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**ABSTRACT**

In training karate, sports initiation through combat or *kumite* is becoming more and more relevant. The objective of the present work, carried out using an observational methodology, consists of analysing the technical-tactical performance in the initiation to *kumite* of karate. The observational sample is made up of 61 data packets, generated by 37 competitors, suitable for combat, in 40 combats. The records have been made using the LINCE software. The quality of the data has been guaranteed through inter-observer agreement and within the generalisability theory. A lag sequential analysis has been carried out in a complementary manner, using GSEQ5 software, and a second analysis was performed for the detection of *T-patterns*, using the THEME software, Edu6 version. The results obtained have made it possible to characterise the offensive technical action executed whether with the fist or leg, the laterality related to the guard that supports the action and the segment with which it is performed, the area of the body to which the technique is directed, and the efficiency obtained. This work is a relevant starting point in the longitudinal programming of formative karate.

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**KEYWORDS**

Karate; initiation; observational methodology; lag sequential analysis; *T-patterns*

1. Introduction

Martial arts, such as karate, provide a series of very relevant benefits for children, both at a motor level, and conditional, cognitive, and affective (Sauvage, 2005). Karate differs from other sports in that it is an educational activity that focuses on the development of personality, knowledge and personal perfection, physical ability and dexterity, as well as being an effective system of self-defence (Puricelli, 2002).

Sports initiation to karate has traditionally been characterised by the learning of *kata* and the basic technique aimed at them (*kihon*), with the teaching of *kumite* (combat) being postponed to later stages. The social evolution of this sport has caused a need to change their initial training, giving greater importance to the field of combat, modelling the exercises according to the features of the competition.

Regarding the scientific production related to karate, work has been carried out in various facets: psychology (Björkqvist & Varhama, 2001; Daniels & Thornton, 1989;
Robazza & Bortoli, 2004; Ruiz & Yuri, 2004); history (Hopkins, 2007; Neide, 2009); physiology (Beneke et al., 2004; Doria et al., 2009; Roschel et al., 2009); biomechanics (Gulledge & Dapena, 2007); electromyography (Collins et al., 1991); and the epidemiology of injuries (Critchley et al., 1999; Halibchi et al., 2006; Violan et al., 1997; Zetaruk, Violan et al., 2000; Zetaruk, Zurakowski et al., 2000).

Combat analyses have also been carried out, such as those of Paz and Miño (2000), Koropanovski and Jovanovic (2007), Vidranski et al. (2015), Koropanovski et al. (2008), and Laird and McLeod (2009), although there are few studies that develop procedures that allow detecting regular structures of behaviour in the course of the confrontations of combatants through the description and systematic observational detection of interactive events in combat (Ibáñez et al., 2018). Especially relevant for this work are the studies that analyse combats carried out by children (Lapresa, Ibáñez, Arana, Amatria et al., 2011; Lapresa, Ibáñez, Arana, Garzón et al., 2011).

The objective of this work is to analyse the technical-tactical performance in combats in the initiation to kumite of karate, by identifying regular structures of conduct (Bakeman & Quera, 2011; Magnusson, 2020) from an observation instrument that allows to integrate: information related to the offensive technical action executed, either fist or leg; the laterality it implies, as regards the guard that supports the action and the segment with which it is performed; the area of the body to which the technique is directed at and the effectiveness obtained. In this way, this work exceeds the contribution of the notational studies usually carried out in karate, which do not contemplate the type of guard that supports the offensive technical actions with the laterality of the segment used in the execution of the technique in an integrated way. This integration allows, in addition to analysing the preference in the use of certain techniques, whether they are fist or leg, and their effectiveness, to deepen the child’s lateral conditioning (Castañer et al., 2018) in initiation karate. The results of this work are of particular relevance to technicians and researchers related to martial arts practised by children, contributing to a coherent longitudinal programming of content in training karate.

2. Method

This work has been developed within the use of observational methodology (Anguera, 1979) which is appropriate in combat analysis studies (Gutiérrez et al., 2011, 2009).

The observational design used is, according to Anguera et al. (2011): nomothetic, a plurality of competitors; intersessional and intrasessional following, the technical-tactical performance of various competitors is analysed, frame by frame, from the beginning to the end of each session, in the bosom of a championship fight; multi-dimensional in nature, which will configure the different criteria of the observation instrument. The observation is non-participant and direct, based on the filmed combats.

The usual behaviour of karatekas has been analysed in its natural context, competition. As the filming of combats by coaches, family members, etc., is a common guideline, the reactivity bias is eliminated (Ibáñez et al., 2018).

This work has the relevant informed consents and the approval of the Research Ethics Committee of the University of La Rioja (approval number: CE-12–2020).
2.1. Participants

The combats analysed took place in the National Karate Tournament (LNK J-1), held in Pamplona (Spain), on 22 February 2020. Participants born in 2011–2012, belong to the age group between 8 and 9 years (Mean = 8.49; SD = 0.51).

Combats from this tournament have been selected since they are the youngest competitors with experience in “national” competition, which will ensure that the selected participants are of a sufficient level to be fit for combat. Of the 37 participants, 31 had a homogeneous right hand-leg lateral preference, two had a homogeneous left hand-leg laterality, three had a right hand-left leg lateral preference, and one left hand-right leg lateral preference.

For the filming of the combats, authorisation was requested from the Royal Spanish Karate Federation and the Organizing Committee of the Championship. The informed consent of the parents and/or legal guardians of each competitor was obtained. At the time of the informed consent agreement, information was collected regarding the lateral preference (hand-leg) of the participants.

2.2. Observation instrument

An ad hoc observation instrument has been designed from the record structure of the observation instrument (OBKA) of Ibáñez et al. (2018) for the analysis of the technical-tactical actions that are developed during the combat. The observation instrument (Table 1) is a combination of field format and category systems.

2.3. Recording and coding

The observational sampling is made up of 61 data packets, generated by 37 competitors that were suitable for combat in 40 combats. The recording of the data packets

<table>
<thead>
<tr>
<th>Criterion or dimension</th>
<th>Category systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fist technique</td>
<td>Direct fist technique -Tsuki- (DT); circular fist technique -Uraken-uchi- (CT); technique of holding or grasping the arm (HT); grabbing the leg (GT); pushing with the arms or hands (PT).</td>
</tr>
<tr>
<td>Leg technique</td>
<td>Front Leg Technique -Mae-geri- (FL); circular leg technique -Mawashi-geri- (CL); backward circular leg technique -Ushiro-mawashi-geri- (BCL); lateral leg technique -Yoko-geri- (LL); backward leg technique -Ushiro-geri- (BL); inside circular leg technique -Ura-mawashi-geri- (ICL); technical knockout action (KL); downward leg technique -Otoshi-geri- (DL); unusual technical actions (L00).</td>
</tr>
<tr>
<td>Guard</td>
<td>Left Guard (LFG); right guard (RTG); position taken by the competitor before an order (PBO); the competitor does not take guard (G00).</td>
</tr>
<tr>
<td>Laterality</td>
<td>Right (RT); left (LF)</td>
</tr>
<tr>
<td>Combat situation</td>
<td>Start of combat (SC); end of combat (EC); start of sequence (SS); end of sequence (ES); start of round (SR); end of round (ER).</td>
</tr>
<tr>
<td>End of sequence</td>
<td>Exit from the competition area (EA); grab the opponent without intention of attack (GW); point in favour (PF); penalty (PY); point against (PA); anomalies in infrastructure or equipment (AI00).</td>
</tr>
<tr>
<td>Contact of the offensive technique on the adversary</td>
<td>High zone contact (HC); middle zone contact (MC); low zone contact (LC); high zone no contact (HNC); middle zone no contact (MNC); low zone no contact (LNC).</td>
</tr>
</tbody>
</table>
has been carried out using the LINCE software, version 1.2.1 (Gabin et al., 2012). Figure 1 shows the capture of the recording process and the encoding software. According to Bakeman (1978), the type of data obtained is type IV (concurrent and time-base).

2.4. Data quality control

Two expert observers were chosen and trained in the observation instrument by Anguera (2003). These observers made the corresponding record.

2.4.1. Agreement between observations

Reliability, in the form of concordance, has been quantitatively calculated using Cohen’s Kappa coefficient (Cohen, 1960, 1968), through the GSEQ5 computer program, taking into account the recommendations of Bakeman and Quera (1995, 2001). The second observer has recorded five randomly selected data packets, belonging to four battles, which represents 8.19% of the data packets and 10% of the combats. The value of Cohen’s Kappa coefficient in each of the compared data packages (combat-competitor) has been: combat 2-participant 3 = .84; combat 3-participant 6 = .79; combat 3-participant 5 = .86; combat 11-participant 12 = .91; combat 28-participant 24 = .87.

2.4.2. Generalisability of the results

This section has been developed within the Generalizability Theory (Cronbach et al., 1972). The sum of squares necessary for the generalisability analysis has been obtained using SPSS, version 24. Subsequently, the data have been entered in the Software Generalizability Theory by Ysewijn (1996). The [Category]/[Combats] design has been made, within the General Linear Model (GLM). The estimation of the variance components has been carried out for an infinite population.

Table 2 shows the results corresponding to the generalisability design carried out to complete the quality of the data. The [Category]/[Combats] design reveals that variability is
associated with the categories facet at 35%, and the category-combat interaction facet at 65%. The high value obtained from the determination coefficient (\(R^2 = .899\)) indicates that with the combination of the aforementioned facets we can explain with guarantees the variability of the data packages that constitute the observational sampling. The analysis of the generalisability coefficients in this design structure determines that a reliability of the generalisation precision of 0.956 is achieved (the same value of the relative generalisability coefficient \(e^2\) and of the absolute \(\Phi\)). This result allows us to verify the homogeneity of the combats that support the work.

### 2.5. Data analysis

In addition to the analysis of frequencies and percentages, other analyses have been carried out in a complementary way to shed light on the technical-tactical performance in combat in the initiation to kumite of karate, these were: (a) a lag sequential analysis using the GSEQ5 software; (b) and a second analysis in search of regular behaviour structures (T-patterns), using the THEME program, Edu6 version. The complementary use of both diachronic analysis techniques has proven to be very beneficial in observational studies, reflecting different facets of the same reality (Lapresé et al., 2013, 2018).

(a) The lag sequential analysis (Bakeman, 1978, 1991), performed using the GSEQ5 software (Bakeman & Quera, 1995, 2011), allows detecting the statistically significant differences existing between the conditioned (from the observed frequencies) and unconditioned probabilities (from the expected frequencies), between given (criteria) and target (conditional) behaviours. In this study, the categories corresponding to the technical criteria of fist and leg techniques have been taken as given behaviours. On the other hand, the categories belonging to the dimensions “guard”, “laterality”, “contact of the technique” and “end of sequence” (the category “point in favour” will indicate the effectiveness of the technique) have been established as target behaviours. Adjusted residuals greater than 1.96 or those less than −1.96 are considered significant. The positive sign will indicate an activation relationship between the given and the target behaviour while the negative sign shows an inhibition relationship between behaviours. The adjusted residuals can be calculated prospectively (behaviours that occur after the criterion behaviour) and retrospectively (behaviours that occur before the criterion behaviour), and the analysis also considers co-occurrence (behaviours that occur at lag 0). The lags that interest us in the present work are the 0 or co-occurrence lag, which takes place in the same row of the record, and the +1 lag, which will incorporate the effectiveness of the

### Table 2. Generalisability analysis results corresponding to the observation plan [Category]/[Combats].

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of squares</th>
<th>gl</th>
<th>Mean square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>194225.725</td>
<td>789</td>
<td>246.167</td>
<td>63.358</td>
</tr>
<tr>
<td>Intersection</td>
<td>7551.166</td>
<td>1</td>
<td>7551.166</td>
<td>1943.492</td>
</tr>
<tr>
<td>Combats</td>
<td>5646.178</td>
<td>40</td>
<td>141.154</td>
<td>36.330</td>
</tr>
<tr>
<td>Category</td>
<td>55762.634</td>
<td>30</td>
<td>1858.754</td>
<td>478.400</td>
</tr>
<tr>
<td>Combats * Category</td>
<td>41681.185</td>
<td>719</td>
<td>57.971</td>
<td>14.920</td>
</tr>
<tr>
<td>Error</td>
<td>18381.634</td>
<td>4731</td>
<td>3.885</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>717655.000</td>
<td>5521</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected total</td>
<td>212607.359</td>
<td>5520</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
technique (category “point to favour”). To incorporate the significant adjusted residual into the results table, a minimum frequency of three has been set.

(b) The THEME software program was used for the detection of T-patterns, temporary structures hidden in the record (Magnusson, 2020). Strict search parameters have been selected to guarantee that the T-patterns detected are not the product of chance, which are detailed below (for more information see reference manual, Ltd & Techno, 2004): (a) T-pattern must be present in 5% of all combats, with a minimum frequency of 3 occurrences; (b) significance level of .005; c) redundancy reduction tool set at 90%; d) the fast requirement has been eliminated at all levels, so that the lower limit of the critical interval is set, not at 0, but at the shortest distance in which its two constituent events occur. In addition, 100 data packets have been randomised using the shuffling randomisation tool provided by THEME to ensure that none of the selected T-patterns is the result of chance - the probability of accepting a T-pattern due to chance it is equal to 0-.

3. Results

This section shows the results obtained from the lag sequential analysis and the T-patterns hidden in the registry detected with THEME. The relevant results regarding percentages will be included directly in the discussion section.

3.1. Lag sequential analysis

As indicated, in our study, the categories corresponding to the technical criteria of fist and leg were taken as given behaviours. On the other hand, the categories belonging to the dimensions “guard”, “laterality”, “contact of the technique” and “end of sequence” (including the category “point in favour”) have been established as target behaviours. The lags that interest us to satisfy the objectives of this work are the lag 0 or co-occurrence - which takes place in the same row of the record- and the lag +1 -according to the structure of the record when a technique is effective, in the next row, the category “point in favour” will be registered-. In Table 3, the adjusted residuals that show statistically significant activation or inhibition relationships are presented.

Table 3. Analysis of adjusted residuals taking as given behaviours (in the first column) the categories of the dimensions “fist techniques” and “leg techniques”; and as target behaviours (in the first row) the categories of the dimensions “laterality” and “contact” (in lag 0) and of the dimension “end of sequence” (in lag +1).

<table>
<thead>
<tr>
<th></th>
<th>LF</th>
<th>RT</th>
<th>HC</th>
<th>MC</th>
<th>LC</th>
<th>HNC</th>
<th>LNC</th>
<th>MNC</th>
<th>PF</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT</td>
<td></td>
<td></td>
<td>2.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td></td>
<td></td>
<td></td>
<td>2.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td></td>
<td></td>
<td>−2.15</td>
<td>3.47</td>
<td>−2.95</td>
<td>−3.44</td>
<td>−2.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICL</td>
<td></td>
<td></td>
<td>4.89</td>
<td>2.73</td>
<td>3.21</td>
<td></td>
<td></td>
<td>2.9</td>
<td>−2.58</td>
<td></td>
</tr>
<tr>
<td>LL</td>
<td></td>
<td>−2.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCL</td>
<td>2.76</td>
<td></td>
<td></td>
<td>−2.03</td>
<td></td>
<td></td>
<td></td>
<td>3.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2. T-patterns detected

In the analysis of the globality of the data packets (competitors-combats), 91 events-type, “multievents” according to the terminology of the lag sequential analysis (Bakeman, 1978, 1991), have been registered. In total, the number of recorded events is 1871.

Table 4 shows the T-patterns detected under the search parameters set forth. Furthermore, and from Amatia et al. (2017), qualitative filters have been added based on the objectives set at work. The T-pattern is included provided that: (a) the technique is followed by a result (point in favour) with an internal interval mean = 1; (b) there is an exchange of techniques with an internal interval mean = 1; c) that there is “leg technique” and “fist technique” in the same T-pattern.

4. Discussion and conclusions

The quality (reliability and generalisability) of the data on which the analysis is carried out that seek to satisfy the objectives of the study has been guaranteed by the agreement procedure and developed generalisability.

To satisfy the objective of the work, two analysis techniques that are at the forefront of observational methodology have been used: lag sequential analysis with conceptual and procedural support in the GSEQ5 software (Bakeman & Quera, 1995) and the detection of T-patterns, using the THEME software (Magnusson, 2020).

Regarding the “fist techniques”, the preferential use of “direct fist technique” (TN1, 97.31%) in relation to the “circular fist technique” (TN2, 2.69%) has been verified. Furthermore, an activation relationship has been detected between the given behaviour “direct fist technique” (TN1) and the target behaviour “middle zone contact” (CM). In the T-patterns (with order numbers 3, 4, 5, and 6) regular behavioural structures have been detected in 11 participants that reflect the execution of this “direct fist technique” (TN1) with “middle zone contact” (CM). The T-pattern with order number 1 also reflects the performance of the “direct fist technique” (TN1) “high zone no contact” (NCA); and the

<table>
<thead>
<tr>
<th>Order N°</th>
<th>Chain format pattern</th>
<th>Occur.</th>
<th>Data package</th>
<th>Internal interval mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(((lf,dt,rt,hnc ((lf,ps,ss,pbo) es,pbo)) ss,pbo)</td>
<td>4</td>
<td>3-3-11-44</td>
<td>1-1-1,75–1</td>
</tr>
<tr>
<td>2</td>
<td>(((lf,dt,lf,ca es,pf)(ss,pbo (es,ps,ss,pbo))(lf,dt,lf,hc lfg,dt,lf,hc))</td>
<td>3</td>
<td>37-42-61</td>
<td>1-1-2-1-6-1,67</td>
</tr>
<tr>
<td>3</td>
<td>(lf,dt,rt,mc (((es,ps,ss,pbo) es,pbo) ss,pbo))</td>
<td>5</td>
<td>2-29-41-48-61</td>
<td>1-1-2-1</td>
</tr>
<tr>
<td>4</td>
<td>(sc (((((ss,pbo,ss,pbo (lf,dt,rt,mc es,pf)))(ss,pbo lfg, dt,rt,mc ss,pbo))(es,ps,ss,pbo))(lf,dt,rt,mc ss, pbo) lfg,dt,rt,mc ss,pbo)(lf,dt,rt,mc ss,pbo))</td>
<td>3</td>
<td>2-29-38</td>
<td>1-1-1-1-1,67-3-4,33</td>
</tr>
<tr>
<td>5</td>
<td>(lf,dt,rt,mc (((es,ps,ss,pbo lfg,dt,rt,mc es,pf))((es,ps,ss,pbo) es,pbo))((lf,dt,rt,mc es, pbo) lfg,dt,rt,mc ss,pbo)(lf,dt,rt,mc ss,pbo))</td>
<td>4</td>
<td>2-29-37-48</td>
<td>1-1,50-1,25–1,50-1-2-1-1</td>
</tr>
<tr>
<td>6</td>
<td>(((ss,pbo lfg,cr,rt,mc ss,pbo)(lf,dt,rt,mc lfg,dt,rt,mc)) ((es,ps,ss,pbo))</td>
<td>3</td>
<td>29-37-41</td>
<td>1,33–2,33-1-2,67-1-1</td>
</tr>
</tbody>
</table>
T-pattern with order number 2, the execution of “direct fist technique” (TN1) with “high zone no contact” (CA). The results obtained in this work are in line with the Ibáñez et al. (2018) where elite competitors showed a higher proportion of using the technique of direct fist to the high zone in relation to the middle zone. In children, our results are also in line with those of Lapresa, Ibáñez, Arana, Garzón et al. (2011), who found statistically significant differences regarding the greater use of the direct fist technique to the middle zone by the 12–13 age group in relation to international competitors. On the other hand, the “circular fist technique” (CT) shows a statistically significant inhibition relationship with the establishment of “middle zone contact” (MC); T-patterns not having been registered that reflect this circular fist technique. Koropanovski and Jovanovic (2007), Koropanovski et al. (2008), Laird and McLeod (2009), and Ibáñez et al. (2018) have already recorded the scarce presence of the circular fist technique in elite karate competition.

Regarding the “leg techniques”, the most performed technique has been the “circular leg technique” (CL), 70.03%, followed by the “inside circular leg technique” (ICL), 14.98%, the “lateral leg technique” (LL), 9.78%, and the “backward circular leg technique” (BCL), 2.75%. The use of the rest of the techniques is residual. In the adjusted residual analysis, an activation relationship has been detected between the given behaviour “circular leg technique” (CL) and the target behaviour with “middle zone contact” (MC); as well as an inhibition relationship with the target behaviours “high zone contact” (HC) and “high zone no contact” (HNC). This technique (CL) is the only one that has been reflected in the T-patterns detected (T-pattern with order number 6). These results are in line with those obtained by Laird and McLeod (2009) and Koropanovski et al. (2008), who concluded that the leg technique most used in combat was the circular technique to the middle zone. This preference for the use of this technique is also consistent with the results obtained in 12–13 year-old competitors, obtained by Lapresa, Ibáñez, Arana, Garzón et al. (2011) and Lapresa, Ibáñez, Arana, Amatria et al. (2011).

An activation relationship has also been detected between the criterion behaviour “inside circular leg technique” (ICL) and the conditioned behaviours “high zone contact” (HC) and “high zone no contact” (HNC); as well as an inhibition relationship with the establishment of “middle zone contact” (MC) and “middle zone no contact” (MNC). Lapresa, Ibáñez, Arana, Garzón et al. (2011) and Lapresa, Ibáñez, Arana, Amatria et al. (2011) found that the “inside circular leg technique” (ICL) was the second most used technique by competitors aged 12–13 years.

Likewise, an activation relationship has been detected between the given behaviour “lateral leg technique” (LL) and the target behaviour “middle zone no contact” (MNC). In Paz and Miño (2000), in elite competitors, this technique accounted for 21% of the total of techniques performed. However, this technique was not recorded in competitors aged 12–13 years in the works of Lapresa, Ibáñez, Arana, Garzón et al. (2011) and Lapresa, Ibáñez, Arana, Amatria et al. (2011).

An activation relationship has been detected between the given behaviour “backward circular leg technique” (BCL) and the target behaviour “high zone no contact” (HNC); as well as an inhibition relationship with the establishment of “middle zone contact” (MC). Ibáñez et al. (2018), obtained a residual use (3.54%) of the backward circular leg technique in relation to the leg techniques, in elite competitors; also Laird and McLeod (2009) with 4.48% of the total of all techniques. Lapresa, Ibáñez, Arana, Garzón et al.
(2011) and Lapresa, Ibáñez, Arana, Amatria et al. (2011) did not record any use of this technique by participants aged 12–13 years.

Regarding “laterality”, 66.37% of the techniques were performed with the “right” limb (RT) and 33.63% with the “left” (LF). About 66.73% of the fist techniques and 65.75% of the leg techniques were performed with the “right” (RT). Regarding the guard, 88.71% of the total technical actions were carried out with a “left guard” (LFG) and 11.29% with a “right guard” (RTG). About 90.34% of the fist techniques were performed with the “left guard” (LFG), compared with 85.93% of the leg techniques. In the T-patterns detected, fist techniques were found executed with the “right” (RT) (T-patterns with order number 1, 3, 4, 5, 6) and with the “left” (LF) (T-pattern with order number 1), always with “left guard” (LFG). In the T-patterns only a regular behaviour structure has been detected that includes the execution with the “right” (RT) (T-pattern with order number 6) also with a “left guard” (LFG). These results obtained at the age of 8 and 9 years are consistent with those obtained by Lapresa, Ibáñez, Arana, Amatria et al. (2011) and Lapresa, Ibáñez, Arana, Garzón et al. (2011) who demonstrated that the 12–13 year-old competitors have not overcome the conditioning of their lateral prevalence, noting, in competitors with right lateral preference (hand-leg), the significantly greater performance of techniques with left guard and right limb. These authors also demonstrated how the senior competitor is able to determine his lateralisation to the circumstances of the competition.

Finally, in the lag sequential analysis, an activation relationship has been detected between the given behaviour “lateral leg technique” (LL) and the target behaviour “left” (LF); as well as an inhibition relationship with the “right” limb (RT). These results are consistent with the internal logic of the execution of the lateral leg technique, since attacking with the leg placed forward guarantees a higher execution speed.

Regarding the effective offensive technical actions (those that score points), the “direct fist technique” (TN1) reaches 96.36% of all effective technical actions performed with the fist. Also, in Laird and McLeod (2009), the most effective technique was the direct fist technique (with 43.28% of all the points recorded), as in the study by Ibáñez et al. (2018) where the direct fist technique to both the high zone (53.84%) and the middle zone (23.07%) reached 76.92% of the total effective actions. In this work, T-patterns (order numbers 1, 2, 3, 4, 5, and 6) have been detected that reflect the effectiveness of the “direct fist technique” (DT) performed with “left guard” (LFG) and “left” (LF) and “right” (RT) fist.

Regarding the effectiveness of technical leg actions, the “inside circular technique” (ICL) accounts for 50% of the effective actions performed with the leg, followed by 33.33% of the “circular leg technique” (CL) and 16.66% of the “lateral leg technique” (LL). In the lag sequential analysis related to efficacy, contradictory results have been obtained with those of other previous studies and with the T-patterns detected; The “inside circular leg technique” (ICL) shows a relationship of activation with obtaining “point in favour” (PF) and inhibition with receiving “point against”; while the “circular leg technique” (CL) obtains an inhibition relationship with the achievement of “point in favour” (PF). On the other hand, T-patterns have been detected that reflect the efficacy of the “circular leg technique” (CL) with “left guard” (LFG) and “right” leg (RT). Laird and McLeod (2009) and Ibáñez et al. (2018), in their respective studies with elite karateka, found that the most effective leg technique was circular, with 17.91% and 15.38% of all effective technical actions, respectively.
This work has provided results of special relevance to technicians and researchers related to martial arts practised by children. Specifically, it has been characterised, in the initiation to karate, the offensive technical action executed (whether with the fist or leg), the laterality (related to the guard that supports the action and the segment with which it is performed), the area of the body to which the technique is directed and the efficiency obtained. If we take into account other relevant works that have characterised the technical performance in the 12–13 year-old elite karate (Lapresa, Ibáñez, Arana, Amatria et al., 2011; Lapresa, Ibáñez, Arana, Garzón et al., 2011) and in adult karate, this work represents another milestone in a roadmap that all those related to formative karate in combat mode (kumite) should take into account.

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References


