EXAMINATION OF AGILITY DEVELOPMENT IN EXTRACURRICULAR ACTIVITIES

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Abstract

In contemporary sports, achieving higher levels of performance has become almost unimaginable without scientific support. This is equally true for modern football, where agility stands out as one of the most critical abilities. Agility is a multifaceted skill that encompasses components such as change-of-direction running, recognizing game situations, decision-making, and response time. While physical abilities contribute significantly to performance enhancement, the distinguishing factor in agility often lies in the speed of decision-making. The objective of our research was to investigate the trainability of agility.

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Specifically, we aimed to design an agility test that evaluates not only physical abilities related to direction changes – such as dynamic leg strength and running technique – but also agility in its full complexity, incorporating all related decision-making mechanisms. Our study sought to determine the extent to which agility could be developed in the examined age group through an 8-week training program consisting exclusively of agility tests. School sports clubs provided an appropriate foundation for the research, as participants were non-elite athletes, making short-term progress more likely. The study was conducted in 2023 at the gymnasium of Huszár Gál High School, Elementary School, Basic Art Education Institution, and Kindergarten. The participants were first- and second-grade boys, with an average age of 7.4 years. A total of 16 students took part in the research. At the start of the study, during the initial assessment, students performed several tests: a 20-meter straight-line sprint, a shadowing agility test, an auditory signal agility test, and a predetermined course agility test with a known route. Following this baseline measurement, an 8-week period commenced, during which students participated in sports club sessions twice a week. These sessions incorporated agility tests as training elements. Specifically, students performed three Agility T-tests and three Illinois agility tests during each session. After eight weeks, post-training assessments were conducted under identical conditions. The results indicated that incorporating agility tests as training elements led to significant improvements in time-based performance metrics. It was also evident that tasks requiring decision-making took longer to execute compared to those following predetermined routes. Our findings confirmed the hypotheses set before the research and provided answers to the research questions posed.

Keywords: agility, school sports clubs, response time

Discipline: pedagogy

Absztrakt

AZ AGILITÁS FEJLESZTHETŐSÉGÉNEK VIZSGÁLATA A TANÓRÁN KÍVÜLI TEVÉKENYSÉGEK SORÁN

Napjainkban az egyre magasabb szintű sportteljesítmény elérése tudományos háttér nélkül már szinte elképzelhetetlen. Így van ez a mai modern labdarúgásban is, ahol az egyik legfontosabb képesség az agilitás képessége, mely összetett, több részképességet foglal magába, úgy, mint az irányváltoztatásos futás, a játékszituációk felismerése, a döntéshozatal és a reagálás. A fizikai képességek fejlesztésével a sportolók teljesítőképessége nő az agilitás tekintetében, ami különbségként jelentkezhet, az a döntéshozatal gyorsasága. Jelen kutatásunk célja az agilitás fejleszthetőségének vizsgálata volt. Célkitűzéseink között szerepelt egy olyan agilitásteszt összeállítása, amelyben nem csupán az irányváltoztatással kapcsolatos képességeket – mint a dinamikus láberő, futótechnika – lehet vizsgálni, hanem az agilitást a maga komplexitásában minden hozzátartozó döntéshozatali mechanizmussal együtt. Kutatásunk során arra kerestük a választ, hogy az általunk vizsgált korosztályban milyen mértékben fejleszthető az agilitás egy olyan 8 hetes edzésprogrammal, amelyben kizárólag agilitástesztek szerepeltek.

Az iskolai sportkörök megfelelő alapot nyújtottak a vizsgálatokhoz, hiszen a foglalkozáson résztvevők nem élsportolók, így egy rövidtávú vizsgálaton hamarabb várható fejlődés. A vizsgálatokat 2023-ban a Huszár Gál Gimnázium, Általános Iskola Alapfokú Művészet Oktatási Iskola és Óvoda tornatermében végeztük el. A vizsgált személyek valamennyien az iskola első és második osztályos fiú tanulói voltak. Életkorukat tekintve az átlagéletkor 7,4 év volt. Összesen 16 fő vett részt a kutatásban. A kutatás kezdetén

a bemeneti mérés során a tanulók végrehajtottak egy 20 méteres egyenes vonalú futástesztet, egy követéssel történő agilitástesztet, egy hangjelzésre történő agilitástesztet, végül pedig egy irányváltoztatással történő agilitástesztet, ahol már ismert volt az útvonal. A mérést követően kezdetét vette egy 8 hetes időszak, melyben heti két alkalommal a sportköri foglalkozásokon belül végezték a gyerekek az agilitásteszteket, mint edzéselem. A foglalkozások alkalmával 3 darab Agility T tesztet és 3 db Illinois agilitástesztet hajtottak végre a tanulók. A 8 hetet követően ugyanolyan körülmények között került sor a kimeneti mérésre.

A vizsgált eredmények arra mutattak rá, hogy az agilitástesztek edzéselemként történő alkalmazása jelentős fejlődést eredményezett az időeredményekben. Az is igazolódott, hogy az olyan feladatokban, ahol a döntéshozatal is szerepet játszik több időt vesz igénybe a végrehajtás, mint amikor egy előre ismert útvonalon haladnak végig a tanulók. A vizsgálatok során feltett kérdéseinkre választ kaptunk, a kutatás előtt megfogalmazott feltételezéseink beigazolódtak.

Kulcsszavak: agilitás, iskolai sportkör, reagálás

Diszciplína: neveléstudomány

Introduction

An athlete's performance is determined by the level of motor skills, including conditional and coordination abilities, as well as joint mobility. These abilities are in constant interaction, often appearing in mixed forms rather than as isolated capacities (Katics, 2015; Polgári and Szatmári, 2011; Dubecz, 2009). Therefore, separating them is not practical.

Recent research increasingly examines not only physical parameters but also integrates them with cognitive abilities, psychological traits (Zimmermann, 2021; Makra and Balogh, 2018), and anthropometric indicators (Czimbalmos et al., 2020) when assessing athletes' performance (Csáki, 2019; Juhász et al., 2018).

One such complex ability is agility, often described by terms such as mobility, dexterity, and swiftness. Initially, agility was equated with running speed, and an agile athlete was considered one who could run fast.

Later, the concept was expanded to include running with directional changes and the ability to accelerate and decelerate. Mobility, in this context, refers to how quickly an athlete can execute changes in direction.

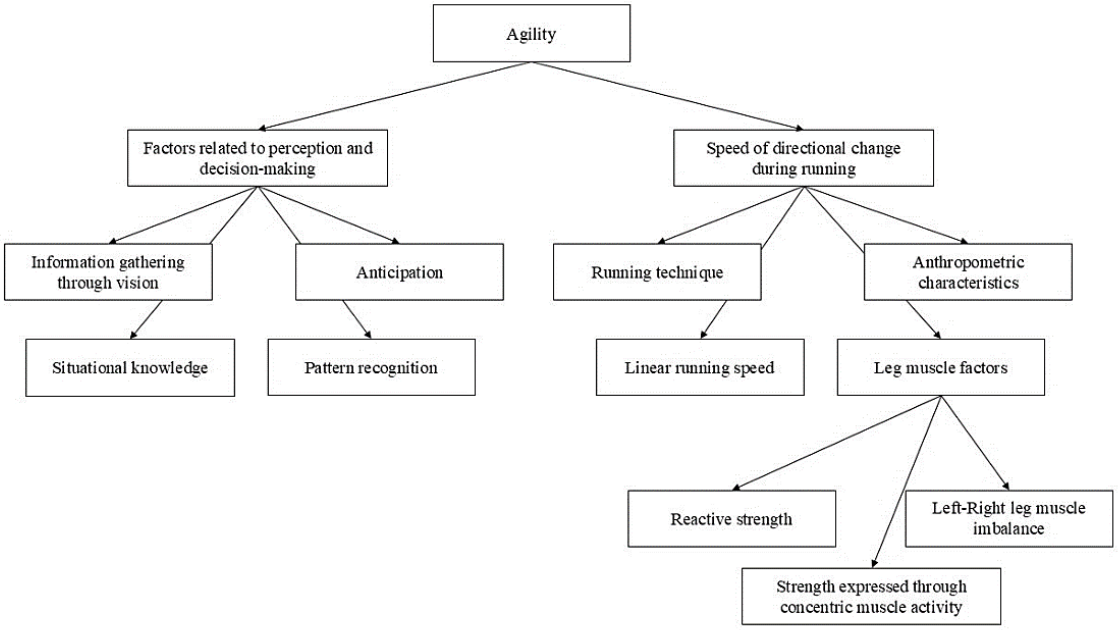
Finally, agility was further defined to include responsiveness to external stimuli, which triggers the initial directional change, thereby completing the concept (Koltai, 2021).

Agility, therefore, is the ability to change the body's direction efficiently and rapidly, requiring a combination of balance, coordination, strength, and speed. In football, agility plays a central role (Robinson and Owens, 2004), as it is not only fundamental to passing and dribbling but also contributes to injury prevention.

In their comprehensive review of agility research, Sheppard and Young (2006) proposed defining agility as an open motor skill, highlighting that these rapid directional changes are unplanned. This definition incorporates decision-making as a key element of agility. While the speed of directional changes, running technique, and alternation between deceleration and acceleration are essential, the entire mechanism is initiated by the athlete's response to external stimuli (Sheppard and Young, 2006).

Building on existing findings, Young et al. (2002) developed a model (*Figure 1*) that currently provides the most comprehensive representation of the components of agility.

Figure 1. The model of Agility. Source: Young et al., 2002, 284.



Considering agility as an open motor skill, tests designed for closed motor skills are inadequate for objectively measuring agility. Closed motor skill tests, such as sprint runs and zigzag runs used in athletics, fail to incorporate key components of agility, including dealing with uncertain factors, decision-making, and anticipation (Koltai, 2021). According to the model developed by Young et al. (2002), these tests only assess the speed of running with directional changes. As these tests can be performed in a pre-planned manner, they exclude factors related to perception and decision-making. Consequently, such methods should be classified as Change of Direction Speed (CODS) tests (Koltai, 2021). Today, tests incorporating elements of perception and decision-making, known as Reactive Agility (RAS) tests, are available. RAS tests allow for evaluations that closely resemble real game situations, opening new avenues for agility research (Koltai, 2021).

School sports clubs and extracurricular sports activities provide students with excellent opportunities for recreation while promoting healthy development in physical, mental, and intellectual domains. It is important to distinguish between activities conducted during school hours and those outside of regular classes, as differences in management, organizational structures, group sizes, and compositions can significantly influence both performance and personal development (Páskuné, 2014). While extracurricular activities cannot replace the educational and developmental processes within the school framework, they serve as valuable supplements to the educational work conducted in schools.

Agility, as one of the motor skills, plays a pivotal

role in children's motor development and the improvement of sports performance (Szabó et al., 2020). The primary school age is particularly suitable for developing speed, directional change ability, and decision-making speed simultaneously, contributing to the optimization of students' motor coordination and physical performance. School sports clubs provide a flexible extracurricular setting for comprehensive development of children's motor and cognitive skills.

This study aims to demonstrate the impact of agility exercises on the development of primary school students, with a special focus on directional change abilities and quick decision-making. The findings not only enrich practical educational opportunities but also highlight the potential of targeted and well-structured training programs to yield significant results at an early age, contributing to children's healthy and active lifestyles.

Materials and Methods

The aim of our research was to assess agility as a complex ability using various tests designed to include as many components as possible. Additionally, we sought to examine how agility can be developed within the framework of school sports clubs and to what extent the integration of agility tests into training contributes to the improvement of students participating in school sports programs.

The study involved 16 participants, all first- and second-grade male students who were not engaged in competitive sports. The average age of the participants was 7.4 years. The assessments were conducted in the gymnasium of the Huszár Gál Secondary School, Primary School, Basic Art School, and Kindergarten. To evaluate the students' progress, we designed a custom agility test. The course featured nine large cones placed 5 meters apart, with smaller cones positioned 2.5 meters between the larger ones to facilitate directional changes. The agility test consisted of three parts:

1. Follow-the-Leader Test: The participant began behind the starting cone, while the guide stood at a cone 2.5 meters away. On cue, the guide proceeded along the designated path, and the participant's task was to follow the guide at full speed along the same route.

2. Auditory Direction Test: The participant started at the initial cone. Upon a start signal, they began running, receiving auditory cues to indicate the next direction they should proceed.

3. Pre-Planned Route Test: Participants followed a predetermined course, designed to assess their Change of Direction Speed (CODS) abilities.

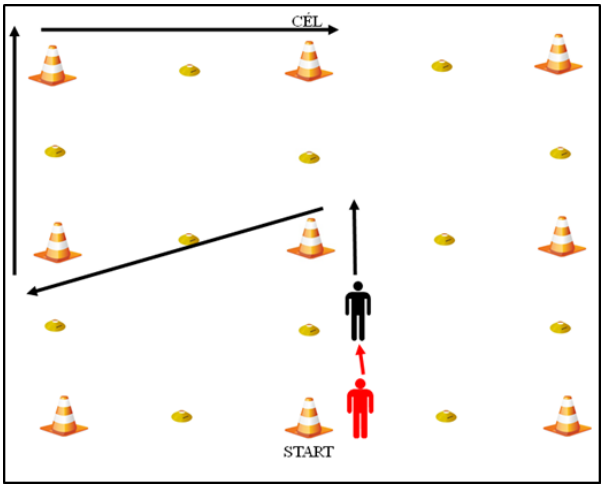
After completing the agility test, a 20-meter straight-line sprint was conducted to measure linear speed.

Subsequently, a 20-meter linear sprint test was conducted to evaluate baseline speed.

Following the initial assessment, the students participated in an 8-week training program conducted twice a week as part of their school sports club activities.

This program was specifically designed to promote improvement in the targeted ability. In addition to general sports club activities, the children completed three Illinois Agility Tests and three Agility T-Tests during each session. At the conclusion of the 8-week program, the same parameters were re-assessed under identical conditions to evaluate progress and address the research questions formulated at the beginning of the study.

Figure 2. Agility Test with pursuit. Source: Authors.



Results

The first test in both the pre- and post-assessments was a 20-meter straight-line sprint (*Table 1*) During the initial measurement, the participants completed the distance in an average time of 4.56 seconds. After the 8-week program, the students demonstrated improvement, completing the sprint in an average of 4.48 seconds, a reduction in time compared to the initial measurement.

The results also indicated that the group's performance in the 20-meter straight-line sprint was relatively uniform, reflecting the homogeneity of the group. As shown in the table, the variation in individual results decreased during the post-assessment.

Table 1. Evaluation of 20-Meter Linear Sprint Results (Sec.), n=16. Source: Authors.

Measurement	Min.	Max.	Mean	SD
Pre-test	3.75	5.82	4.56	0.53
Post-test	3.84	5.56	4.48	0.46

Follow-the-Leader Test

Following the 20-meter straight-line sprint, the students completed the pursuit running test. During the initial assessment, the group achieved an average completion time of 7.48 seconds. The fastest result was 6.45 seconds—nearly one second faster than the group average—while the slowest participant completed the task in 8.83 seconds. This test revealed greater variability in performance compared to the 20-meter straight-line sprint.

After eight weeks, the students were reassessed, yielding intriguing results. Although the specialized training program did not include exercises explicitly aimed at improving reaction or perception, the group average demonstrated a positive trend, decreasing from 7.48 seconds to 7.20 seconds. There was no significant change in the fastest performance time; however, notably, the top result in the post-assessment was achieved by a different student, suggesting that their performance improved more significantly than that of their peers.

Additionally, the findings highlighted that the slowest participant in the post-assessment achieved a better time than the weakest performer in the initial assessment, as reflected in Table 2.

Table 2. Evaluation of Pursuit-Based Agility Test Results (Seconds), n=16. Source: Authors.

Measurement	Min.	Max.	Mean	SD
Pre-test	6.45	8.83	7.48	0.72
Post-test	6.43	8.64	7.20	0.76

Auditory Direction Test

As the third element of the measurements, the students performed a directional change running test triggered by an auditory signal. The course layout was identical to the pursuit test, consisting of a 20-meter track with three direction changes. The difference between the two tests lay in the stimulus: in this case, an autory signal was used. During the initial assessment, the best result recorded was 7.11 seconds, while the weakest performance was 8.77 seconds. On average, the participants completed the task in 7.95 seconds. Among all the tests, this one exhibited the smallest variation from the mean.

In the follow-up measurement, there was a notable improvement in the minimum result. The fastest participant completed the task in 6.66 seconds, showcasing significant progress. However, this was not reflected in the maximum result, which increased to 9.08 seconds, taking 0.31 seconds longer than during the initial assessment. Despite this, the overall results indicated that the eight-week training program had a positive impact on the participants' performance and the group's collective results. Following the training program, the participants completed the auditory signal directional change running test in an average of 7.59 seconds, as shown in Table 3.

Table 3. Evaluation of Audio-Cue Agility Test Results (Sec.), n=16. Source: Authors.

Measurement	Min.	Max.	Mean	SD
Pre-test	7.11	8.77	7.95	0.48
Post-test	6.66	9.08	7.59	0.67

Pre-Planned Route Test (CODS)

The final part of the measurements involved a simple directional change running test. The course layout was the same as in the pursuit and auditory signal tests. The initial assessment results showed that the participants completed the designated course in an average of 6.93 seconds. The best time recorded was 5.68 seconds, while the slowest participant completed the task in 8.75 seconds, demonstrating a significant difference between the two results.

In the follow-up measurement, minimal improvement was observed across all results. The students completed the course in an average of 6.75 seconds, reflecting a measurable improvement compared to the first measurement. The fastest participant achieved a time of 5.61 seconds, slightly better than their initial performance. The most significant improvement occurred in the slowest participant's performance, which improved from 8.75 seconds to 8.13 seconds.

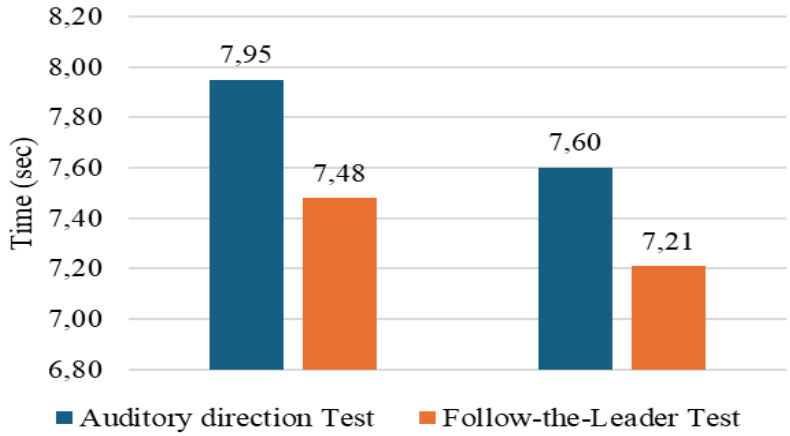
The results of the eight-week program also indicated a reduction in performance disparities among the students, as their performances became more closely aligned. This convergence in results is another positive outcome of the training program (*Table 4*).

During the measurements, we observed that the results for change-of-direction speed (CODS), where the course layout was known in advance, were better than those requiring reactive agility. This difference can be attributed to the additional time students needed for decision-making and perception to choose their paths.

Table 4. Evaluation of CODS Results (Seconds), n=16. Source: Authors.

Measurement	Min.	Max.	Mean	SD
Pre-test	5.68	8.75	6.93	0.75
Post-test	5.61	8.13	6.75	0.68

Figure 3. Comparison of the Average Results of the Auditory direction Test and the Follow-the-Leader Test (seconds), n=16. Source: Authors.



Our research also explored whether students responded faster to auditory signals or pursuit-based cues within reactive agility tests. In the initial assessment, students performed 0.47 seconds better in pursuit tasks compared to auditory signal tasks. In the follow-up assessment, the averages still favored the pursuit tests, although the performance gap narrowed to 0.39 seconds (Figure 3).

In the measurements, we found that the results of the change-of-direction running test (CODS), where the course layout was known, showed better performance compared to tests requiring reactive agility. This difference can be explained by the fact that students needed more time to make decisions and choose the route when they had to react. During the pursuit running test, the initial measurement took 0.55 seconds longer, and in the retest, it took 0.45 seconds longer than the known route change test. In the auditory signal-based running test, the difference was 1.02 seconds in the initial measurement and 0.84 seconds in the retest. In both cases, the difference improved compared to the first measurement, but the decision-making process still required, on average, this extra time to complete the same distance (*Table 5*).

Table 5. The effects of using agility tests as training elements (in seconds) n=16. Source: Authors.

Test	Pre-test				Post-test			
	Mean	Min.	Max.	SD	Mean	Min.	Max.	SD
Pre-Planned Route Test	6,93	5,68	8,75	0,75	6,75	5,61	8,13	0,68
Follow-the-Leader Test	7,48	6,45	8,83	0,72	7,20	6,43	8,64	0,76
Auditory Direction Test	7,95	7,11	8,74	0,48	7,59	6,66	9,08	0,67

Discussion

The results of the research confirm the possibility of developing agility within the context of school sports clubs, particularly for the 7-8-year-old age group. The use of agility tests as components of training has demonstrated measurable improvements in both reaction time and the speed of change-of-direction running, which provides valuable feedback for teachers and coaches. The results show that times for change-of-direction running improved, particularly for pre-planned movement patterns. This aligns with findings in the literature (Koltai, 2021; Young et al., 2002), indicating that motor skills are more easily developed at younger ages when motor abilities are rapidly evolving.

The study also revealed that the development of different agility components follows distinct developmental dynamics, consistent with international research showing that speed does not develop linearly during childhood and adolescence. However, the precise impact of growth and maturation on sprinting performance remains unclear (Mendez et al., 2011; Meyers et al., 2015), while other studies have confirmed age-specific developmental trends in agility (Horicka and Simonek, 2021).

An interesting finding is that, in tests where decision-making played a role, the rate of improvement was more moderate, though the group average still improved. This suggests that, while physical capabilities developed, the enhancement of cognitive elements (e.g., quick reactions, situation recognition) may require more targeted training methods.

The methods applied in the study are highly applicable to the everyday practice of sports training in school sports clubs, as they do not require complex equipment and can be well adapted to the age-specific characteristics of students. Training sessions at sports clubs provide an opportunity to develop agility in a comprehensive manner, contributing to the improvement of children's motor skills as well as their general motor and cognitive abilities. For young football players (U12), Sandra et al. (2022) emphasize a complex approach to developing speed, agility, and coordination. The complex and individualized training program showed tangible improvements in physical performance, specifically in agility and speed tests. The study highlights the importance of structured training programs that focus on the physical characteristics of young athletes.

Limitations and Future Directions

One limitation of the research is that the sample size of the group was small, which restricts the generalizability of the results. Furthermore, the training program did not specifically target the development of cognitive elements, which could be an important direction for future research. It would be valuable to integrate methods that enhance reaction and decision-making efficiency, particularly with tests that are more closely aligned with game situations.

The results clearly demonstrate that agility can be developed within the context of school sports clubs, especially when the program is well-structured and takes into account the age-specific characteristics of children. The research underscores the importance of school sports clubs in supporting children's physical and cognitive development and opens new possibilities for the complex development of agility, both in extracurricular activities and competitive sports.

Conclusion

The aim of the research was to examine the developability of agility within the context of school sports clubs, with a particular focus on the ability to change direction and the speed of decision-making. The 8-week program conducted among primary school boys, who were not

competitive athletes, demonstrated that the inclusion of agility tests as a training element led to significant improvements in the students' time results. The findings showed that the development of different agility components exhibited distinct development dynamics. Tasks involving reaction time and decision-making remained more time-consuming, but abilities related to direction-changing showed significant improvement. The research confirmed the hypothesis that targeted training within school sports clubs is suitable for developing agility, especially at a young age when the development of motor coordination and speed is of particular importance.

Recommendations

The regular inclusion of agility-enhancing exercises in extracurricular sports activities can effectively contribute to the development of children's motor skills. It is recommended that schools design programs that combine the development of direction-changing, speed, and decision-making in a comprehensive manner (Sandra et al., 2022). Based on the results, it is recommended to design differentiated tasks based on the level of skill. For students starting from a lower level, simpler, pre-determined movements should be prioritized, while for more advanced students, greater emphasis should be placed on improving reaction time and decision-making.

Although the 8-week program led to significant progress, longer, continuous training sessions offer further development opportunities. It is recommended to extend such studies over several months or even a year to obtain a more comprehensive picture of the development pace.

The complex development of agility requires appropriately trained instructors. It is suggested that teacher training programs and further education include specialized modules on agility-enhancing exercises and related measurement methods.

Overall, well-structured training programs aimed at developing agility can be effective tools for improving students' motor skills. Thus, their wider implementation can contribute to the healthy development of young people and improve their movement culture.

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