Evidence of the Effect of Winning or Losing in Levels of Anger and Anxiety in Judo Fighters

Evidencia del efecto de ganar o perder en los niveles de rabia y ansiedad en luchadores de judo

Evidências do efeito de ganhar ou perder em níveis de raiva e ansiedade em lutadores de judô

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Abstract

Aggression is a behavior that involves a simultaneous activation of physiological, biochemical, neurological, and behavioral components and emotions, such as anxiety and anger. In humans, sports can be considered as a form of display because they allow aggression to be expressed with a low probability of permanent damage to subjects. The competitions have been used as models to evaluate the activation produced by its different stages, such as the outcome of the combat. Judo has been used as a model of competitive aggression to evaluate the different body responses in agonistic behaviors in humans since it offers a context to those studied in animal fights. The aim of this study was to evaluate the effect of winning/losing in the levels of anger and anxiety in regional male judo fighters, linked to the Pará Federation of Judo, Brazil. The STAXI and STAI psychometric scales and their results were used in a correlation analysis to know the interaction between the components of the scales with the total number of strikes, using a pre/post fight evaluation and the filming of the fights. Significant statistical differences ($p < 0.05$) were found between winners and losers. Losers had higher levels of anger, while anxiety was higher for the winners, being that judo is a mean of competition in which such behaviors can be expressed in a socially accepted way.

Keywords: Defensive aggression; offensive aggression; sport; anxiety; anger.

Resumen

La agresión es un comportamiento que implica una activación simultánea de componentes fisiológicos, bioquímicos, neurológicos, conductuales y emocionales como la ansiedad y la rabia. En los humanos, los deportes pueden considerarse una forma de exhibición

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porque permiten que la agresión se exprese con una baja probabilidad de daño permanente a los sujetos. Las competiciones se han utilizado como modelos para evaluar la activación producida por las diferentes etapas de la competencia, como el resultado del combate. El judo ha sido utilizado como un modelo de agresión competitiva para evaluar las diferentes respuestas del cuerpo en comportamientos agonísticos en humanos, ya que ofrece un contexto similar a los estudiados en peleas de animales. El objetivo de este estudio fue evaluar el efecto de ganar/perder en los niveles de rabia y ansiedad en luchadores de judo vinculados a la Federación de Judo de Pará, Brasil. Se utilizaron las escalas psicométricas STAXI y STAI, y sus resultados fueron usados en un análisis correlacional para conocer la interacción entre los componentes de las escalas con el número total de golpes, utilizando una evaluación pre/post lucha y la filmación de las peleas. Se encontraron diferencias entre ganadores y perdedores estadísticamente significativas (p< 0.05); los perdedores presentaron mayores niveles de rabia, mientras que la ansiedad fue mayor en los ganadores, debido a que el judo es un medio de competición en el que pueden expresarse de manera socialmente aceptada dichos comportamientos.

Palabras clave: agresión defensiva; agresión ofensiva; deportes; ansiedad; rabia.

Resumo

A agressão é um comportamento que implica uma ativação simultânea de componentes fisiológicos, bioquímicos, neurológicos, comportamentais e emocionais tais como a ansiedade e a raiva. Nos humanos, os esportes se podem considerar como uma forma de exibição porque permite que a agressão se exprese com uma baixa probabilidade de dano permanente aos sujeitos. As competições se têm empregado como modelos para avaliar a ativação produzida pelas diferentes etapas da concorrência como o resultado do combate. O Judô tem sido usado como um modelo de agressão competitiva para avaliar as diferentes respostas do corpo em comportamentos agonísticos em humanos, pois oferece um contexto similar aos estudados em brigas de animais.

O objetivo deste estudo foi avaliar o efeito de ganhar/ perder nos níveis de raiva e ansiedade em lutadores de judô já vinculados à Federação de Judô de Pará, Brasil. Se utilizaram as escalas psicométricas STAXI e STAI e seus resultados foram usados em uma análise de correlação para conhecer a interação entre os componentes das escalas com o número total de golpes, utilizando uma avaliação pre/pós briga e a filmagem das lutas. Encontraram-se diferenças entre ganhadores e perdedores estatisticamente significativa (p< 0.05); perdedores apresentaram maiores níveis de raiva, enquanto a ansiedade foi maior para os ganhadores. Sendo que, o judô é um meio competição, onde podem expressar-se de forma socialmente aceita, ditos comportamentos.
Palavras-chave: agressão defensiva; agressão ofensiva; esportes; ansiedade; raiva.

Martial arts originated from different fighting techniques that were applied in excessive and non-ritualized aggressive confrontations. Judo has been used with a competitive aggression model to study the neuroendocrine response in humans' fighting behaviors since it provides a context similar to those found in the daily encounters studied in animals (Geniole, Bird, Ruddick, & Carré, 2017; Parmigiani et al., 2009; Salvador, Suay, Gonzalez-Bono, & Serrano, 2003). In natural situations, aggressive behavior is used to maintain or obtain resources, such as social status, territory, food, and access to partners for reproduction (Martínez-Díez, 2008). In this way, aggression is a behavior that attends to a determined function, triggered by a stimulus that generates a behavioral response and a physiological and biochemical activation that allows individuals to react to situations that could endanger their life or resources.

The biochemical and neuroanatomic basis of interspecific and intraspecific aggression, as well as its manifestations have been explored in different researches regarding their pharmacology and chemistry (Ariás-Carrion, Stamelou, Murillo-Rodriguéz, Menéndez-González, & Pöppel, 2010;

Siever, 2008; Takahashi, Shimamoto, Boyson, Debold, & Miczek, 2010), behavioral expression (Alcazar-Corcoles, Verdejo-García, Bouso-Saiz, & Bezos-Saldaña, 2010; Montás, 2011; Rosell & Siever, 2015; Siever, 2008; Verona, Patrick, Curtis, Bradley, & Lang, 2004), and physiology (Alcazar-Corcoles et al, 2010; Siever, 2008; Von Borries et al., 2012) —see table 1.

A trait used to study the agonistic behavior in animals is the *aggressive display*, defined as the patterns of behavior that allow transmitting different types of information (Paton & Caryl, 1986). In general, fights always start with sensory expressions designed to discourage the candidate from starting combat, reducing the possibility of harm and death (Blank, Ruckstuhl, & Yang, 2015). In humans, sport is considered a ritualized agonistic struggle characterized by games, where the conflicting members win the reward and prevent the other group from winning it, the aggression used tends to be symbolic and destined to gain victory, even before the opponents have been defined (Sebastián, 2013). Using aggressive display to gain a tactical advantage in the confrontation that allows increasing the probability of victory will be a way to choose the best components to be transmitted to the next generation (Huber, Bannasch, & Brennan, 2011). Considering that humans also fight for different rewards in sports, we may conclude that socially constituted prices, such as money or a better job position, are objectives of disputes that are also beyond those found in animals (Dos Santos, Junior, Torralba, & Lopez, 2017; Schiphof-Godart, Roelands, & Hettinga, 2018).

It seems that in many species, there is an effect related to the result of an encounter between conspecifics, called winning or losing; winning a fight increases the likelihood of future wins, and losing will increase the risk of losing in the future (Geniole et al., 2017; Ouergui et al., 2016). The winning-losing effect is considered adaptive, since participation in fights will decrease or increase, regarding the last social experience (Lehner, Rutte, & Taborsky, 2011; Trannoy & Kravitz, 2017; Zhou et al., 2017).

Table 1.

Types of Aggressions, according to object, trigger stimulus pattern, observed behavior, and affection, as well as indication of possible associated brain areas and neurochemistry

Aggression	Object	Triggering Stimuli	Behavior	Involved affection	Areas of brain involved	Neurochemistry
Defensive	Defense of predation	Presence of predator	Avoidance / flight / avoidance	Fear / anxiety	Insula Amygdala Thalamus Hypothalamus Rafe ATV Accumbens	-5-HT -NA + Cortisol -TES +DA -GABA
	Co-specific defense	Competition for feature	Fight / display	Fear / anxiety		
	Defense of the offspring	Risk of loss of offspring	Fight / display / avoidance / Escape / avoidance	Fear / anxiety		
Offensive	Predation	Physiological need (hunger)	Hunting	Hunger / deprivation / will / desire	Thalamus Insula Amygdala Pre-optical area Hypothalamus	+Cortisol + TES + GABA -5-HT
	Intraespecific (dispute)	Competition for feature	Fight / display	Anger		

Acronym: ATV: Ventral Tegumentary Area; 5-HT: serotonin; NA: Noradrenaline; TES: Testosterone; DA: Dopamine; GABA: Gamma-a butyl butyric acid; +: Increase; -; Decrease

Anxiety and Anger in Combat Sports

The emotional responses of athletes are fundamental aspects in their performance and training, both sports and psychological. The competitive experience and the type of sport will influence the interpretation that the athletes make of the behaviors, it will be affected by the previous results, level of anxiety and anger, among other components (García, Zafra, & Toro, 2008; Gómez, Sánchez, Sánchez, & Amarillo, 2016).

Sports practices and competitions are considered stressful situations for each of the people participating in them, due to the stress produced. Different negative states may arise in the competitors, anxiety is one of those that has been studied in the context of competition (Peña & Oreja, 2019; Pulido, Fuentes, & De la Vega, 2019; Strahler, Berndt, Kirschbaum, & Rohleder, 2010) since it appears before and during it and can adversely affect sports performance (Oliva & Hernandez-Pozo, 2009). In addition, anxiety has been considered as a physiological advantage that prepares the body for exercise, making energy available for the first moment of the competition (Fry, Schilling, Fleck, & Kraemer, 2011).

In sports, it has been defined with respect to the stability in the time of the symptom or characteristic in people (state or trait). The transient emotional condition of the human being, characterized by subjective feelings of tension and apprehension, as well as by an overactivity of the autonomic nervous system that can change over time and fluctuate in intensity is defined as state anxiety (Spielberger, Gorsuch, & Lushene, 1982). Whereas, the relatively stable anxiety propensity that differentiates individuals in the tendency to perceive situations as threatening, which would increase anxiety levels is called trait anxiety (Spielberger et al., 1982). Following this classification, some studies have focused on the anxiety regarding its activation in and out judo competitions (state), and how it is a part of personality that affects how the athlete

behave (trait) (Sanıoglu, Ulker, & Tanıs, 2017; Papacosta, Nassis, & Gleeson, 2016).

Anger has been defined as an unpleasant and more basic emotion than hostility and aggressiveness (Spielberger et al., 1985). It is considered a negative and destructive emotion that may be related to feelings of sadness, angst, rage and fury (Modrcin-McCarthy, Pullen, Barnes, & Alpert, 1998). Anger is an emotional component, mainly composed of intense emotions (fury), which is preceded by a physiological neurochemical activation, as well as a subjective experience of sensations and different types of coping and expression, which can vary considering the nature of the situation and the intensity of the element that produces the emotional control that has the subject of cultural and social factors and the presence of mental disorders (Benézech, 2016). Anxiety and anger can be studied as a personality trait, as well as a transient emotional state (Fernández et al., 2019; Spielberger, et al., 1985).

In its expression, anger can take many forms such as violence, self-inflicted injuries, and physical and verbal aggression, among others; these types of aggressions generated by anger are commonly used in sports, but not necessarily with the same results or motivation. In contact and combat sports, it has been suggested that before a competition, individuals may present anger states (Salvador et al., 2003), which are influenced by biological variables that include neurological and endocrine mechanisms (Parmigiani et al., 2009). Information on the effect of anger in sports is contradictory since it may appear in relation to victory or defeat (Robazza & Bortoli, 2003); in pre-competition, it is considered negative, so intervention programs try to improve athletic performance seeking to reduce this emotional state (Loehr, 1982). It can be considered positive because a low intensity of anger can help the athlete's performance (Proios, 2012), for example, in fighting sports, the fighter can use anger to bring more energy to the movements, considering this as a tactical advantage. The use of low

levels of anger can be understood as an important component in physical contact sports, where it can increase the intensity, but not the risk of attacking others (Olivia & Hernández-Pozo, 2009).

Judo requires a non-cyclical and intermittent physical effort, a melee fight by two athletes, where the goal is to beat the opponent before the time ends either by throwing him to the ground or by immobilizing him (García et al., 2008). As a sport, training and competence have similar technical and mechanical stress, but the second leads to a state of different physiological demands (Serrano, Salvador, González-Bono, Sanchis, & Suay, 2001). In addition, the stressful potential of the competitions, age, experience, and training process, in the end, increase the number of implicit psychological demands to the sports modality (García et al., 2008).

Different studies have used the competitions as models to explore the emotional activation produced by its different moments, such as training (Salvador et al., 2003) and competition intervals (Salvador et al., 1999), to observe the result (Salvador et al., 1999). In sports like judo, one of the difficulties that apparently arises with this type of study is the impossibility to control the variables completely. However, this does not prevent the sports confrontations from being considered as reliable to obtain the results of the emotional measures, especially those related to aggression (Pesce et al., 2015).

Studies have found that the closer a competition is, the anger levels measured in questionnaires are higher (Pesce et al., 2013; Pesce et al., 2015). After the competition, the scores on the rage scale (STAXI) were higher in the athletes who won, in comparison to those who lost in an official competence, and as soon as they were restored 30 minutes after the competence.

Considering the above, it is possible to conclude that aggression is a sports activity phenomenon related, which can be understood as a display form with different levels of anxiety and anger among winning and losing athletes in different sports, such as judo. The present research aimed to evaluate the effect of winning or losing in a judo fight in the levels of anger and anxiety in male regional judo athletes, regularly linked to the Paraense Federation of Judo, Brazil, before and after competitions, as well as the correlations between total strikes and the different anger and anxiety scales evaluated in the three moments of the research.

Method

Participants

Twelve regional judo male athletes, regularly linked to the Paraense Federation of Judo, Brazil, who had a competitive experience of at least five years, were properly ranked, and officially authorized by the Federation were selected. Regarding the technical capacity, all the athletes presented at least the purple belt. People with any evidence of cardiovascular disease, a history of endocrine disorders or hypertension, or even those who used steroid-based drugs were excluded.

Instruments

State-Trait Anger Expression Inventory (Spielberger & Biaggio, 1992). In this self-report inventory, anger is defined as a primitive emotion that does not need an attitudinal or cognitive component; it is only a behavioral expression, different from hostility. The STAXI is composed of eight subscales, with a Cronbach's alpha between 0.69 and 0.88 (Thadeu & Ferreira, 2013): "transitory *state* of anger at the time of application of the tests (0.86)," trait (0.87) "Stable chronic anger". Temperament: "trait's subscale indicates the chronic tendency to anger"; in addition, Allport (1961; quoted by Izquierdo, 2002) defined it as:

that which characterizes the emotional nature of an individual; includes the susceptibility to

emotional stimulation, the force and speed with which the responses, the state and its fluctuations in intensity are accustomed to produce, and the phenomena are characterized as depending on the constitutional structure and the inheritance.

Reaction: "trait's subscale indicates the tendency to react with anger in situations of ego-threat and self-esteem;" anger out (0.82): "tendency to attack others or the environment;" anger in (0.73): "unconscious tendency to blame —can lead to depression;" control of anger (0.79): "conscious tendency to control anger, suppress it," and expression: "global measure of anger, taking into account the three previous scales;" STAXI was validated for its use in Brazil (Azevedo, Wang, Goulart, Lotufo, & Benseñor, 2010; Spielberger & Biaggio, 1992) and has also been widely used to assess anger in sports.

The Trait-State Anxiety Inventory (STAI) was designed by Spielberg, Gorsuch and Lushene in 1970 and validated for its application in Brazil by Spielberg, Biaggio and Natalício (1979). STAI is a self-application scale that allows you to assess anxiety, both as a state and as a trait. The questionnaire consists of 40 questions, placed in terms of intensity (from almost never to usually). The questions are divided into two scales: the state-anxiety understood as an experience at the time, a sense of insecurity, helplessness as perceived harm that can lead to worrying or fleeing and avoiding, and another scale of anxiety-trait measures the tendency to perceive stressful situations as dangerous and threatening, and respond to different situations with different intensity. In its refined version, it uses 13 for the state and 12 for the trait (Kaipper, Chachamovich, Hidalgo, Da Silva Torres, & Caumo, 2010).

To count the number of strikes in the encounter, we recorded (Sony DCR-SX20) and later analyzed them, using the ethogram proposed by Miarka in 2014, who defined "hits", effective or not, as the technique applied in standing combat with arms, legs or hips. The filming was done with full view of the fighters, as well as making a fight time control.

Procedure

All measurements were made in a judo competition with the exception of the baseline, which was taken at the training site and out of competition (figure 1), before completing the anamneses and the terms of consent. The full versions of the STAXI 2 and STAI tests were applied at least three weeks before competition. After the baseline's measures were taken, the athletes were accompanied to a competitive event in the city of Paragominas, where the second and third measurements were taken, the first one, half an hour before the fight, and the second, after the fight was concluded. These evaluations used the refined versions. In the case of STAXI, 4 scales and in the case of STAI, 25 questions (Kaipper et al., 2010).

After the competition results, the fighters were separated into two groups, winners (8) and losers (4), and the anger and anxiety scales were applied. The fights were filmed to count the number of strikes; right after the fight, the instruments were re-applied.
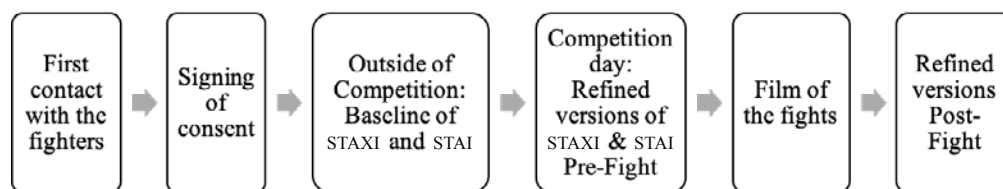

Figure 1. Data collection procedure

Ethical care

Research Ethics Committee of the Federal University of Pará Opinion no. 1 622 308. Confirmation of participation in the study was determined by the signing of a consent form prepared for this purpose.

Data analysis

For the data analysis, we used the SigmaStat 3.5 software (Systac Software Inc.). The fight data was summarized in the number of strikes, adding the strikes of hip, feet and pitch. Data used for analysis showed normality when statistically analyzed. In order to evaluate the effect of the result of the fight (win/lose) on the different behavioral measures pre-fight and post-fight, a one-way analysis of variance (one-way ANOVA) was done, where the factor was related to the result (winners vs. losers). In addition, an ANOVA for repeated measures was performed that allowed to evaluate the data in relation to time (basal, pre-, and post), and to know the possible differences between and intragroup.

Finally, a Pearson correlation was performed to know the relation between the measured components (STAXI-STAI-Number of Strikes). In the case of the measures evaluated by the refined versions, the values were normalized with a simple three rule in relation to the total score in the baseline evaluations. A $p < 0.05$ was used for all cases.

Results

Effect of Winning/Losing in Anger and Anxiety

The analysis of variance of a factor (one-way ANOVA) performed to evaluate the effect of the result on the STAI and STAXI scales revealed that there was no statistically significant difference for most scales. However, the same analysis showed (figure 2) a statistically significant difference in basal anger out (F [1:10] = 5.955, p = 0.035, VD = 1,43). The subjects who were going to lose had a higher level of anger than those who won.

Although the difference was not significant, the analysis also revealed a trend with respect to the baseline state of the STAI basal (F [1:10] = 4,390, p = 0.063, VD = 1,43), which refers to a higher anxiety state in the winning subjects.
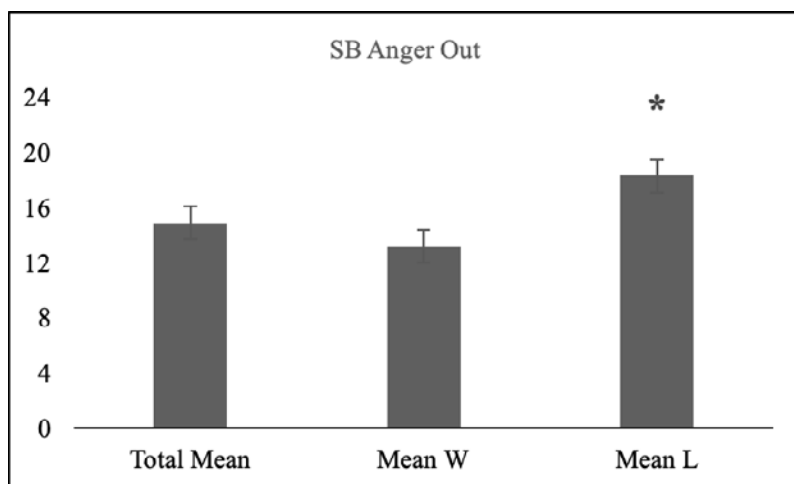

Figure 2.
STAXI basal anger out, total mean of the sample, mean of the winners (Mean W) and the losers (Mean L); *, >; where W – Winners of the fight; L – losers of the fight; SB – STAXI Basal; (One-way Anova, P<0,05).

Differences between Groups and Inter-Groups over Time (Winners and Losers)

Regarding the differences between groups and inter-groups, the ANOVA for repeated measures showed that in STAXI, there were no statistically significant differences between winners and losers (figure 3), for any of the scales evaluated in the three moments of the research.

STAI had statistically significant differences between the winners and losers (repeated measures ANOVA), both in the state (F [1, 10] = 5.655, p= 0.039) and in the trait (F [1, 10] = 8.794, p= 0.014). The losers presented higher levels of anxiety than the winners did (figure 4). In addition, there was

also a difference in anxiety levels over time, where the trait and the pre- and post-fight state were higher than in baseline measurements (for losers).

Correlations between Total Number of Strikes, Anger and Anxiety

After the above analysis, the Pearson correlation was made, using the data for baseline anger and anxiety (figure 5), pre-fight (figure 6), and post-fight (figure 7), along with the total number of strikes, of the three competition times. There were different positive and negative correlations (p <0.05) between the different values of each moment and between moments.
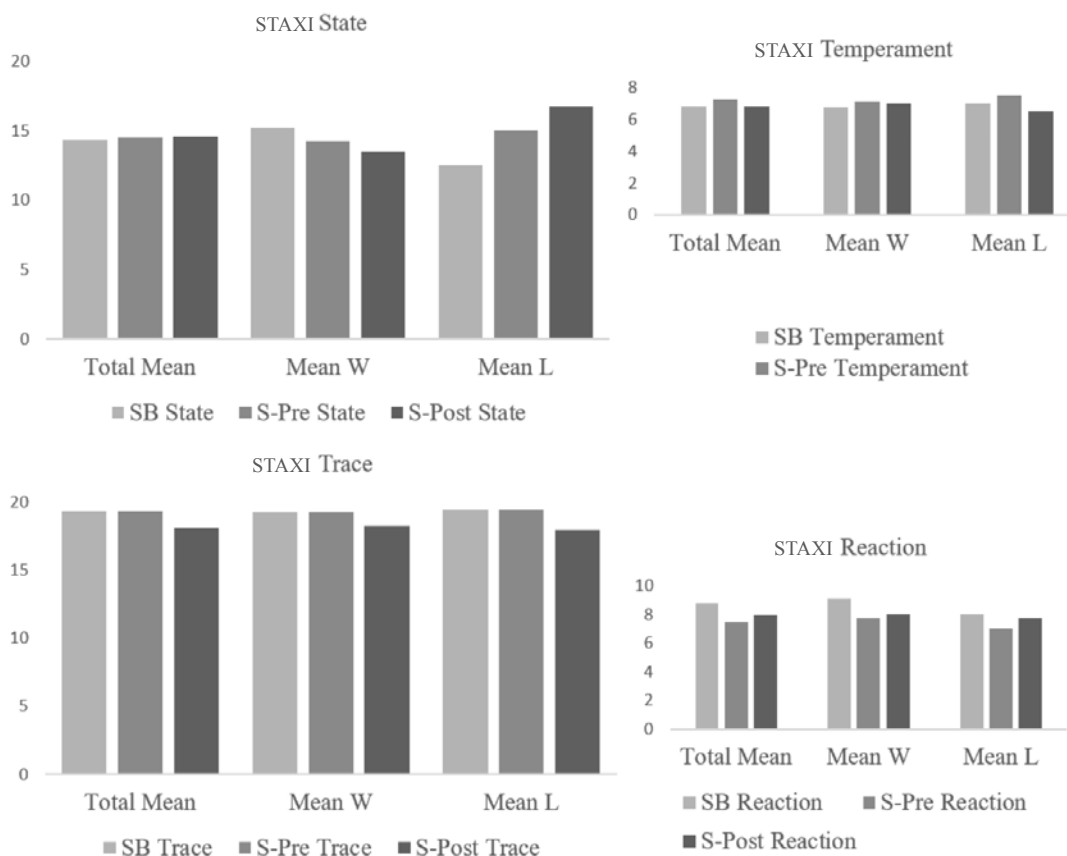
Figure 3.
STAXI Trait, State, Temperament and Reaction through investigation, total means, Mean of Winners (Mean W), Mean of Losers Mean (Mean L), basal, pre e post fight, where SB – STAXI Basal; S-Pre – STAXI Pre fight; S-Pos – STAXI Post fight.
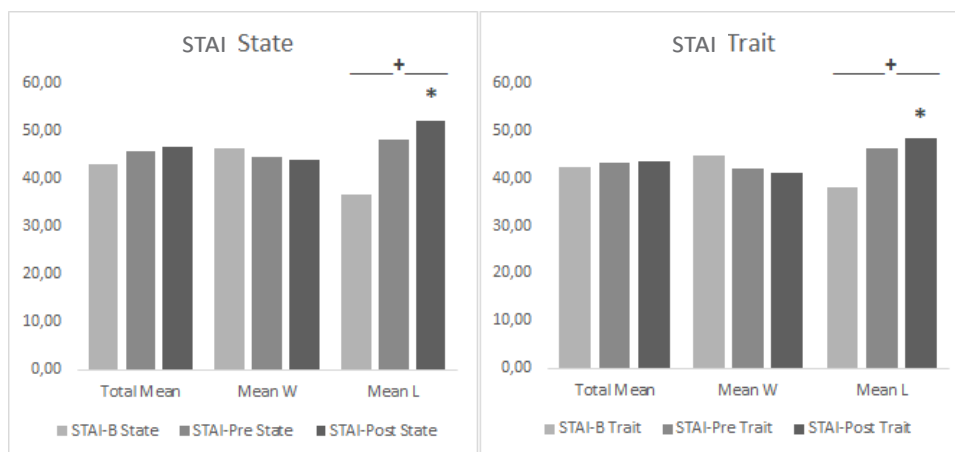
Figure 4.
STAI State and Trait through investigation, total means, Mean of Winners (Mean W), Mean of Losers Mean (Mean L), basal, pre e post fight, where * > ; and + >. ANOVA for repeated measures ($p < 0.05$).

Figure 5. Positive and negative correlations between
Total number of strikes and basal anxiety and anger ($p < 0.05$). (→) Positive correlations; (--->) negative correlations.

In the baseline measurements, we found correlations with the total number of strikes and anger, but not with anxiety, trait anger, and the number of strikes negatively correlated ($r = -066$, $p = 0.019$). However, the basal control positively correlated with the number of strikes ($r = 0.625$, $p = 0.30$). The same was also found between control and trait ($r = -0.581$, $p = 0.048$), and positively with the temperament ($r = 0.812$, $p = 0.001$), the reaction ($r = 0.792$, $p = 0.002$), and the expression ($r = 0.614$, $p = 0.034$). A positive correlation was also found between the baseline states of STAXI and STAI ($r = 0.852$, $p = 0.000$) and STAI trait ($r = 0.868$, $p = 0.000$).

Correlations Results: STAI and STAXI Pre-Fight

Regarding the pre-fight results and the total number of strikes, a negative correlation with temperament (r = - 0.596, p = 0.41) was identified, plus temperament positively correlated with the pre-fight anger trait (r = 0.743, p = 0.006) with post-fight trait (r = 0.718, p = 0.009), and temperament (r = 0.803, p = 0.002), and with state pre-trait (r = 0.642, p = 0, 24 & r = 0.743, p = 0.024, respectively) and post-fight (r = 0.709, p = 0.010 and r = 0.638, p = 0.026, respectively) of the STAI.

The trait of pre-fight anger positively correlates with pre-fight reaction (r = 0.702, p = 0.001), the trait (r = 0.861, p = 0.000), the temperament (r = 0.812, p = 0.001), and the reaction (r = 0.727, p = 0.007) post-fighting, and STAI with the anxiety state, trait (r = 0.618, p = 0.032 & r = 0.703, p = 0.011, respectively), and post-fight (r = 0.662, p = 0.019 & r = 0.616, p = 0.33, respectively).

Correlations Post-Fight: Results of STAI and STAXI

Finally, the post-fight results had correlations with each other. In addition to those previously mentioned, in this case no correlation was found in relation to the number of strikes.

Anger trait in this case correlated with the temperament (r = 0.883, p = 0.000) and the reaction (r = 0.907, p = 0.000), and STAI with the state (r = 0.684, p = 0.014) and the trait (R = 0.756, p = 0.004). The temperament correlated positively with the reaction (r = 0.687, p = 0.014) and the state (r = 0.637, p = 0.026) and trait (r = 0.636, p = 0.026) of STAI, and the reaction correlated with STAI's trait (r = 0.581, p = 0.047).

Discussion and Conclusions

There were differences between the groups of winners and losers in relation to anxiety, but not to anger, both the state and the trait varied in the groups regarding time. The final post-fight anxiety was higher in comparison to the basal and pre-fight; the change in strikes was associated with a temporal perception of different questions found on the scale. In the case of the winners, the pre-competitive anxiety was higher than that post-fight. The low pre-fight anxiety and the levels of anger have been associated with an increase in energy and, in certain amounts, can even be an advantage to increase the confidence of the athletes, as well as to improve

Figure 6. Positive and negative correlations between
Total number of strikes and pre-fight anxiety and anger (p<0.05). (→) Positive correlations; (---›) negative correlations.
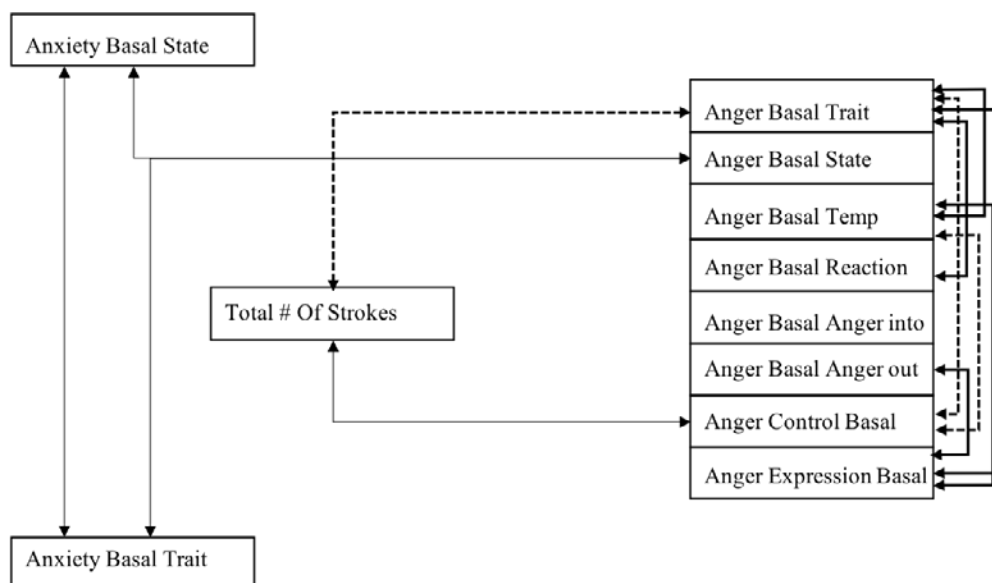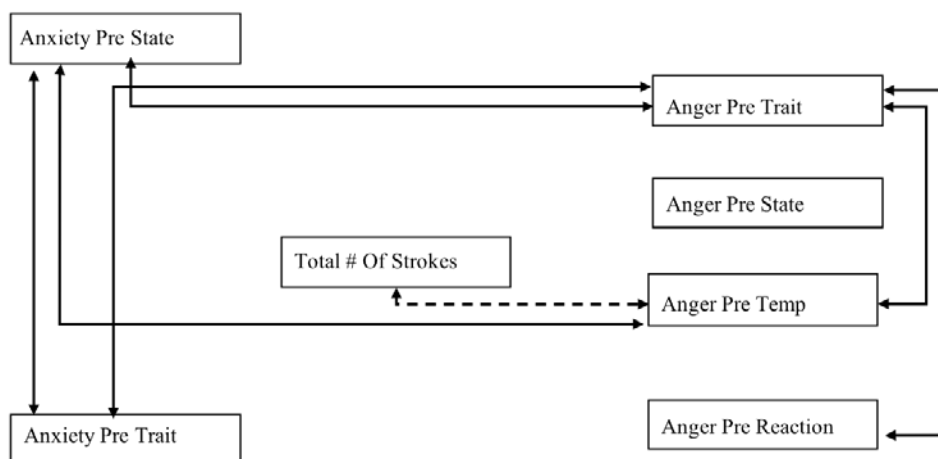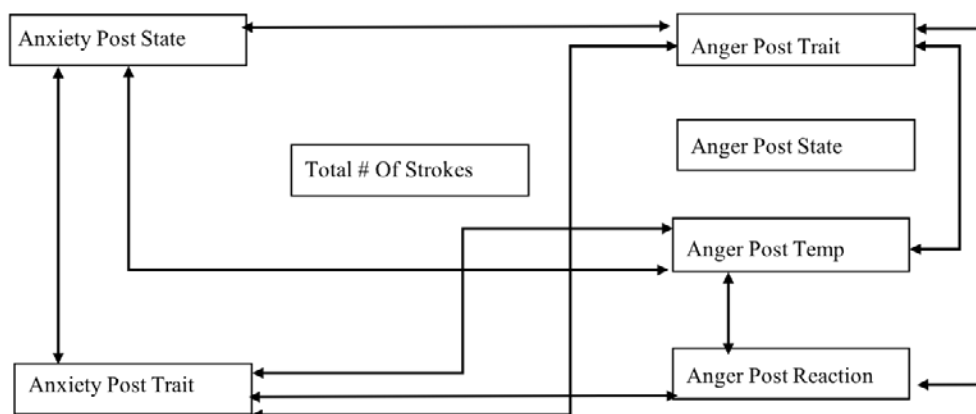
Figure 7. Positive and negative correlations between
Total number of strikes and post-fight anxiety and anger (p<0.05). (→) Positive correlations; (--->) negative correlations.

the decisions made by judokas (Lane et al., 2010; Valente, Moreira, & Zanetti, 2012; Vaughan, Laborde, & McConville, 2019).

These data corroborate the study carried out by Gea García, Alonso Roque, Ureña Ortín, and Garcés de los Fayos Ruiz (2016), the increase in anxiety, called tension in the research, increased in intensity previously and in the confrontations; however, anger decreased in intensity. This increase in anxiety has been reported as an advantage for competitions by different studies that include both individual or team sports (Arruda, Aoki, Paludo, & Moreira, 2017; Cintineo & Arent, 2019; Fry et al, 2011; Radzi, Yusuf, Amir, & Mansor, 2018). For it to be effective, the athlete has to be prepared to cope with the stress response (Papacosta et al., 2016).

Correlations evidenced the relationship between the scales, the measured affections, the number of strikes, anger, and anxiety. In relation to the scales, these correlations were related to the internal consistency of the tests, where different questions evaluate different components, as in the case of STAXI-2 and its 8 scales. In relation to the STAI, which are two different scales for state and trait, this correlation was associated with an anxious reaction in everyday situations due to the emotional component that remains over time, a way to actually confirm the anxious response, was the

correlation found between the basal line and the states in the three moments of the competition. A trait of anxiety affects the way in which people usually react to stressful situations, in the case of sportsmen competition.

Finally, in what refers to correlations, anger correlated with the number of strikes, but anxiety did not. The correlations were mostly negative, where the trait and the high temperament meant a lower number of strikes. Although, the high control correlated with a greater number of strikes, considering that anger allows to dispose of a boost of perceived energy levels (Chhabra, Vyas, Chatterjee, & Voß, 2016; Moons, Eisenberger, & Taylor, 2010), lack of self-control could end in a punishment related to the breaking of the rules (Ruiz & Hanin, 2011).

In the case of the relation between anger and anxiety, the correlations outside the fighting situation were different than in the moments of struggle. The anger state and the baseline STAI trait and state correlated, but they did not correlate with the STAXI trait, in the pre- and post-fight; the two anxiety scales correlated with the trait. In addition to the states/traits correlations, a positive correlation between temperament and anxiety (state/trait) was found at all moments of the competition, something similar to what was found by Kuuseok and Ratassepp

(2001; quoted by Carretero, Moreno-Murcia, Ponce, González & Gimeno, 2012), which is explained by the convergence of affections in relation to temperament, so the temperament that is expressed as a baseline in the subject predisposes to a reaction above this in a stress situation, here placed the fight and its outcome.

In relation to table 1, the presence of anger and anxiety reveals a convergence of the two types of aggression (defensive and offensive). Firstly, in the case of the defensive aggression, the tendency of the state to be greater in the winners allowed us to observe a greater presence of the defensive. In the case of the offensive, especially the intra-specific one reflected in higher levels of anger, which were the results found in losers. Although not on the same levels, when analyzing the set of fighters, this allowed observing the presence of the two types of aggression, mainly in the amounts of positive correlations found between the two affections since they are not disconnected responses but increase and decrease together. Changes in mood states are related to the type of activity (Gea García et al, 2016). In conclusion, two types of aggression can be found with different objects, equal triggering stimuli, similar behaviors with different effects, and an opposite result. In the case of the winners, a type of defensive aggression that seeks the defense of the individual, in addition to obtaining a resource, uses the sports medium as a display with higher levels of anxiety. In the offenders' aggressive offense, seeking the attack of the opponent and obtaining recourse, aggression is supported by the display (the combat) and moved to a greater extent by anger (table 1).

The results of the present study show a statistically significant difference between winners and losers in relation to anger, but not anxiety, specifically with regard to the baseline anger out. Fighters who presented the highest levels of this type of anger lost the fight, while the winners presented a lower level. Anger can increase when approaching a sporting event, the study carried out by Pesce et al. (2013), moreover, correlated with an increase in IL-1B levels, a biomarker of anger. Similarly, Cisneros-Fonseca, Morales-Toboso, and Fomenech-Morales (2015) found in a group of baseball pitchers that anger worsened performance at the time of the sport, which was related to a loss of concentration of the athletes. However, according to Robazza and Bortoli (2003) anger appearance is not only related to loss, as it can also be presented in the victory. Although, in this research, it was only found in the losers.

Based on the above, it can be concluded that the responses associated with anger had a physical component, whereas anxiety was more cognitive. That justifies the increase in anxiety inventories and its lack of correlation with the number of strikes.

In the comparison between winners and losers, the expression of anger was greater in losers than in winners. The correlation analysis showed that the expression of the aggression was positively related to the control of anger and negatively related to its basal expression, given that there is no relation with the data in the post-fight.

As conclusions, we found that anger seemed to be an important component of the fight's outcome, and its levels are necessary for performance, but are likely to impair at higher levels. Also, in relation to the strikes and to the anger and anxiety components, the aggressiveness in the fight seems to be dissociated from the emotional indicators in the post-fight, so that there is no correlation between the number of strikes and emotional measures in the second moment. Finally, losing the fight alters anxiety, but not anger probably because the latter is more demanding of reflection on the part of the subject.

Limitations and Future Research Directions

There are some methodological limitations that have to be considered when interpreting the

results. The first one is related to the kind of psychological tests used; they were self-reported, and even though they offer a reliable way to evaluate both anger and anxiety, other measures, such as physiological ones, could confirm the higher or lower results in the scales.

Another limitation found was related to the comparison between the general population and the sample used in the research since when comparing both, the fighters showed higher levels of anger that those of the Brazilian standards of the staxi, so the fact that this research did not have a non-practice sports group, prevented from issuing a statement with statistical significance of the differences between these two types of groups.

Considering the limitations, as future research, we recommend including physiological assessment of cortisol and testosterone, as well as non-competitive and non-practice sports groups.

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Complementary Archive

Correlations

		templut	Anger Basal State	Anger Basal Trait	Anger Basal Temp	Anger Basal Reaction	Anger Basal Anger into	Anger Basal anger out	Anger Control Basal	Anger Expression	Anger Pre State	Anger Pre Trait	Anger Pre Temp	Anger Pre Reaction	Anger Post State	Anger Post Trait	Anger Post Temp	Anger Post Reaction	Anxiety Basal State	Anxiety Basal Trait	Anxiety Pre State	Anxiety Pre Trait	Anxiety Post State	Anxiety Post Trait	Total # of Strikes
templut	Correlação de Pearson	1	-,387	-,473	-,557	-,143	-,253	-,396	,053	-,472	-,435	-,243	-,516	-,198	,126	-,349	-,494	-,204	-,233	-,513	-,244	-,527	-,310	-,360	,483
	Sig. (2 extremidades)		,214	,120	,060	,658	,427	,203	,869	,121	,158	,446	,086	,537	,697	,266	,103	,525	,467	,088	,444	,079	,326	,251	,112
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal State	Correlação de Pearson	-,387	1	,149	,208	,000	,335	,183	,053	,314	,437	,303	,089	,244	-,022	,267	,268	,067	,852**	,868**	,288	,490	,246	,379	,308
	Sig. (2 extremidades)	,214		,643	,517	1,000	,287	,569	,869	,321	,156	,339	,783	,445	,946	,401	,399	,836	,000	,000	,363	,106	,441	,224	,329
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal Trait	Correlação de Pearson	-,473	,149	1	,812**	,792**	,081	,295	-,581*	,614*	,328	,838**	,807**	,735**	,155	,819**	,796**	,729**	-,061	,359	,449	,722**	,747**	,639*	-,661*
	Sig. (2 extremidades)	,120	,643		,001	,002	,803	,353	,048	,034	,298	,001	,002	,006	,630	,001	,002	,007	,851	,252	,143	,008	,005	,025	,019
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal Temp	Correlação de Pearson	-,557	,208	,812**	1	,347	,005	,463	-,645*	,719**	,230	,710**	,884**	,352	,106	,692*	,842**	,440	,001	,502	,397	,730**	,759**	,596*	-,559
	Sig. (2 extremidades)	,060	,517	,001		,269	,987	,130	,024	,008	,473	,010	,000	,262	,742	,013	,001	,152	,998	,096	,201	,007	,004	,041	,059
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal Reaction	Correlação de Pearson	-,143	,000	,792**	,347	1	,135	-,164	-,392	,218	,074	,643*	,411	,898**	,010	,668*	,493	,822**	-,074	,045	,161	,343	,319	,317	-,467
	Sig. (2 extremidades)	,658	1,000	,002	,269		,676	,610	,207	,496	,819	,024	,184	,000	,976	,018	,103	,001	,820	,890	,617	,275	,312	,315	,126
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal Anger into	Correlação de Pearson	-,253	,335	,081	,005	,135	1	-,203	,516	,201	,447	,273	,003	,279	-,129	,364	,472	,309	,273	,348	,264	,234	-,096	,140	,446
	Sig. (2 extremidades)	,427	,287	,803	,987	,676		,527	,086	,532	,145	,390	,993	,380	,690	,245	,122	,328	,390	,268	,407	,464	,766	,664	,146
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Basal anger out	Correlação de Pearson	-,396	,183	,295	,463	-,164	-,203	1	-,373	,784**	,581*	,274	,421	,063	,561	,376	,271	,126	,011	,226	,431	,620*	,723**	,652*	-,401
	Sig. (2 extremidades)	,203	,569	,353	,130	,610	,527		,232	,003	,048	,388	,173	,845	,058	,229	,395	,696	,973	,480	,162	,031	,008	,022	,196
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Control Basal	Correlação de Pearson	,053	,053	-,581*	-,645*	-,392	,516	-,373	1	-,533	,137	-,531	-,673*	-,399	-,278	-,543	-,428	-,496	,024	-,123	-,181	-,400	-,553	-,410	,625*
	Sig. (2 extremidades)	,869	,869	,048	,024	,207	,086	,232		,074	,671	,075	,016	,199	,381	,068	,165	,101	,940	,704	,574	,198	,062	,185	,030
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Expression	Correlação de Pearson	-,472	,314	,614*	,719**	,218	,201	,784**	-,533	1	,609*	,696*	,707*	,473	,473	,833**	,761**	,596*	,172	,461	,582*	,827**	,774**	,794**	-,368
	Sig. (2 extremidades)	,121	,321	,034	,008	,496	,532	,003	,074		,036	,012	,010	,120	,121	,001	,004	,041	,592	,132	,047	,001	,003	,002	,240
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Pre State	Correlação de Pearson	-,435	,437	,328	,230	,074	,447	,581*	,137	,609*	1	,364	,259	,251	,510	,449	,413	,216	,252	,448	,491	,570	,544	,535	-,057
	Sig. (2 extremidades)	,158	,156	,298	,473	,819	,145	,048	,671	,036		,244	,416	,432	,090	,143	,182	,499	,429	,144	,105	,053	,067	,073	,861
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Pre Trait	Correlação de Pearson	-,243	,303	,838**	,710**	,643*	,273	,274	-,531	,696*	,364	1	,743**	,702*	,146	,861**	,812**	,727**	,067	,421	,618*	,703*	,662*	,616*	-,300
	Sig. (2 extremidades)	,446	,339	,001	,010	,024	,390	,388	,075	,012	,244		,006	,011	,651	,000	,001	,007	,836	,173	,032	,011	,019	,033	,343
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Pre Temp	Correlação de Pearson	-,516	,089	,807**	,884**	,411	,003	,421	-,673*	,707*	,259	,743**	1	,410	,020	,718**	,803**	,554	,031	,439	,642*	,743**	,709**	,638*	-,596*
	Sig. (2 extremidades)	,086	,783	,002	,000	,184	,993	,173	,016	,010	,416	,006		,185	,952	,009	,002	,062	,923	,153	,024	,006	,010	,026	,041
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Pre Reaction	Correlação de Pearson	-,198	,244	,735**	,352	,898**	,279	,063	-,399	,473	,251	,702*	,410	1	,109	,833**	,569	,938**	,197	,230	,324	,554	,414	,549	-,303
	Sig. (2 extremidades)	,537	,445	,006	,262	,000	,380	,845	,199	,120	,432	,011	,185		,735	,001	,053	,000	,540	,473	,305	,061	,180	,065	,339
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12

■ **Héctor Andrés Páez–Ardila, Ítalo Sergio Lopes Campos, Amauri Gouveia Jr.**

Correlations

		templut	Anger Basal State	Anger Basal Trait	Anger Basal Temp	Anger Basal Reaction	Anger Basal Anger into	Anger Basal anger out	Anger Control Basal	Anger Expression	Anger Pre State	Anger Pre Trait	Anger Pre Temp	Anger Pre Reaction	Anger Post State	Anger Post Trait	Anger Post Temp	Anger Post Reaction	Anxiety Basal State	Anxiety Basal Trait	Anxiety Pre State	Anxiety Pre Trait	Anxiety Post State	Anxiety Post Trait	Total # of Strikes
Anger Post State	Correlação de Pearson	,126	-,022	,155	,106	,010	-,129	,561	-,278	,473	,510	,146	,020	,109	1	,288	,152	,139	-,113	,002	,029	,225	,497	,371	-,239
	Sig. (2 extremidades)	,697	,946	,630	,742	,976	,690	,058	,381	,121	,090	,651	,952	,735		,364	,638	,667	,728	,994	,929	,482	,100	,235	,455
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Post Trait	Correlação de Pearson	-,349	,267	,819**	,692*	,668*	,364	,376	-,543	,833**	,449	,861**	,718**	,833**	,288	1	,883**	,907**	,178	,428	,543	,797**	,684*	,756**	-,348
	Sig. (2 extremidades)	,266	,401	,001	,013	,018	,245	,229	,068	,001	,143	,000	,009	,001	,364		,000	,000	,579	,165	,068	,002	,014	,004	,268
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Post Temp	Correlação de Pearson	-,494	,268	,796**	,842**	,493	,472	,271	-,428	,761**	,413	,812**	,803**	,569	,152	,883**	1	,687*	,135	,558	,500	,755**	,637*	,636*	-,314
	Sig. (2 extremidades)	,103	,399	,002	,001	,103	,122	,395	,165	,004	,182	,001	,002	,053	,638	,000		,014	,677	,059	,097	,005	,026	,026	,320
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anger Post Reaction	Correlação de Pearson	-,204	,067	,729**	,440	,822**	,309	,126	-,496	,596*	,216	,727**	,554	,938**	,139	,907**	,687*	1	,095	,166	,400	,578*	,426	,581*	-,360
	Sig. (2 extremidades)	,525	,836	,007	,152	,001	,328	,696	,101	,041	,499	,007	,062	,000	,667	,000	,014		,769	,607	,198	,049	,167	,047	,250
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Basal State	Correlação de Pearson	-,233	,852**	-,061	,001	-,074	,273	,011	,024	,172	,252	,067	,031	,197	-,113	,178	,135	,095	1	,796**	,262	,364	,042	,312	,402
	Sig. (2 extremidades)	,467	,000	,851	,998	,820	,390	,973	,940	,592	,429	,836	,923	,540	,728	,579	,677	,769		,002	,411	,245	,896	,324	,195
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Basal Trait	Correlação de Pearson	-,513	,868**	,359	,502	,045	,348	,226	-,123	,461	,448	,421	,439	,230	,002	,428	,558	,166	,796**	1	,489	,694*	,456	,574	,117
	Sig. (2 extremidades)	,088	,000	,252	,096	,890	,268	,480	,704	,132	,144	,173	,153	,473	,994	,165	,059	,607	,002		,107	,012	,136	,051	,718
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Pre State	Correlação de Pearson	-,421	,421	,633*	,612*	,275	,263	,566	-,317	,758**	,566	,704*	,739**	,476	,143	,722**	,677*	,526	,336	,636*	,932**	,952**	,793**	,927**	-,188
	Sig. (2 extremidades)	,173	,173	,027	,034	,387	,409	,055	,315	,004	,055	,011	,006	,118	,658	,008	,016	,079	,286	,026	,000	,000	,002	,000	,559
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Pre State	Correlação de Pearson	-,244	,288	,449	,397	,161	,264	,431	-,181	,582*	,491	,618*	,642*	,324	,029	,543	,500	,400	,262	,489	1	,777**	,612*	,772**	-,047
	Sig. (2 extremidades)	,444	,363	,143	,201	,617	,407	,162	,574	,047	,105	,032	,024	,305	,929	,068	,097	,198	,411	,107		,003	,035	,003	,883
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Pre Trait	Correlação de Pearson	-,527	,490	,722**	,730**	,343	,234	,620*	-,400	,827**	,570	,703*	,743**	,554	,225	,797**	,755**	,578	,364	,694*	,777**	1	,863**	,960**	-,287
	Sig. (2 extremidades)	,079	,106	,008	,007	,275	,464	,031	,198	,001	,053	,011	,006	,061	,482	,002	,005	,049	,245	,012	,003		,000	,000	,365
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Post State	Correlação de Pearson	-,310	,246	,747**	,759**	,319	-,096	,723**	-,553	,774**	,544	,662*	,709**	,414	,497	,684*	,637*	,426	,042	,456	,612*	,863**	1	,866**	-,462
	Sig. (2 extremidades)	,326	,441	,005	,004	,312	,766	,008	,062	,003	,067	,019	,010	,180	,100	,014	,026	,167	,896	,136	,035	,000		,000	,131
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Anxiety Post Trait	Correlação de Pearson	-,360	,379	,639*	,596*	,317	,140	,652*	-,410	,794**	,535	,616*	,638*	,549	,371	,756**	,636*	,581*	,312	,574	,772**	,960**	,866**	1	-,273
	Sig. (2 extremidades)	,251	,224	,025	,041	,315	,664	,022	,185	,002	,073	,033	,026	,065	,235	,004	,026	,047	,324	,051	,003	,000	,000		,391
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Total # of Strikes	Correlação de Pearson	,483	,308	-,661*	-,559	-,467	,446	-,401	,625*	-,368	-,057	-,300	-,596*	-,303	-,239	-,348	-,314	-,360	,402	,117	-,047	-,287	-,462	-,273	1
	Sig. (2 extremidades)	,112	,329	,019	,059	,126	,146	,196	,030	,240	,861	,343	,041	,339	,455	,268	,320	,250	,195	,718	,883	,365	,131	,391	
	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12

*. Correlation is significant at the 0.05 level (2 ends).
**. Correlation is significant at the 0.01 level (2 ends)+A+A181:AF263