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## AIKIDO'S CHOKU TSUKI MOTOR SKILL: VALIDATION CHECKLIST

## MOTORIČNA VEŠČINA CHOKU TSUKI V AIKIDU: KONTROLNI SEZNAM ZA VALIDACIJO

### ABSTRACT

Assessment is an essential procedure for any professional intervention, including in physical education and sports contexts. It concerns a process of collecting information that allows accessing the state of practitioners in relation to desired teaching-learning or training behaviors. Recently, the focus on assessment instruments has been extended to the martial arts contexts, whose studies have shown that the assessment instruments have been recognized by experts of different martial arts not only in relation to access of specific performances, but also as a means of promoting the practitioner's knowledge and motivation. The present study sought to develop and validate a checklist for an aikido's motor skill: the *choku tsuki*. For content validation, the evaluators were 17 aikido experts, with at least 7 years of experience, all black belts (n = 6 (6<sup>th</sup> dan); n = 2 (5<sup>th</sup> dan); n = 3 (3<sup>rd</sup> dan); n = 5 (2<sup>nd</sup> dan); n = 2 (1<sup>st</sup> dan)). And, for the reliability test, there were four participants (n = 1 (5<sup>th</sup> dan); n = 2 (2<sup>nd</sup> dan); n = 1 (1<sup>st</sup> dan)). Ten adolescents, all inexperienced in the practice of *jo*, male (n = 7) and female (n = 3), whose ages ranged from 14 to 16 years old also participated as performers. At least 70% of the aikido experts evaluated the items as clear, adequate and technically viable for application in research contexts. The intra and inter-rater correlation indexes reached at least 0.90. It can be concluded that the *choku tsuki* assessment instrument is reliable, since it reached significant values in the reliability and objectivity indices.

*Keywords:* aikido, motor skill, validation, reliability, checklist

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### IZVLEČEK

Ocenjevanje je bistven postopek pri vsakem strokovnem ukrepanju, tudi pri telesni vzgoji in športu. Gre za postopek zbiranja informacij, ki omogoča dostop do stanja izvajalcev glede na želeno vedenje pri poučevanju, učenju ali vabi. V zadnjem času se je osredotočenost na ocenjevalne instrumente razširila na kontekste borilnih veščin, katerih študije so pokazale, da so strokovnjaki različnih borilnih veščin ocenjevalne instrumente prepoznali ne le v povezavi z dostopom do določenih izvedb, temveč tudi kot sredstvo za spodbujanje znanja in motivacije vadečih. Namen študije je bil razviti in potrditi kontrolni seznam za motorično veščino aikida: *choku tsuki*. Za preverjanje vsebine je bilo izbranih 17 ocenjevalcev – mojstrov aikida z vsaj 7 leti izkušenj, vsi so imeli črne pasove (n = 6 (6. dan); n = 2 (5. dan); n = 3 (3. dan); n = 5 (2. dan); n = 2 (1. dan)). Pri preizkusu zanesljivosti so sodelovali 4 mojstri aikida (n = 1 (5. dan); n = 2 (2. dan); n = 1 (1. dan)) in 10 neizkušenih mladostnikov (7 moških), starih od 14 do 16 let. Vsaj 70 % ocenjevalcev je postavke ocenilo kot jasne, ustrezne in tehnično izvedljive za uporabo v raziskovalnem kontekstu. Indeks korelacije znotraj in med ocenjevalci sta dosegla vsaj 0.90. Sklepamo lahko, da je instrument za ocenjevanje motorične veščine *choku tsuki* zanesljiv, saj je dosegel pomembne vrednosti indeksov zanesljivosti in objektivnosti.

*Ključne besede:* aikido, motorične sposobnosti, validacija, zanesljivost, kontrolni seznam

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## INTRODUCTION

Assessment is an essential procedure for any professional intervention, including in physical education and sports contexts. It concerns a process of collecting information that allows: (i) accessing the state of practitioners in relation to desired teaching-learning or training behaviors, (ii) judgment on instructional products and processes; (iii) motivation of practitioners to maintain or modify their performances; and, (iv) coaches maintain or modify their planning (Arias & Castejón, 2012; Rink, 2010).

In the last few decades performance assessment has increasingly been focus of concerns for physical education teachers, coaches, and researchers (Banville & Rikard, 2001; Barquero-Ruiz, Arias-Estero & Kirk, 2019; Baumgartner & Jackson, 1998). One could say that it has occurred mainly in relation to the elaboration, proposition, and/or validation of assessment instruments to access (i) the teacher's competence (Palacios Picos, López-Pastor, Fraile Aranda 2019), (ii) biomechanical parameters of performance (Grigg et al. 2018), (iii) physical fitness components (Castagna, Krstrup & Póvoas, 2020; Chaabene et al., 2012; Chaabene et al., 2018; Hendarto, Rahayu & Soegiyanto, 2018; Young et al., 2011), and (iv) the performance of specific individual and team sportive motor skills (Ali et al., 2007; Ali, Foskett & Gant, 2008; Barquero-Ruiz, Arias-Estero & Kirk, 2019; Baumgartner & Jackson, 1998; Chung-Yu et al., 2015; Garbeloto dos Santos et al., 2020; Memmert & Harvey, 2008).

Recently, the focus on assessment instrument has been extended to the martial arts contexts. According to Gomes et al. (2002), in this context one of the strategies still widely used by teachers/coaches and *senseis* to carry out assessments concern the non-systematic observation based on criteria with individual subjective scales built based on common knowledge. Notwithstanding the importance of this type of knowledge to the development of the martial arts, it has been assumed that it can be added by the scientific one. That is, the scientific method could contribute to the strengthening, reorganization, and/or reformulation of the existing knowledge about martial arts, or even the promotion of new knowledge (Ciaccioni et al., 2021; Corrêa & Walter, 2016; Gomes et al., 2002; 2008; 2017).

For instance, Gomes et al. (2009) developed an assessment instrument composed by two checklists to assess the judo *o soto gari*, one referring to the blow global configuration and another to the phase of unbalance (*kuzushi*). Many of judo's blows unfold through three phases: 1) *kuzushi* – unbalance; 2) *tsukuri* – fitting; 3) *kake* – performance. By considering the *kake* is the result of the previous phases, no grade was assigned for this phase of the motor skill. Thus,

regarding the blow global configuration, two parts were evaluated: the *kuzushi* and the *tsukuri*. The items on this checklist are: 1) regarding the *kumi kata* (grip mode), when both judokas are right-handed, the attacker performs the grip by the right hand on the collar and left hand on the sleeve of the defender in the first part of the skill (*kuzushi*), 2) the defender must be leaning backwards to the right; thus, the attacker "pulls" the defender's body forward with his right hand, and the defender, opposing the movement, resists in the opposite direction, turning his body back and supporting himself on his right leg; 3) in *tsukuri*, the attacker immediately makes a long stride with his left leg, forward and to the side of the defender's right leg, then the attacker advances his right leg in the same direction, trying to mow the defender's leg from behind, at the same time he "pulls" the defender's right arm down and pushes his body back with his right hand, projecting him. Results revealed that, in addition to intra- and inter-evaluators agreement, almost 100% of judo experts considered the items of the checklist clear, relevant, and feasible for evaluation.

The taekwondo motor skills were focused by the assessment instrument proposed by Oh (2014). This instrument includes three scoring levels (unacceptable = 1 point; acceptable = 2 points; target = 3 points) for each of the following items: 1) proper kihop is evident, understanding of basic taekwondo terminology and etiquette is excellent; 2) stances are excellent, demonstrating all aspects of correct technique with strong balance; 3) punching techniques are excellent, demonstrating all aspects of correct technique with power; 4) block techniques are excellent, demonstrating all aspects of correct technique with power; and, 5) kicking techniques are excellent, demonstrating all aspects of correct (accurate) technique with strong balance, power, and speed. According to the author, this instrument allows to assess the performance in a realistic taekwondo environment and helps practitioner become more proficient and motivated.

Another example can be seen in the Benitez-santiago and Miltenberger (2016) study. Aiming to investigate the effects of the video feedback on performance of capoeira motor skills (*meia lua reversao/lambida de peixe*, *au de costas*, and *macaco*) over practice, they elaborated one 15-item checklist for each foregoing motor skills, which identified the correct and incorrect performances. For instance, the *macaco* checklist was composed by: 1) Start from the base position (left leg back); 2) Move into center position; 3) Bring the right leg next to the left so that both feet are facing to left; 4) Bend knees so that the body is close to the floor; 5) The right arm stays straight as it reaches towards the floor behind the body (and the palm is flat on the floor); 6) The left arm is opposite of the right arm (in the air to the front); 7) The left arm is swung back; 8) Simultaneously, the legs are straightened so that the back is arched and the feet

push off the ground; 9) The left hand reaches behind the body and is placed on the ground in a 45 degree angle from the right hand; 10) The legs follow over the body, the left leg leading the right leg; 11) The left leg is straightened as it lands parallel to the right hand; 12) The right hand comes off the ground as the right leg is parallel to the ground; 13) The left hand comes off the ground right before the right leg reaches the ground and is parallel to the left leg; 14) The upper body comes off the ground and moves to the right until it is upright; and, 15) The body is now back in center position. Three evaluators were trained to become familiar with the instrument and then assessed the specific performance in 30% of practice sessions. The results revealed that the inter-evaluator agreement was from 82% to 86%. Therefore, there was substantial reliability inter-evaluators.

Based on the foregoing, it can be said that the assessment instruments have been recognized by experts of different martial arts (e.g., judo, taekwondo, and capoeira) not only in relation to access of specific performances, but also as a means of promoting the practitioner's knowledge and motivation. The present study sought to develop and validate a checklist for an aikido's motor skill: the *choku tsuki*. It consists of hitting the opponent in vital points with the *jo* (wooden stick) (Dang & Seiser, 2006). The aikido is an adaptation by Morihei Ueshiba (1883-1969) of several martial arts, specially the *daitoryu aikijujutsu*, a samurai martial art that for centuries was restricted to only one family, and from 1900 onwards began to be taught to the military, the nobility or graduates of other martial arts (Dang, 2003). It is composed by a great number of motor skills predominantly of counterattack (Gemaz Neto et al., 2021; Westbrook & Ratti, 1996). The *jo* is practiced as a basis for the practitioner to learn to move all parts of the body in a coordinated manner and the *choku tsuki* motor skill is the first to be taught, which is why it is important to create a checklist for it, as a way to standardize the movement of a basic aikido skill to identify the correct and incorrect performances (Westbrook & Ratti, 1996).

## METHODS

This study was approved by the Research Ethics Committee of the School of Physical Education and Sport of the University of São Paulo under number 20022018.

A checklist refers to an instrument that contains items (with specific values/weights) that make up the phenomenon to be observed (Thomas, Nelson & Silverman, 2015). For content validation, the evaluators were 17 aikido experts, with at least 10 years of experience, all black belts [n = 6 (6<sup>th</sup> dan); n = 2 (5<sup>th</sup> dan); n = 3 (3<sup>rd</sup> dan); n = 5 (2<sup>nd</sup> dan); n = 1 (1<sup>st</sup> dan)]. And, for

the reliability test, there were four participants [n = 1 (5<sup>th</sup> dan); n = 2 (2<sup>nd</sup> dan); n = 1 (1<sup>st</sup> dan)]. They were affiliated to different institutions (Brazil Aikikai Confederation, Brazilian Aikido Federation, Paulista Aikido Federation, South American Aikido Union, Aikido Research Association, and Birankai).

### ***Content validation***

It sought to assess the clarity, relevance and applicability of the instrument (Mokkink et al., 2012). This was made, first, considering the elaboration of a checklist based on the authors' experiences with the practice of aikido (fourteen years). The contents of the checklist presented below were then submitted to the evaluators:

- Initial Position – Start in the *hidare kamae* position (left leg forward); left hand holds the *jo*;
- Phase 1 - Upper limbs
  - 1.1 Left hand pushes the *jo* so that it starts to change from the vertical position to the horizontal position. Right hand helps to change the position of the *jo*
  - 1.2 Right hand, which is behind, holding the tip of the *jo*, that was placed on the ground
  - 1.3 Both hands move simultaneously, pulling the *jo* back
- Phase 1 - Lower limbs
  - 1.4 Left leg must be forward
  - 1.5 Left leg moves slightly to the left diagonal
  - 1.6 Left knee must be flexed and right knee must be extended
- Phase 2 - Upper limbs
  - 2.1 The right hand should push the *jo* forward and the left hand should loosen slightly for the *jo* to slide through it, performing the lunge
  - 2.2 Both hands perform a twisting motion. The right hand turns the wrist to the left, i.e. in, and the left hand turns the wrist to the right, i.e., out.
  - 2.3 The right elbow must end the movement flexed at a 90° angle. The left elbow must finish the extended movement, i.e. at a 180° angle
- Phase 2 - Lower limbs

2.4 Right leg follows the movement that the left leg had made, which was to advance to the left diagonal

2.5 Left knee must be flexed and right knee must be extended

After analyzing the list, the evaluators answered a questionnaire with questions related to agreement with the presented content, technical relevance and possible mistakes that could be made during the performance of the *choku tsuki*. The questionnaire also allowed the evaluators to comment on the content of the list.

### **Reliability**

The second stage involved the participation of ten adolescents, all inexperienced in the practice of *jo*, male ( $n = 7$ ) and female ( $n = 3$ ), whose ages ranged from 14 to 16 years old. The guardians authorized their participation through a free and informed consent term. At this stage of the validation process, the concern was to assess the consistency of the evaluation by the same evaluator (reliability or intra-evaluator correlation), also called test-retest, and the reproducibility of evaluation by different evaluators (objectivity or inter-evaluator correlation) (Hopkins, 2000). To obtain intra- and inter-reliability data, four other aikido experts with similar characteristics to those of the previous phase analyzed ten videos containing the execution of the *choku tsuki* skill. Each evaluator analyzed the same videos twice (test and retest), with an interval of one week between the evaluations. It is worth noting that to avoid any kind of memory of the first evaluation, the videos were presented in a different order for the evaluators. The evaluation consisted of watching the videos and determining whether the item analyzed was correctly performed, performed more or less or not performed, respectively, with scores of 9, 3 and 1. These values were defined by considering there were three levels of performance (performed correctly, performed more or less, did not perform). Thus, it appeared reasonable that the upper level was three times larger than the intermediate level, and that the latter was three times larger than the lower level, which would allow them to be differentiated. Thus, the dependent variable referred to the sum of points obtained in each performance.

The inferences about reliability were based on the interobserver agreement test (IOA) indicated by Thomas, Nelson and Silverman (2015) as a common way of estimating reliability among coders by using a formula that divides the number of agreements in behavior coding by the sum of the agreements and disagreements, calculated according to the equation (1):

$$\text{IOA} = A \div (\Sigma A + \Sigma D) \quad (1),$$

where A refers to the agreements and D to disagreements. In this case, the correlation is considered high when it is greater than 0.75 on a scale between 0 and 1.

### ***Construct validation***

Finally, construct validity was tested considering the instrument's ability to assess different performances (Maguire et al., 1994). For this purpose, the points obtained in the evaluations were analyzed in terms of rate of performance as follows:  $P = op / pp$ , where P refers to the performance level (rate), op is the performance point obtained by the performer, and pp is the maximum score possible. In the latter case, considering that there are 11 items and that each one can reach 9 points, pp was equal to 99. Thus, the closer to 1, the better the performance. In order to detect whether the instrument was capable of accessing the performances, the values of each participant were compared to each other by a test of multiple comparisons through the Trend Module (Trend Analyses and Multiple Comparisons) of PEPI software (Gahlinger & Abramson, 2005).

## **RESULTS**

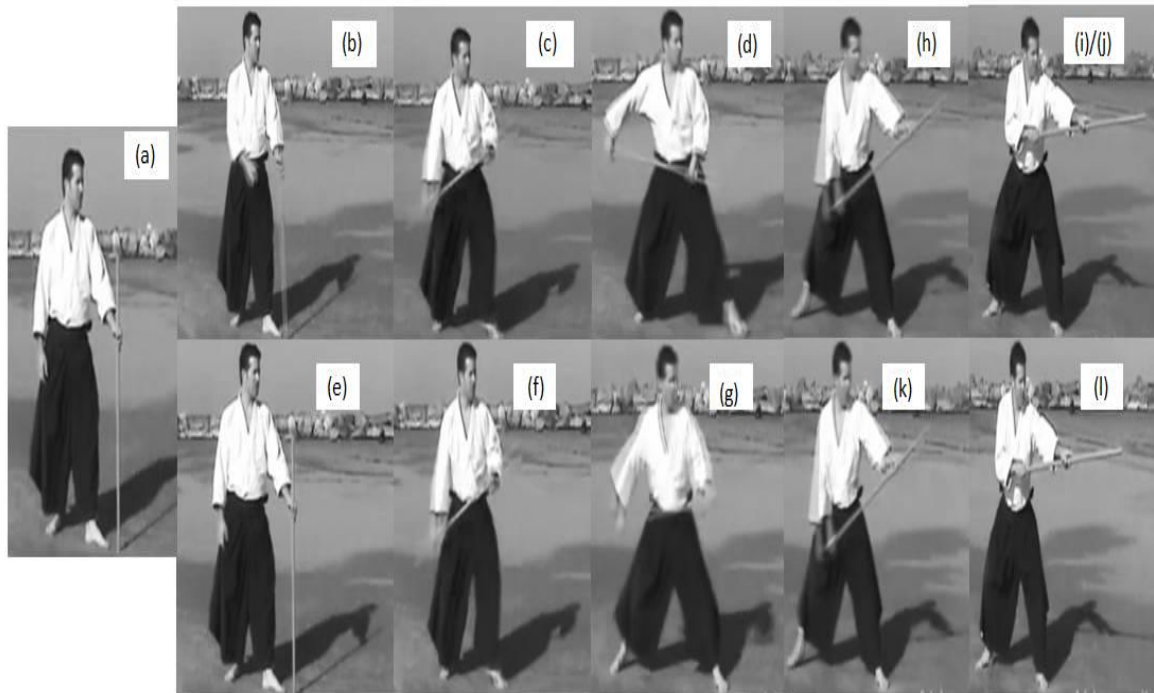
### ***Content validation***

The results for the items of each phase of the *choku tsuki* performance are presented below.

#### ***Starting position***

Figure 1(a) was presented to the experts to identify what would be the correct starting position of the *choku tsuki* skill. Table 1 presents the absolute and relative frequencies of answers related to the level of agreement of the experts regarding the initial position and the errors of execution of the *choku tsuki* skill.

Figure 1. Illustration of the phases of the *choku tsuki* skill. (a) starting position; (b), (c) and (d) phase 1 - upper limbs; (e), (f) and (g) phase 1 - lower limbs; (h), (i) and (j) phase 2 - upper limbs; and (k) and (l) phase 2 - lower limbs. (Available at: <[http://www.akban.org/wiki/Choku\\_tsuki\\_-\\_Direct\\_thrust,\\_Jo\\_Suburi,\\_Aikido](http://www.akban.org/wiki/Choku_tsuki_-_Direct_thrust,_Jo_Suburi,_Aikido)>. Accessed Feb. 2022)



It can be seen that there was a high number of agreements on the part of the evaluators (82.4%); one expert (5.9%) did not agree and two other experts (11.8%) stated that they might agree. Of these, those who decided to give an opinion declared: “*I practice on both sides although the version with the right foot in front is not in any kata (form)*”, or even, “*That would not be the only form*”.

Still regarding the starting position, the experts were asked if they would agree with possible errors that could occur in the starting position of the *choku tsuki* skill. The possible mistakes were: (1) reversing the base (start with *migi kamae* – right leg forward); and (2) reverse hands (hold the *jo* with the right hand, since the left leg is in front). It can be inferred from Table 1 that there was a certain balance in the number of responses considering agreement (47.1%) and the two other possibilities, perhaps agreeing (35.3.9%) or not agreeing (17.6%). What was observed with the answers of the experts who decided to give an opinion on this issue is that most of them do not consider the fact of, for example, inverting the base (question 1 of the possible errors) as a mistake.



Some opinions in this sense brought statements such as: “*You can practice with the opposite position, there is nothing to prevent it*”; “*I don't consider that reversing the base and starting with the right leg in front is a mistake*”; “*Although this is the kata, I believe training with the base reversed is valid. Therefore, I do not agree that the migi position is necessarily incorrect*”. Regarding the second possible error, only one expert gave an opinion, and agreed with the possible error, that is, inverting the front hand with the leg that is in front, as follows: “*I think the mistake would be to stay in hidare kamae and hold the jo with the right hand or vice versa. But I've seen more senior people do it starting in migi kamae and holding the jo with the right. As long as the foot and hand are not inverted, I don't see a problem*”.

Thus, it can be assumed that there is no single starting position pattern; this protocol can be valid to perform the skill of both sides. However, for the sake of standardization, an option was made in this work, so that the motor validation of the *choku tsuki* skill could be continued.

Table 1. Absolute and relative frequencies of answers concerning the level of agreement of the experts regarding the components of the *choku tsuki* skill (S.P. = starting position; 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4 and 2.5 = components; C = content; E = error).

Components	Content/ Error	Agree	Maybe agree	Does not agree
S.P.	C	14 (82,4%)	2 (11,8%)	1 (5,9%)
	E	8 (47,1%)	6 (35,3%)	3 (17,6%)
1.1	C	10 (58,8%)	4 (23,5%)	3 (17,6%)
	E	10 (58,8%)	4 (23,5%)	3 (17,6%)
1.2	C	17 (100%)	0 (0%)	0 (0%)
	E	16 (94,1%)	1 (5,9%)	0 (0%)
1.3	C	9 (52,9%)	4 (23,5%)	4 (23,5%)
	E	8 (47,1%)	4 (23,5%)	5 (29,4%)
1.4	C	13 (76,5%)	1 (5,9%)	3 (17,6%)
	E	11 (64,7%)	2 (11,8%)	4 (23,5%)
1.5	C	8 (47,1%)	4 (23,5%)	5 (29,4%)
	E	9 (52,9%)	2 (11,8%)	6 (35,3%)
1.6	C	9 (52,9%)	6 (35,3%)	2 (11,8%)
	E	10 (58,8%)	5 (29,4%)	2 (11,8%)
2.1	C	15 (88,2%)	1 (5,9%)	1 (5,9%)
	E	14 (82,4%)	1 (5,9%)	2 (11,8%)
2.2	C	10 (58,8%)	5 (29,4%)	2 (11,8%)
	E	13 (76,5%)	3 (17,6%)	1 (5,9%)
2.3	C	12 (70,6%)	3 (17,6%)	2 (11,8%)
	E	12 (70,6%)	5 (29,4%)	0 (0%)
2.4	C	12 (70,6%)	4 (23,5%)	1 (5,9%)
	E	12 (70,6%)	3 (17,6%)	2 (11,8%)
2.5	C	10 (58,8%)	4 (23,5%)	3 (17,6%)
	E	10 (58,8%)	4 (23,5%)	3 (17,6%)

### ***Phase 1 - upper limbs***

Component 1.1 - It was evaluated considering figure 1(b) and a GIF (moving image) of what would be the correct movement for component 1.1 of the upper limbs for the *choku tsuki* skill. As can be seen in Table 1, just over half (58.8%) of the experts agreed with the proposed move. The other experts were divided into “maybe agree” and “does not agree”. When observing the answers of the experts, it was noticed that they did not agree in relation to the hand that drives the *jo* from the vertical position to the horizontal position, as follows: “*the left hand does not move the jo, what moves it must be the hip, and the hand left goes towards the jo. The hip moves, extending the left arm and naturally pulling the right arm*”; “*movement comes from the hara (center) and not from the hand*”; “*As I said at the beginning, I believe that what moves the jo is the center and not the hand. I think the hand directs it, but it doesn't push*”.

The possible error presented to the experts was that the subject went “down there” to get the *jo*, that is, the left hand did not perform the initial impulsion. Table 1 shows similar results to the evaluation of the items: 58.8% of the experts agreed with the possible error proposed, but the other experts may have agreed (23.5%) or not agreed (17.6%). When analyzing the opinion of the experts who decided to give an opinion, it was noted that they did not give an opinion on the possible error that was suggested, they only said “*Same opinion as mentioned in the previous item*”, that is, they insisted on using the hip. It is possible that if was written “*the subject goes 'down there' to get the jo, that is, the hip does not perform the initial impulsion*”, they would agree. Thus, in view of the different opinions pointing to the use of the hip to propel the *jo*, it was concluded that the use of the hip should be added to component 1.1 of the upper limbs.

Component 1.2 – Figure 1(c) was used to assist the experts along with a GIF (moving image) of what would be the correct movement for component 1.2 of the upper limbs for the *choku tsuki* skill. The results showed that all experts (100%) agreed and comments were not made. Regarding the possible errors, only one was presented: right hand held in the middle of the *jo*. It can be considered that the frequency of agreement on this was also high (94.1%). Only one specialist (5.9%) said that he might agree and made a suggestion: “*instead of 'holding in the middle' I would consider 'not holding at the end'*”. Thus, changes were not seen as necessary in relation to the 1.2 component of the upper limbs for the execution of the *choku tsuki* skill.

Component 1.3 - The experts were presented to figure 1(d) and a GIF (moving image) of what would be the correct movement for component 1.3 of the upper limbs for the *choku tsuki* skill. Table 1 shows that 52.9% of the experts agreed with the proposed movement, but the other

experts may have agreed (23.5%) or not (23.5%). When observing the experts' answers, it was noted that they did not agree, claiming that it is not the hands that pull the *jo* back, but the hip: “*the center (koshi) that moves the jo backwards*”; “*again, the movement must start from the center, making the whole body move backwards and not just the hands*”; “*under no circumstances do both hands pull, the hip moves, the right hand pulls, but the left hand remains in an isometry, extended and keeping the distance. If the left pulls, it loses its breadth and dominance of space*”.

Regarding execution errors, only one was presented: the movement of “pulling” backwards did not occur with both hands. Here, only eight experts (47.1%) agreed. The others stated that they might agree (23.5%) or that they did not agree (29.4%). Through the opinions given by them, it was noted that this was a reflection of the previous item, in which the experts reported that using the hip would be more important than just using the hands to “pull” the *jo* back. One of the experts also pointed out, as another possible mistake: “*positioning the left foot in front of the jo*”. Thus, in view of the different opinions pointing to the use of the hip to pull the *jo*, it was concluded that the use of the hip should be added, which had not previously been considered.

### ***Phase 1 - lower limbs***

Component 1.4 - Figure 1(e) and a GIF (moving image) were presented to the experts of what would be the correct movement of component 1.4 of the lower limbs in the *choku tsuki*. Table 1 shows that 76.5% of the experts agreed with the proposed move. The others stated that they might agree (5.9%) or that they did not agree (17.6%). When observing the answers, it was noted that what they did not agree with referred to item 1 discussed about the initial position, that is, although in the official *kata* one starts from the position in *hidare kamae* (left leg in front), it would not be a problem to perform the movement from the base in *migi kamae* (right leg forward).

Regarding the errors, only one was presented: inverting the legs, that is, putting the right foot forward (error possibly caused by the inversion of the *kamae* in the initial position). Table 1 shows that 64.7% of the experts agreed with it “*advanced ones train in *migi* and *hidare* as long as their hands follow*”.

Therefore, although there is no single standard, this protocol could be considered valid to perform the skill of both sides. However, for the sake of standardization, one can also consider eliminating this component since it refers to the initial position.

Component 1.5 - The experts were presented to figure 1(f) and a GIF (moving image) of what would be the correct movement of component 1.5 of the lower limbs in the *choku tsuki* skill. Table 1 shows that 47.1% of the experts agreed with the proposal. The others stated that they might agree (23.5%) or that they did not agree (29.4%). When observing the answers, it was noted that what they did not agree with considering that it would be necessary to advance the left foot to the left diagonal: *“my movement is straight and forward, without turning the left foot (front) to the right”*; *“in theory, choku means straight, straight, so there's no need to go left. However, the forms of practice vary from what is proposed. If the idea is something basic, it must be done straight, linear and direct, without opening to the side”*; *“left leg moves forward”*; *“the choku tsuki is by definition a direct attack, it doesn't have this exit to the left”*; *“we also practice without lateral displacement”*; *“I move forward. I don't go slightly to the left”*.

The errors presented to the experts were: left leg not moving; left leg moves only forward, not slightly to the left. Here it was found that 52.8% of the experts agreed with the proposal. The others stated that they might agree (11.8%) or that they did not agree (35.3%) considering that the leg would necessarily have to advance to the left, and not in a straight line.

Thus, it is assumed necessary to review the 1.5 lower limbs component for the *choku tsuki* skill in such a way that, in agreement with the various experts, it would be necessary to advance the left leg in a straight line. Consequently, failure to move forward is also assumed to be an error.

Component 1.6 – The experts were presented to figure 1(g) and a GIF (moving image) corresponding to the correct movement of component 1.6 of the lower limbs for the *choku tsuki* skill. Table 1 shows that just over half of the experts (52.9%) agreed with the proposal. The other experts may have agreed (35.3%) or not (11.8%). When observing the answers of the experts, it was noted that they did not agree, arguing that it would be necessary to have the right knee extended: *“I believe that both knees can be flexed, in such a way that the aikidoka maintains himself with the kamae low and the center of gravity closer to the ground, for greater stability and power of the lunge”*; *“right knee is not fully extended”*; *“during the lunge the weight of the center (koshi) comes to the front leg. The back leg should not be fully extended as it would block the next movement”*.

Regarding possible errors (left knee not flexed and right knee flexed; right knee not extended and left knee extended), it was found that 58.8% of the experts agreed with the proposal. The others stated that they might agree (29.4%) or that they did not agree (11.8%). Here, all opinions were repeated to the previous item.

It was assumed, therefore, that it is necessary to review the 1.6 lower limbs component of the *choku tsuki* skill in such a way that, in agreement with the experts, it is clear that the back leg may have the knee flexed, giving greater mobility to the subject who is practicing.

### ***Phase 2 - upper limbs***

Component 2.1 - The experts were presented to figure 1(h) and a GIF (moving image) of what would be the correct movement for component 2.1 of the upper limbs for the *choku tsuki* skill. Most experts (88.9%) agreed with the proposal. Those who may have agreed (5.9%) and those who did not (5.9%) actually opined the same thing as those who agreed. The opinions given brought the following information: *“the impulse starts from the center taking the whole body forward and not just the hand”*; *“the right hand moves along with the koshi”*; *“Along with the movement of the body”*.

The following error was evaluated by the experts: right and left hands perform a “swing” with the *jo*, that is, the lunge occurs with both hands pushing the *jo* forward simultaneously. Table 1 shows that 82.4% of the experts (82.4%) agreed with the proposed error. The others stated that they might agree (5.9%) or that they did not agree (11.8%). In this case, the experts agreed with the error, but added that the hip should also be used at the time of the lunge: *“there should not be a swing, because the span is lost. The left hand/arm remains in an isometry, without swinging the jo. The lunge occurs with a push of the right leg, and a little with the left, to the ground, transferring this power with the hip, the arms only serve as an extension”*; *“the movement is not only done with the arms”*.

Thus, it can be concluded that the right hand (back hand) should perform the lunge, but followed by the hip movement, which would help in the forward thrust of the *jo*.

Component 2.2 - The experts were presented to figure 1(i) and a GIF (moving image) of what would be the correct movement of component 2.2 of the upper limbs for the *choku tsuki* skill. Table 1 shows that 58.8% of the specialists agreed with the proposed item. The others stated that they might agree (29.4%) or that they did not agree (11.8%). Here, opinions were diverse: *“I perform the movement without any twisting of the wrists”*; *“movement of the left hand inwards and the right hand outwards, both turn to the right”*; *“both hands turn towards the center of the body, that is, towards the inside”*; *“there are differences between styles that the right hand flexes completely to the right causing greater impact in the blow”*; *“Some masters don't do the twist. I do it myself sometimes”*.

The proposed execution error was "*twist does not occur with either hand*". It was found that 76.5% of the experts agreed with the same. The others stated that they might agree (17.6%) or that they did not agree (5.9%). The curious thing is that only one expert gave an opinion on this component, and it was one of the experts who agreed with the proposed error: "*I just didn't quite understand the meaning they explain. If so, each hand twists towards its respective thumb, inwards, ok. It could be that they are describing the same as me or the opposite, sorry for my lack of understanding*" these results make it possible to maintain, for standardization, the form already chosen initially, that is, both hands perform the inward twist (as placed by the specialist, in the direction of the thumbs).

Component 2.3 - The experts were presented to figure 1(j) and a GIF (moving image) of what would be the correct movement for component 2.3 of the upper limbs for the *choku tsuki* skill. Table 1 shows that 70.6% of the experts agreed with the proposed item. The others stated that they might agree (17.6%) or that they did not agree (11.8%). There were different opinions here: "*the elbow does not need to be 90 degrees (right elbow). I think that in this case he is using only the strength of his arm*"; "*not fully extended (left elbow), but a lot of tension*"; "*I have doubts if the correct is really the elbow of the back hand to be at 90 degrees*"; "*the right elbow may end up slightly extended, in such a way that the choku tsuki is performed and kept more in line with the waist*".

Regarding the errors that could occur (right elbow ends up extended; right hand advanced too much at the time of the lunge; left elbow ends up flexed, possibly due to the error of not allowing the *jo* to slide through the left hand), Table 1 shows that 70, 6% of the experts agreed with the proposed error. The others stated that they might agree (29.4%). Interestingly, only one expert opined, and he was one of those who agreed with the proposed errors: "*yes, possibly not extending the left elbow impaired accuracy and even strength in a faster movement*".

These results point to the possibility of maintaining the content and errors previously decided: left elbow extended and right elbow flexed.

### ***Phase 2 - lower limbs***

Component 2.4 - The experts were presented to figure 1(k) and a GIF (moving image) of what would be the correct movement for component 2.1 of the lower limbs for the *choku tsuki* skill. Table 1 shows that 70.6% of the specialists agreed with the proposed content. The others stated that they might agree (23.5%) or that they did not agree (5.9%). It is noteworthy that the

opinions were identical to those of component 1.5 (lower limbs), that is, that the movement should happen in a straight line.

The possible error evaluated by the specialists was: the right leg did not follow the movement, possibly due to the error of the left leg not having advanced to the left diagonal previously. Most experts (70.6%) agreed with him. The others stated that they might agree (17.6%) or not agree (11.8%). It was noted that the opinions were in the sense of the right leg following the left leg, allowing the decision that the movement occurs in a straight line, with the right leg also following in a straight line.

Component 2.5 - The experts were presented to figure 1(l) and a GIF (moving image) of what would be the correct movement for component 2.1 of the lower limbs for the *choku tsuki* skill. Table 1 shows that 58.8% of the specialists agreed with the proposal. The other experts may have agreed (23.5%) or not (17.6%). When observing the experts' answers, it was noted that they did not agree with the need for the right knee to be extended: The following opinions were given: “*the right knee is not fully extended*”; “*both knees can be flexed, keeping the base lower*”; “*my final position is a kamae, both knees are slightly bent in a comfortable and natural way*”; “*left knee bent with your weight on it and the back leg slightly bent without your body weight on it*”. It is curious to note that a specialist, who says he did not agree, opines as follows: “*at the end, the left knee must be flexed and the right one extended, similar to a lunge in fencing*”.

Regarding errors (left knee not flexed and right knee flexed; right knee not extended and left knee extended), there was agreement by 58.8 of the experts. The others stated that they might agree (23.5%) or that they did not agree (17.6%). All opinions given were repeated from the previous item.

It is clear that there are several ways to perform the skill in the face of these opinions, but in the case of the present work, it is assumed necessary to review the lower limbs component 2.1 for the *choku tsuki* skill, in such a way that, in agreement with the various experts, it is necessary to make it clear that the back leg can have the knee flexed, giving greater mobility to the subject who is practicing.

In view of the analysis of the level of experts' agreement in each item and the performance errors, as well as their suggestions, some items of the checklist were revised and modified:

(i) Starting position:

It starts in the *hidare kamae* position (lower limbs positioned anteroposteriorly, with the left leg in front and right leg behind; the left knee must be flexed and the right knee must be extended; the *jo* must have one of the ends resting on the ground, facing the foot of the left leg; the left hand holds the *jo* almost at its tip and the right hand remains further back, free).

(ii) Phase 1:

Upper limbs:

1.1 – The left hand, along with the hip, pushes the *jo*, so that it begins to change from the vertical to horizontal position. The right hand helps the *jo* to change its position;

1.2 – The right hand, which is behind, holds the end of the *jo*, which end was resting on the ground;

1.3 – The right hand pulls the *jo* backwards simultaneously with the help of the hip movement. The left hand remains still.

At the same time,

Lower limbs:

1.4 – The left leg moves forward;

1.5 – The left knee must be flexed, while the right knee can also be flexed.

(iii) Phase 2:

Upper limbs:

2.1 – The right hand must push the *jo* forward, aided by the hip movement, and the left hand must loosen slightly, so that the *jo* slides through it, performing the lunge;

2.2 – Both hands perform a twisting movement. The right hand turns the wrist to the left, that is, inwards, and the left hand turns the wrist to the right, that is, outwards;

2.3 – The right elbow must finish the movement flexed at a 90° angle. The left elbow must finish the extended movement, that is, at a 180° angle.

Lower limbs:



2.4 – The right leg follows the movement that the left leg had made, which was to advance forward;

2.5 – The left knee must be flexed, while the right knee can also be flexed.

### ***Reliability***

As can be seen in Table 2, there was a high level of agreement in all validation items. Specifically, in the interobserver evaluations, the IOAs were 1. Only one item of the inter-evaluator correlation received 0.9, with the others being equal to 1. These results allow us to infer that there was high reliability in the checklist.

Table 2. Results of interobserver agreement (IOA) tests on each item (component) of the checklist. The correlation is considered high when it is greater than 0.75 on a scale between 0 and 1.

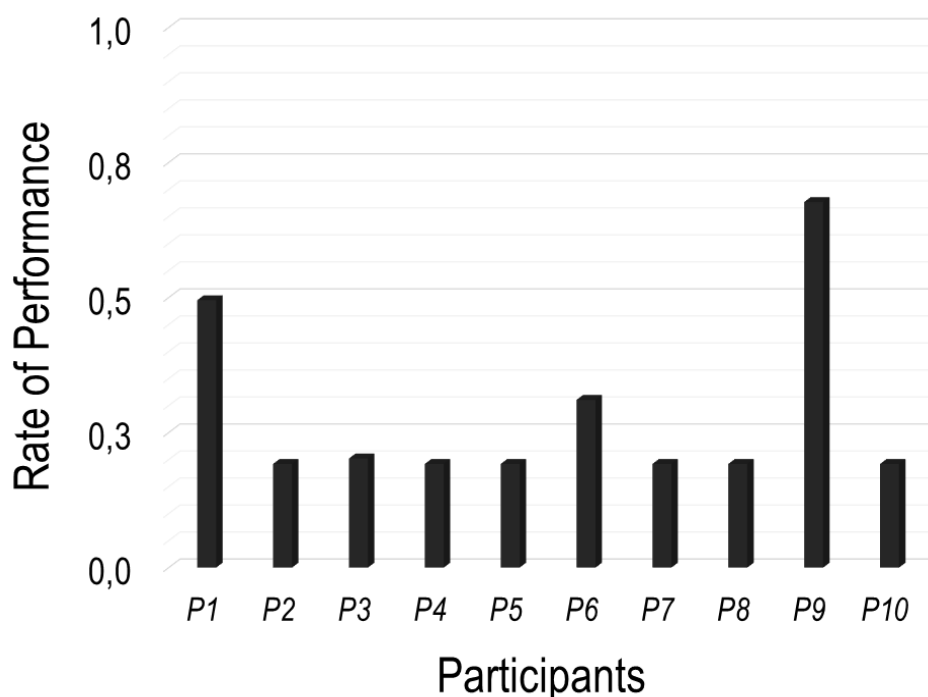
Components	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4	Inter Evaluator
1.1	1	1	1	1	1
1.2	1	1	1	1	1
1.3	1	1	1	1	1
1.4	1	1	1	1	0.9
1.5	1	1	1	1	1
2.1	1	1	1	1	1
2.2	1	1	1	1	1
2.3	1	1	1	1	1
2.4	1	1	1	1	1
2.5	1	1	1	1	1

### ***Construct validation***

Figure 2 presents the rate of performance of each participant (P). It can be observed that P2, P3, P4, P5, P7, P8, and P10 obtained similar rates of performance, which form the lowest (below 20% of maximum possible performance). On the other hand, P10 was one with superior performance (almost 70% of maximum possible performance). Furthermore, P10 was the only one with the rate of performance above 50% of the maximum possible performance. The rates of performance of P1 and P6 were close to 50% and 30%, respectively.

The inferential statistic revealed differences between the rates of performances ( $\chi^2 = 125.27$ ,  $df = 9$ ,  $p < 0.01$ ). Multiple comparison test showed that P1 and P9 had superior rates of performance than the other participants ( $p < 0.01$ ).

Figure 2. Rates of performance of the ten participants (P1, P2, P3, P4, P5, P6, P7, P8, P9, and P10).



## DISCUSSION

The elaborated and validated assessment instrument, checklist, for the aikido's *choku tsuki* motor skill was based on the assumption that the items should be representative of the actual performance of the *choku tsuki*. In addition, the checklist should be consistent to the point of presenting a certain stability when evaluated in future moments (Gomes et al., 2009; Morkink et al., 2012; Thomas, Nelson & Silverman, 2015).

The existence of an instrument for the qualitative analysis of a movement pattern is important because it makes it possible to measure someone's condition at a given moment and to follow the changes that occur over time (Rink, 2010). The content validation process was carried out in order to determine the component items considered important for the performance of the *choku tsuki*. To this end, at least 70% of the evaluators, aikido experts, rated the items as clear, adequate, and technically viable for application in a research context. The percentage above 70% in content validation provides legitimacy to the checklist content (Fleiss, 1981; Haynes et al., 1995; Sullivan, 2011), including in the field of sports (e.g. Madureira et al., 2023) and martial arts (Gomes et al., 2009).

In relation, the intra and inter-evaluator correlation indexes reached at least 0.90. Such values have been considered as highly acceptable (Gomes et al., 2009; Mokkink et al., 2012; Thomas, Nelson & Silverman, 2015). Therefore, it can be assumed that the *choku tsuki* assessment instrument is reliable. This means that if different evaluators use this instrument to evaluate the performance of the same motor skill, they will obtain similar evaluations. To put it another way, this is a reliable instrument to be used by different evaluators.

Finally, construct validation sought to verify whether the instrument was capable of accessing the *choku tsuki* performances. Although we selected non experienced participants, individual differences were expected as a natural characteristic of human being (Magill & Anderson, 2020). Interestingly, the results showed that two participants had superior performance to the other eight. Therefore, construct validation was confirmed. However, it can though as a study limitation the fact of this instrument do not categorize the performance levels. For example, could participants who were below 20% of maximum possible performance be considered beginners? In the same vein, could participants who had performance rates close to 50% and 70% be considered as intermediate and advanced levels, respectively? In addition, it is known that many aikido organizations use belts to differ performers' grades. How could the present checklist help to classify the performance of *choku tsuki* in relation to them? These limitations warrant to be focused on further studies.

## CONCLUSION

In summary, the obtained validities and reliability made it possible a checklist as an assessment instrument for the *choku tsuki*. In terms of practical implication, this study provides useful insights into the design of practice tasks in aikido, suggesting that senseis, teachers, and coaches could use this checklist for accessing not only the overall performance, but also the relative performances of each component item (phase) of *choku tsuki*. Finally, in addition to the limitations presented above, for better analysis it is recommended that the images be captured from the right side of the performer when *choku tsuki* is performed with the left leg in front. This procedure should use of special video playback features, for example, changing frame rate.

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