

RETURN TO PLAY DECISION AFTER SHOULDER DISLOCATION IN UPPER LIMBATHLETES: CRITICAL ANALYSIS BETWEEN THE HABITS OF MEDICAL PROFESSIONALS AND THE LITERATURE

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Keywords

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Abstract

Background: The return to field is a critical moment for an athlete who has dislocated his shoulder as there is a significant risk of recurrence. The decision to return to field made by the doctor will therefore be crucial for the smooth continuation of the athlete's career.

Hypothesis: This objective is to compare the criteria most used by specialists in clearing an overhead athlete to return to competition after a first episode of antero-internal dislocation of the glenohumeral joint with or without surgery and those mentioned in the literature.

Patients and methods: The target population consisted of French-speaking physicians in orthopedic surgery, physical medicine and rehabilitation or sports medicine. This study was conducted by the means of a questionnaire. The questionnaire was validated by three experts in sports medicine and published on an online survey website.

Results: Sixty-three medical specialists responded to the questionnaire. On average, they use more than nine criteria to decide if an athlete is fit to return to competition. Over the 12 criteria proposed, four are used by more than 90% of respondents: laxity/instability, pain, range of motion and patient's subjective feeling. The methods used to evaluate certain criteria such as pain, joint range or muscular strength are often subjective and very often not validated by the literature.

Conclusion: Doctors use a set of criteria to allow an overhead athlete to return to competition. This study highlights that the techniques employed to evaluate these criteria are not always thoroughly validated by literature reviews.

Level of evidence: III; observational study.

1. Introduction

“Overhead” athletes are highly susceptible to shoulder dislocations as they regularly perform movements with their arm in an extreme position, resulting in anterior tissue laxity [1]. In tennis, for example [2], the incidence of upper limb injuries is around 25% during the 2 years of follow-up. In high-level pitchers, the shoulder is also the most affected joint (70% of lesions). The incidence for throwers is 0.36 arm injuries per 1000 hours of exposure [3],[4].

According to the literature, there are two types of treatment following anterior–internal dislocation of the glenohumeral joint: conservative treatment and surgery (Bankart or Latarjet-Bristow). Following this initial treatment period, rehabilitative care is started. This rehabilitation, where the goal is to obtain effective coaptation of the humeral head, is based on different techniques [5], although all are used to bring the athlete as quickly and safely as possible back to competition. However, depending on the technique used and on the age of the patient, the recurrence rate can be high. Indeed, when the patient is young and not operated on, the rate of recurrence can be as high as 88% [6]. When the patient has had surgery, the recurrence rate is substantially lower [7],[8]. In addition, recurrence injuries lead to consequences both on performances, but also at the economic level. Consequently, one should ask: what criteria do the specialist doctors consider, to allow athletes to resume the demanding practice encountered in competition after a first episode of glenohumeral dislocation that has been operated on or not?

After having identified the different relevant criteria cited in the literature and their relative importance, it is important to understand what is implemented in the field. Our approach aims to question medical specialists on their daily practices to identify the criteria they consider to allow an athlete to return to the field and to competition, and to compare the results to the recommendations found in the literature.

2. Method

2.1. POPULATION

The target population consisted of doctors specialized in sports medicine, physical and rehabilitation medicine or orthopedic surgery – all were required to be French speakers (as the questionnaire was written in French).

2.2. CREATION AND IMPLEMENTATION OF THE QUESTIONNAIRE

In order to collect data on the criteria used by the doctors in their daily practice, a novel questionnaire was created and published online.

Thus, a literature review was conducted with the objective of determining the most relevant return-to-play after shoulder injury criteria possible. The criteria identified were summarized in a questionnaire, which was reviewed by three experts with recognized experience in the field of sports medicine. The questionnaire was placed on a website dedicated to conducting online surveys. Then, the questionnaire was tested by four people to identify possible inconsistencies/functional errors. Once the questionnaire was fully operational, the link was made available to participants for a fixed period of time.

Potential participants were invited to the study either from an e-mail broadcasted by a specialist in physical and rehabilitation medicine at the Liege University or through different websites of learned societies related to sport.

The email and website contained a link allowing participants to access the online questionnaire. Participation was fully voluntary and only people receiving the link could answer.

Participants were also informed of the nature and objectives of the questionnaire as well as its anonymity. Indeed, the identity of the participants was not requested, and the data provided was collected with an anonymous identifier. As a result, it was not possible to identify any of the contributors. In addition, only the principal investigator had access to the data and this access was protected by a password.

The questionnaire consisted of five separate parts: the first was aimed at collecting information on the criteria used by medical specialists to allow the athlete to return to competition. The list consisted of 12 criteria and an empty field to give the possibility to add a custom criterion. The second part asked specialists to rank the criteria in order of importance. In this part, the practitioner was also asked if the order of the criteria had changed during his career and if yes, which changes had been made. The third part aimed at understanding if the specialist doctor made his decision on his own or if he considered the opinion of other professionals such as the physiotherapist, the physical trainer, the field trainers, the surgeon or the rehabilitative doctor. The fourth part dealt with post-recovery follow-up questions. Finally, the last part was aimed at collecting information specific to specialists (age, expertise, etc.).

The observational study was developed based on the CHERRIES checklist (Checklist for Reporting Results of Internet E-Surveys) [9]. The aim of this checklist is to reduce the biases inherent to online questionnaires and thus increase the scientific value of the collected data. The online questionnaire developed for this study met 26 of the 30 suggested items while two of them were not applicable (supplemental materials).

This study was approved by the local ethics committee. No informed consent was required because the study was not based on patient data.

3. Results

Altogether, 64 participants responded to the whole questionnaire. However, one questionnaire was later excluded as the participant was a physiotherapist and did not fit to the inclusion criteria. The sample consisted therefore of 63 participants.

Of the 63 participants, the majority were in the age group between 35 and 39 years (20.6%) or between 55 and 59 years (19.0%).

Twenty-nine questionnaires (46%) were completed by specialists in sports medicine, 22 (35%) by specialists in physical medicine and rehabilitation and 12 (19%) by orthopedic surgeons.

Almost half of the participants have worked in sports medicine for over 15 years (49.2%) while 22.3% of them have a professional experience of 9 to 14 years. Only about one-third (28.5%) have been working in this field for 6 years or less.

On average, participants take into account a little more than 9 ± 2 out of the 12 suggested criteria to decide on the aptitude of their patient to return to competition. The participants use between 5 and 12 criteria. [Fig. 1](#) shows the frequency of use of the different criteria.

Four criteria are used by more than 90% of participants. These criteria are: pain, instability/laxity, range of motion and patient's subjective feelings. The least used criterion by the specialists is the use of questionnaires. Indeed, only a quarter of participants use them.

Amongst the tools proposed for pain assessment (visual analogue scale, simple digital scale and patient's speech), the participants refer preferably only to the patient's speech (37.1%). In the majority of cases (53.2%), they consider not only pain at rest during the day, but also pain at night, pain during specific activities and pain during daily activities.

Instability is defined as abnormal translation of the humeral head causing discomfort/pain to the patient [10]. Laxity is defined as the ability of the humeral head to be passively translated on the glenoid fossa [11]. To avoid confusion in the participant's responses, both terms were used in the same question. To assess instability/laxity, different tests are available in the literature. In this study, the most widely used test is the "apprehension test" (96.8%) followed by the "relocation test" (72.6%). The "Fulcrum test" is used by 33.9% of participants who deal with shoulder instability.

Regarding range of motion, 92.1% of the specialists use this criterion. The majority of participants assess this criterion only visually (60.3%). Some use goniometry (27.6%) while others combine the two techniques (12.1%). The amplitude is measured in both passive and active modes by 84.5% of specialists.

Muscle strength is also an important criterion for specialists, as it is evaluated by 87.3% of them, and 9.1% only use manual testing. Sometimes, practitioners use two techniques to assess strength: the combination of an isokinetic assessment and manual testing is used in 29.1%. Isokinetics on its own is used by 12.7% of the participants while the handheld dynamometer is very rarely used (1.8%).

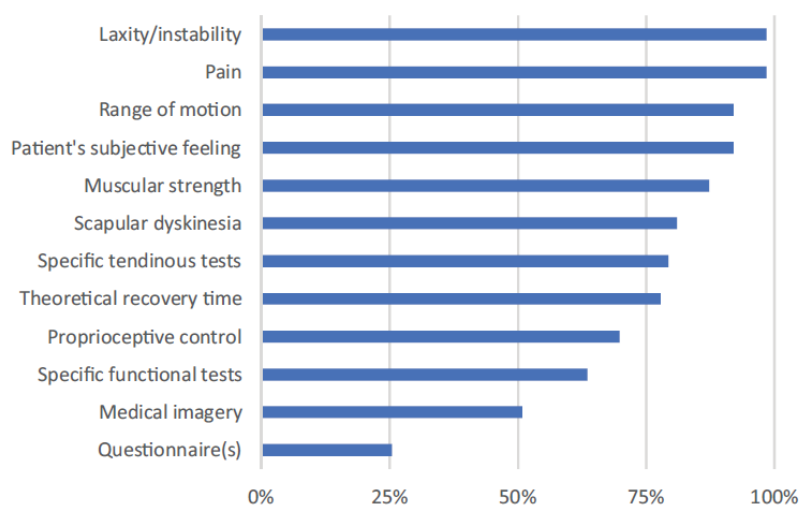


Fig. 1. Use of criteria (in percentage).

The criterion of scapulothoracic dyskinesia also represents an important criterion that the participants consider (81.0%). To assess dyskinesia, specialists use different methods: measuring tape, inclinometer or visually. In 98.0% of the cases, dyskinesia is assessed using a visual observation.

Finally, 77,8% of doctors base their decision on the theoretical time after the injury/operation and before return to play. The duration differs according to whether or not there was surgery and according to the type of surgery. The average duration to return to the field is the shortest in the no-operation scenario (2.8 ± 1.1 months). When the patient has undergone surgery, the doctors consider that it takes about a month and a half longer to return to the field than when there was no operation (4.4 ± 1.5 months for the Bankart operation and 4.3 ± 1.4 months for the Latarjet operation). Fig. 2 compares the different techniques (non-operative approach, Latarjet or Bankart surgeries).

In a second stage, participants were asked to rank the proposed criteria from most important to least important. The criterion cited first received 12 points, the second 11 and so on. By adding the points collected for criterion, we obtained the weighted importance of each criterion relative to each other (Fig. 3).

This analysis showed that the patient's subjective sensations represented the most important weighted criterion in the decision-making process of specialists. Pain is ranked second and instability/laxity third. This approach also identified that medical imagery and questionnaires are the least important criteria for specialists.

It is, however, surprising to see that scapular dyskinesia is not an important criterion for specialist doctors, while 87% of specialists say that they use it in their daily practice. This probably means that the specialists evaluate it because it is recommended, but without understanding the real importance of the rehabilitation of this dysfunction.

The study also addressed the question of whether the participants take into account the opinion of other stakeholders to allow the athlete to return to the field. On average, specialists seek for the advice of 2.71 other people (standard deviation: 1.29). This demonstrates that the decision to return to the field is a multidisciplinary decision. The most requested opinion is that of the physiotherapists (84.1%).

The percentage of dislocation relapse after a rehabilitation phase was also considered in the questionnaire. The difference of dislocation relapse rate between patients who had a surgery and those who didn't is significant. The percentage of new episodes of dislocations for patients who have not undergone surgery is estimated at $41.2\% \pm 25.9$ by the specialists. When athletes have been operated on (Bankart or Latarjet), the dislocation relapse rate in this questionnaire is estimated on average at $10.4\% \pm 14.11$.

4. Discussion

The first aim of this research was to identify the criteria that medical specialists use to authorize athletes' return to field after a first episode of antero-internal dislocation of the glenohumeral joint, whether operated or not, and to compare these results to the literature. The second aim was to analyze the relevance of the techniques used to evaluate each criterion.

In the literature, the most commonly used criterion is undoubtedly the length of time that has elapsed since the surgery/injury [12]. Some criteria are sometimes found in the literature such as strength or range of motion. Other criteria are still cited in a more scattered way such as stability [13],[14], etc. Unfortunately, few articles describe the means used to evaluate these different criteria.

As a reminder, the four criteria most used by specialists in this questionnaire are: pain, instability/laxity, range of motion and patient's subjective feelings.

In regard to the evaluation of pain felt by the athlete, this criterion is cited sparingly in the literature but it was the most frequently cited in the questionnaire. Among the different techniques available to assess pain, the patient's feeling is the most commonly used. These surprising results show that specialist doctors tend to use subjective means (the patient's speech) rather than a simple numeric scale and visual analogue scale which are methods validated in the literature [15],[16] and sensitive to change; the measure captures the fluctuations in the patient's perception of pain [17]–[19]. One hypothesis for the use of subjective means is the ease of listening to the patient's explanations.

The second most used criterion, "laxity/instability", is also sparingly cited in the literature. Various tests are available to assess possible laxity and/or instability problems. Among these, the "apprehension test" is used by the vast majority of specialist participants. This test is more predictive of an instability problem when the examiner only takes into account the patient's apprehensions when compared to taking pain and apprehension into account [20]. According to Farber et al. [21], the sensitivity of the apprehension test is 72% and its specificity is 96%.

We can therefore note that the first two criteria are the most used by the doctors who answered this questionnaire, but they are only mentioned sparingly in the literature. This may be explained by the difficulty of assessing these two criteria. Indeed, the evaluation of pain must be done with different dimensions (intensity, location, type, etc.). As for laxity, scientists do not agree upon a single test.

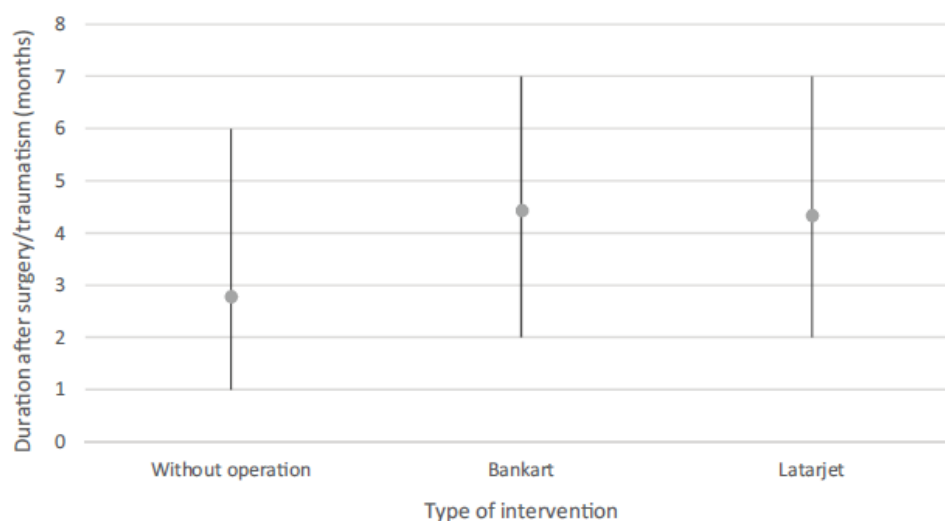


Fig. 2. Range of recovery time post-operation/injury for the respondents.

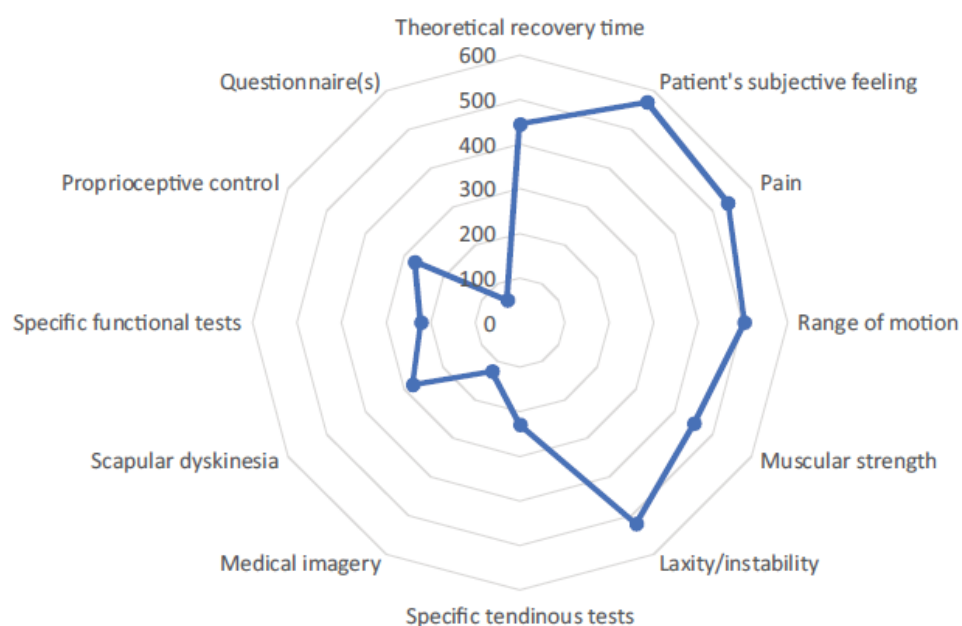


Fig. 3. Relative importance of criteria.

According to the literature, the recovery of range of motion (ROM) is an important factor for returning to the field [12]. The recovery of ROM is frequently listed in the literature [13],[22],[23] after a shoulder dislocation. There is therefore an agreement between the literature and the results obtained in this questionnaire. Indeed, ROM was the third most used criteria by the specialists. ROM is often modified in overhead athletes (IR decrease and ER increase). This can be explained by repeated movements above 90° that cause changes in the dominant upper limb [1],[24]–[27]. Several techniques may be used to measure the recovery of joint amplitudes: goniometry, by eye, measuring tape, inclinometer. The data from the questionnaire shows that most of the specialists mainly evaluate ROM visually, which cannot be reproduced in the literature, despite objective and reproducibility techniques being available. Indeed, the reproducibility of the visual test varies from one experimenter to another and ranges from low to good intra- and interreliability [28],[29]. The visual evaluation

presumably finds values similar to those obtained in the goniometry, even though the precision is not to the nearest degree. The simplicity and speed of the visual assessment may explain the choice for this method. The literature recognizes that goniometry appears to be a good technique for measuring shoulder amplitudes provided that the measurement method is defined beforehand and that the same method is always used thereafter [30],[31].

The second most identified criterion in the literature is the level of muscle strength. However, it only places forth for the specialists who completed this questionnaire. According to Watson et al., despite the lack of consensus and specific recommendations, strength must be taken into account to allow the athlete to return to the field after an unoperated instability injury [22].

There are several ways to measure strength. Data from the questionnaire shows that manual strength testing is used by the majority of the doctors. Even though it is commonly used, this method appears to be insensitive to changes in strength or to small differences between the two limbs [32]. It is therefore difficult to precisely quantify muscular imbalances, loss of strength, etc. The handheld dynamometer shows excellent intrarater reproducibility and good interrater reproducibility for measuring isometric shoulder rotator strength in symptomatic patients [33]. The handheld dynamometer is not as specific as the isokinetic device. If the investigator tests the isometric strength (e.g. with the handheld dynamometer), it is difficult to extrapolate eccentric or concentric force. This method is therefore insufficient to evaluate the overhead athlete's shoulder that uses concentric and eccentric contractions. However, the handheld dynamometer was only used by 9.1% of doctors using athletes' strength level as a criterion. This can be explained by the fact that manual isometric evaluations take time to set up properly, especially when the evaluator performs a bilateral comparison. Isokinetic evaluations, on the other hand, represent a standard tool for testing shoulder muscular strength as well as for rehabilitation [34]–[36]. The handheld dynamometer can be used as an alternative to isokinetics even if the latter remains the gold standard (specificity of contraction mode, safety, reproducibility, etc.) [37],[38]. In the questionnaire, 43.6% of participants say that they use isokinetics. This represents a significant proportion given the cost of this material and the low availability of the devices.

Despite the different techniques validated by the literature, it appears that almost half of the specialists declare evaluating strength using only a single manual strength measurement, which lacks precision and reproducibility. This can presumably be explained by the high cost of the isokinetic device and its availability compared to the rapid and simple manual technique. In addition, isokinetic shoulder evaluation remains a methodologically difficult and less explored test than the lower limb test. The manual dynamometer, on the other hand, represents an intermediate method between isokinetics and a manual evaluation. Indeed, its cost is in between isokinetic and manual technique, and the results also give an intermediate precision, situated between the two other methods. For practitioners who use manual testing, it is important to standardize the position in which strength is evaluated.

The sixth most commonly used criterion in the questionnaire is scapulothoracic dyskinesia. However, in the literature, the presence or absence of scapulothoracic dyskinesia as a criterion for a return to the field is rarely cited, despite the scapula's important role in overhead movements. Kibler describes the different roles of the scapula in throwing movements, such as transmitting the energy from the

trunk to the arm, elevating the acromion to keep a large subacromial space or allowing the rotator cuff muscles to becoaptators during the abduction movement [39]. Each role is important and poor scapula kinematics is often associated with shoulder pathologies such as instability or rotator cuff injuries [40]–[42].

The scapular dyskinesia can be identified using a measuring tape, an inclinometer or visually. In the questionnaire, the majority of specialists relying on this criterion do so through visual assessment. A recent review of the literature mentions intrarater reliability ranging from 0.59 to 1 for the visual assessment. Interevaluator reproducibility varies from 0.34 to 0.81 [43]. These variations can probably be explained by the experience of practitioners who care for these patients. It therefore becomes difficult to follow the evolution of scapular dyskinesia.

The criterion that is mainly mentioned in the literature is the time since the first dislocation or the surgery and the return to play. According to Ciccotti et al.'s literature review [12], this criterion is used in 89.6% of articles reporting return to the field after stabilization surgery. Popchak et al. [13] also state that the time elapsed after stabilization is a commonly used criterion even at the expense of other criteria. Yet in our study, this criterion is only ranked eighth by the specialists. The difference can be explained by the willingness of doctors to individualize their decision. In fact, there is a minimum amount of time physiologically speaking before which the patient cannot return to the field. However, after this period, the decision to return depends on other criteria.

Good proprioception is an important factor in movement control during sports. However, it is not easy to objectively quantify and assess proprioception through testing, and according to Ager et al. [44], complementary studies are required to define standardised protocols. However, according to the results of the questionnaire, only a few doctors use the isokinetic dynamometer to evaluate proprioception. Nonetheless, this already represents an impressive population as the protocol is relatively time-consuming. As a reminder, in the criteria rankings, proprioception appeared only in ninth position, far behind criteria such as pain or patient's subjective feelings. The main reason is presumably the difficulty to quickly and accurately evaluate proprioception during a conventional appointment. Therefore, as mentioned by some participants, it may be interesting for the physiotherapist to carry out this examination.

4.1. LIMITATIONS

The limitations in this study are mainly linked to the two missing items on the CHERRIES list: participation rate and atypical participation times. Thus, the questionnaire could be somewhat improved although it is already of a good standard as such.

Secondly, the specialists who participated may not represent the entire doctor population. Indeed, those who responded are most likely the ones who are most concerned, but also interested by return to play consultations. Those who are indifferent would not take time to answer a questionnaire on a subject that is useless to them.

Some practitioners may also have been tempted to answer in an expected way. Indeed, some techniques are surprisingly used by a fairly high percentage of technicians while they are cumbersome to perform and practically unfeasible during a 15-minute consultation. The anonymous nature of the

study, however, reduced the apprehension of any judgment regarding the answers given and thus encouraged participants to reply honestly.

Finally, it is questionable whether the practices employed by the specialists are the right ones simply because many of them use them. Currently, there is no prospective study to define whether a criterion is really useful to define a return to the field safe.

5. Conclusions

Among the 63 participating doctors, it appears that they take into account an average of 9.16/12 criteria to make their decision to authorize athletes' return to field. Pain and laxity/instability are the two most commonly used criteria.

When a weighted importance is assigned to these criteria, the "patient's subjective impressions" comes first, followed by the "pain" criterion. This is the most commonly used criterion, and is also recognized as one of the most important by the practitioners.

The methods for assessing the different criteria have been analyzed and compared with the literature. The results of the study show that the techniques applied by the specialists are not always those validated by the literature. Timesaving and limited cost of the methods used could be the main reasons to explain this choice.

Overall, the different results of this research make it possible to consider future studies aimed at implementing easier objective tests as well as a validated strategy to reduce the rate of recurrence of antero-internal dislocations. Clinical trials number: NCT04387188.

DISCLOSURE OF INTEREST

The authors declare that they have no competing interest.

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AUTHOR CONTRIBUTIONS

Each author contributed to the article.

ARTIFICIAL INTELLIGENCE STATEMENT

No artificial intelligence was used for the writing of the submitted work.

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