techniques. (chassés, glissades, pas de bourrée)
- Turns in the air (TIA) Turning techniques in which both feet are in the air. It is a combination of two motor skills: jumping and turning.
- Pas de valse (PVALS) Motor action in which a combination of steps is executed to the rhythm of waltz (3/4 time signature)

Results

Table 4 reflects the technique codes for each role after combining the five works. The percentage is calculated based on the recorded time for each role in each work.

Table 4. Differences in techniques between the roles of principal dancer and female soloist combining the five works.

TECHNIQUE	FREQUENCY Principal Dancer	% Principal Dancer	FREQUENCY Female Soloist	% Female Soloist	p-value
BAL	50	13.40	113	16,47	0,054739
TRAN	42	11.26	108	15,74	0,000001
STJ	40	10.72	57	8,31	0,025270
PRE	34	9.12	45	6,56	0,028467
PBOU	33	8.85	22	3,21	0,000065
PI	22	5.90	8	1,17	0,053582
POSE	22	5.90	53	7,73	1,000000
TT	19	5.09	29	4,23	0,536652
BTJ	15	4.02	25	3,64	0,401710
WAL	14	3.75	8	1,17	0,000002
LLI	11	2.95	19	2,77	0,003923
LEX	11	2.95	49	7,14	0,000007
BVJ	9	2.41	1	0,15	0,578058
SQS	9	2.41	31	4,52	0,000130
BAT	8	2.14	37	5,39	0,000004
FPOS	8	2.14	17	2,48	0,215326
RUN	6	1.61	11	1,6	0,003027
PVALS	6	1.61	3	0,44	0,261494
IPOS	5	1.34	14	2,04	0,109866
TIA	3	0.80	12	1,75	0,006901
SVJ	2	0.54	16	2,33	0,000161
TEA	2	0.54	3	0,44	0,000452
PBR	2	0.54	5	0,73	0,861574

23 Codes

Source: Research Data.

Additionally, the significance value for the differences between both roles is provided. For the interpretation of these values, we have applied the Bonferroni (1936), which adjusts the significance level by dividing it by the number of hypotheses conducted.

Regarding the principal dancer role, the most frequently performed techniques include the following codes: transitions, turns in the air, preparations, traveling turns, big traveling jumps, pirouettes, poses, batterie, walking, and balances. Conversely, the least frequently performed techniques in this role are those represented in the codes of theater, big vertical jumps, pas de valse, small traveling jumps, and leg extensions. The duration of each technique was not recorded as they mostly consist of very brief moments. The decision was made to only record the beginning of each technique, resulting in an equal number of registrations.

Considering the results obtained for the female soloist role, it is noteworthy to observe that the codes with the highest number of registrations are, in this order, balances, transitions, and small traveling jumps. These codes all exhibit a significantly high number of recordings. Additionally, leg extensions and short, quick steps are two codes that are important for this role but not for the others. The code related to batterie techniques is also significant for the female soloist role. This could be attributed to the fact that, although the recording of techniques did not consider duration, this role performs a greater number of batterie movements compared to the principal dancer role. However, the latter performs more leg beats in the air (once they jump) than the female soloists.

Finally, the codes of traveling turns, pas de bourrée, leg lifts, and small vertical jumps are particularly relevant in this role. On the other hand, ports de bras, pas de valse, and theater represent the codes with the least number of registrations. Batterie movements also hold great significance.

Regarding the two roles we have analyzed, it is worth pointing out several shared aspects. Firstly, they all encompass a common set of codes with a high number of occurrences, including transitions, preparations, poses, big traveling jumps, and traveling turns. On the other hand, techniques represented by the codes pas de valse, ports de bras, and theater exhibit a lower number of occurrences.

Discussion

The structure of this section is in accordance with the objectives outlined in the research. The first objective was to know the technical motor behaviors of the roles of principal dancer and female soloist.

Both studied roles exhibit a high number of occurrences in the following codes: balances, transitions, small traveling jumps, preparations, poses, and pas de bourrée. In line with Laws (2002), we emphasize the codes of traveling turns, big traveling jumps, and leg lifts. It is worth noting that the role of female soloist exhibits a higher frequency of these codes compared to that of the principal dancer. Similarly, the codes for turns in the air and small vertical jumps have a low frequency, albeit slightly higher for the female soloist. Among the codes with a lower number of recordings for both roles, we highlight ports de bras, theater, and pas de valse.

In line with the second objective, which aims to examine if there are clear technical differences between the principal dancer and female soloist roles, our findings reveal

some variations in specific codes. Notably, the role of the female soloist exhibits a strong emphasis on leg extensions, *batterie*, and short, quick steps, distinct from the principal dancer role. Conversely, as noted by Wong (2011), pirouettes hold significant importance for the principal dancer, while they are less prominent in the female soloist role.

The high number of occurrences in the codes of transitions and preparations seems coherent. As Dixon (2005) points out, these techniques usually precede other more complex movements found in codes such as pirouettes, traveling turns, and big traveling jumps, among others. Similarly, prior to executing a balance, transitional steps are often performed to facilitate proper body alignment. Additionally, the large number of poses is justified, as the techniques contained in this code are often performed after the completion of other highly complex movements, serving as a cushioning effect for jumps or as a stopping point for pirouettes.

Both roles hold a prominent status within a Ballet performance, which justifies the execution of such complex techniques. Furthermore, we can find two codes present in both roles that include techniques characteristic of *pointe* work: balances, the code with the highest frequency, and *pas de bourrées*. Additionally, as noted by De Pedro (2010), within the code of pirouettes, we can find *fouettés*, a technique which is associated with the principal dancer. In fact, the final part of all Ballet performances features a segment where the principal dancer performs a sequence of approximately thirty-two consecutive *fouettés*. This highly complex technique is reserved for the dancer assuming this role.

Thus, the results reflect the important presence of technique in the roles of principal dancer and female soloist. Moreover, there are statistically significant differences between the roles of principal dancer and female soloist.

Regarding the codes with a low frequency, it is worth noting the inclusion of the theater code. This is due to the selected segments showcasing a high level of technicality. However, contrary to Taccone's (2016) assertion of a rivalry between technique and expressiveness, we can observe that, despite the absence of explicitly theatrical elements in this study's analysis of technique, theater does play a significant role in the overall composition of Ballet. Moreover, in line with Ameri (2013), we find that theatrical expression often resides implicitly within the technique itself. Hence, we consider the aforementioned rivalry to be more prevalent in the preparation of dancers, where the emphasis lies on perfecting technique at the expense of expression. Additionally, we highlight the techniques encompassed by the *pas de valse* and *ports de bras* codes, which exhibit a lower number of occurrences. These techniques, of lower complexity, are typically reserved for dancers assuming roles in the *corps de ballet*.

At a general level, we observe that the technical performance of the principal dancer role, when dancing individually, is similar to that of the female soloist. However, it is important to point out that the former is assumed by a single dancer throughout the entire production, while the latter is performed by multiple dancers.

In relation to the third objective, which seeks to analyze whether Ballet productions that appear distinct also differ in the technical performance of the principal dancer and female soloist roles, we find that this question pertains to the external logic of practice (J. Hernández and Ribas 2004), rather than the technical behavior of the studied roles.

Conclusions

The main conclusions of the research are as follows:

The developed research instrument has allowed for the detailed study of technique in the roles of principal dancer and female soloist

The use of systematic observation brings a great advantage to dance research, as it enables the observer to describe scenarios, situations and phenomena in a structured way, using a scientific and duly validated instrument (both in terms of the way it is used and the categories used), making the coding and analysis of large ballet works possible in a precise and feasible manner.

These findings lead to the conclusion that the observation instrument developed has facilitated a detailed analysis of technique in the roles of principal dancer and female soloist, providing a systematic and highly valuable tool for the scientific study of dance. As Anguera and Hernández-Mendo (2014) point out, the use of validated observational instruments increases precision and objectivity in the study of complex motor manifestations, such as ballet.

On the other hand, the incorporation of the LINCE observation tool is a great step forward for dance, as it allows the visualisation and re-visualisation of the recordings alongside the codes without the need to resort to drawings or other types of aids. The possibility of dumping and quantifying these data in Excel provides a general and complete overview of the aspects analysed, allowing their comparison and contribution with respect to other choreographies and performances. The implementation of the LINCE program, along with the technical categorization developed, has made it possible to visualize and re-visualize movement sequences, quantify their frequency, and rigorously compare choreographies of varying complexity.

The use of this instrument and methodology provides a more complete analysis of dance, and can be treated with the same clarity as other scientific disciplines (with respect to the observation instruments and validations carried out). Its adaptation to the world of dance can be considered an important milestone for dance, both in terms of the instruments used and the adaptations and results obtained.

In line with the assertions of Parlebas (2001) and Mateu Serra and Martín (2012), the study confirms ballet's praxeological dimension as a motor practice of high technical demand, which, in turn, carries a strong symbolic and expressive load. In this sense, the difference in frequency of codes such as *tours en déplacement*, leg extensions, or *fouettés*—traditionally reserved for the principal dancer's role—reinforce the value of systematic analysis in evidencing the degree of specialization within each role. Likewise, the lower presence of codes like *ports de bras* and *pas de valse* relates to the level of technical complexity and the functional hierarchy of the characters on stage, which aligns with the approach of the internal logic and sign systems proposed by Parlebas.

On the other hand, the scarce number of records for the theatrical code cannot be understood as an absence of expressivity, but rather as part of the segmentation logic adopted for this analysis. As Ameri (2013) and Taccone (2016) argue, expressivity in ballet is implicit in the technique and in the bodily attitude, reinforcing the idea that the symbolic component is integrated into the very execution of the movement. In this way,

ballet is not only manifested as a demanding technical practice but also as a privileged means of aesthetic expression and non-verbal metacommunication.

Finally, and in dialogue with research such as Gastélum Morgan (2011), this study provides elements that support ballet's value not only as an artistic manifestation but also as a comprehensive educational tool. The technical skills observed in the analyzed roles - when pedagogically worked on from an early age- can contribute to the cognitive, affective, and social development of students, reaffirming ballet's potential as a formative practice and as a legitimate field for scientific research. In summary, the obtained results not only validate the instrument and methodology employed but also consolidate ballet as an intentional, complex, and profoundly significant motor practice.

The technical behavior of the studied roles is similar

This study shows that there are common technical behaviours that are significantly repeated in both roles. These are those referring to codes of greater technical complexity such as balances, transitions, small jumps in displacement, preparations, poses and pas de bourrée. Spins and large jumps in displacement, as well as leg lifts, are also performed with great frequency in both roles. Numerous transition steps before balance and poses are also commonly performed to prepare the body for other more complex techniques such as jumps, pirouettes and big jumps in displacement.

This finding reinforces what Laws (2002) and Dixon (2005) point out: complex technical sequences require a solid foundation of refined motor skills, shared by dancers in leading roles. In this sense, it's unthinkable to access soloist or principal roles without a comprehensive command of these competencies, as technical complexity not only supports theatrical virtuosity but also legitimizes the hierarchical status these characters hold within the internal logic of ballet.

This aspect is of great importance because it is verified that both the principal dancer and the soloist must have a high mastery of these techniques, it being unthinkable for them to acquire this role without absolute control. This is justified by the fact that both roles have a prominent status within a ballet work, so it is essential to acquire the status of principal dancer or soloist without the complete acquisition of these complex techniques.

This is an important requirement when selecting dancers for these roles, as well as the certainty that in order to perform them, dancers must acquire them extensively in their training.

In contrast, *port de bras* and *pas de vals* are in short supply. This is logical and understandable, as these are less complex behaviours than the previous ones, which are mainly performed by the *corps de ballet*.

These technical commonalities, in turn, support the notion that ballet demands intensive and prolonged training, as highlighted by Castañer Balcells et al. (2009). They assert that technical construction in dance not only responds to biomechanical criteria but also articulates expressive, symbolic, and pedagogical elements throughout the formative process.

On the other hand, the low incidence of codes like *ports de bras* and *pas de valse* aligns with their lower technical complexity and their common attribution to the *corps de ballet* roles. This functional and symbolic distribution of technical behaviors across the different hierarchical levels of the performance aligns with Parlebas's (2001) view on the

structural logic of motor praxes organized as sign systems. Within this framework, the data obtained help illustrate how ballet's technical demands not only respond to an aesthetic logic but also to a coherent internal organization that gives meaning to gestures based on the role performed.

Regardless of the work being performed, there are no differences pertaining to the technical behavior of the principal dancer and female soloist roles.

Regarding the third objective of the study – to analyze whether ballet works, despite their apparent differences, exhibit variations in the technical behavior of the roles studied – the results indicate a remarkable stability in the technical behaviors associated with both the principal dancer and female soloist roles, regardless of the work performed. This technical regularity is maintained despite external differences in plot, music, or set design, which reinforces the distinction between external and internal logic in motor praxes, as pointed out by J. Hernández and Ribas (2004).

Although both roles share a common technical core – including turns, traveling jumps, balances, pas de bourrée, and poses – differentiating behaviors have also been identified that determine access to and execution of each. In particular, the obligatory execution of 32 fouettés in the principal ballerina's role stands out as a highly demanding technical code whose presence is verified in all analyzed productions. This finding aligns with Wong's (2011) observation, who emphasizes that pirouettes and their variants constitute a distinctive mark of the principal role's virtuosity. In contrast, the female soloist role tends to be characterized by a higher frequency of leg extensions, batteries, and short, agile steps, aspects that add dynamism without assuming the degree of demand implied by the principal role's sequences.

This functional distinction has significant implications for the training, selection, and curriculum design of technical training in professional companies, as—Parlebas (2001) notes – motor praxes are configured from intentional sign systems that give meaning to motor behavior within a hierarchical structure. Thus, while the soloist role can be assumed by several dancers at different times in a production, the principal ballerina role falls to a single performer who must master, in a consolidated manner, the technical codes assigned to the character.

Consequently, the present study has not only identified the technical elements common to both roles but also the specific behaviors that differentiate them. This differentiation provides concrete tools for designing differentiated technical and pedagogical profiles, which are fundamental for career planning, auditions, and selection processes in the field of ballet. In this way, the research contributes to systematizing the technical analysis of ballet from a praxeological perspective, emphasizing the relationship between stage role, motor behavior, and symbolic structure.

Therefore, the obtained results allow us to affirm that the developed observation instrument constitutes a valuable tool for the technical analysis of ballet from a praxeological perspective, allowing for a rigorous and systematized description of the motor behaviors of principal dancer and female soloist roles. Its application, through the LINCE platform, not only facilitates precise visualization of movement but also enables the quantification and comparison of complex choreographies, granting dance research a methodological status comparable to that of other scientific disciplines (Anguera and Hernández-Mendo 2014).

Regarding the technical behavior of both roles, it is concluded that there is a common body of highly complex motor skills -such as balances, transitions, traveling jumps, poses, and turns- that require a high level of technical mastery for their execution, thus ratifying the need for intensive and specialized training (Castañer Balcells et al. 2009). However, distinctive behaviors were also identified: while the principal dancer's role is unequivocally associated with the execution of 32 fouettés and other complex pirouettes (Wong 2011), the female soloist role is characterized by more dynamic technical combinations such as leg extensions, rapid steps, and batteries.

Finally, the study reveals that these technical structures remain stable regardless of the work analyzed, suggesting that the internal logic of ballet -that is, its system of roles and technical behaviors- prevails over the variability introduced by external logic (plot, music, or set design). This confirms that ballet technique responds to a coherent hierarchical organization, as proposed by Parlebas (2001), with its own meanings and codes that define the status and function of each performer. Consequently, these findings not only allow for defining the technical and expressive profiles that characterize each role but also offer pedagogical criteria to guide selection, evaluation, and training processes in professional and educational settings.

This study consolidates ballet as an intentional, aesthetic, and symbolic motor praxis that, in addition to its artistic dimension, is configured as a comprehensive formative experience capable of articulating technical, expressive, and social aspects of human development (Gastélum Morgan 2011). In this way, the research provides solid evidence on the relevance of applying praxeological approaches to the analysis of ballet and lays the foundation for future research focused on the intersection between technique, education, and meaning in the movement arts.

These findings provide valuable information for understanding the dynamics of roles in classical dance, highlighting the potential for interchangeable technical execution between principal dancer and female soloist roles. Future studies could explore how these similarities influence casting decisions, pedagogical approaches, and choreographic design.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Ethics declarations

Ethical approval is not required because of national laws for non-interventional studies. The authors confirm all the subjects have provided appropriate informed consent and informed written consent to take part in the research have been obtained prior to the commencement of the study.

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