Agility training for team sports – running the OODA loop

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INTRODUCTION

It could be argued that no domain of fitness has undergone as dramatic a change over the last 10 to 15 years as agility training. This is a reflection of the fact that agility plays a key role in high-level performance in team and court sports, and secondly, that our understanding of agility itself and the way to train it has evolved at the same rate. Today, the vocabulary of agility has similarly evolved and now involves elements such as reactive agility, change of direction speed, and so on. However, despite this, there still remains a degree of separation between the theoretical constructs of agility and the actual movement that we see on the field of play. This article will attempt to develop the concept of agility training further by focusing on the challenges facing athletes today on the field of play, borrowing from a range of other quite diverse fields to outline a potentially new way of looking at the challenges of agility.

Agility – the key component

Agility plays a key role in the performance of court and team sports, being intricately linked with the performance of the sport itself.[3] Indeed, it could be argued that agility is one of the key factors in determining performance in team sports. However, unlike other capacities which simply underpin performance, agility helps to explain performance as the ability to move effectively in the context of the game is a key component of performance in the majority of team and court sports.[2,4] This is because performance of the skills of the game itself require an athlete to effectively move to the points at which the skill occurs and to manipulate their body to be able to perform the skill effectively.[2,4] Therefore, it could be argued that agility and performance are intricately linked, and that skills cannot be optimally performed without effective agility-based movement capacities. This link between the two not only further stresses the critical role that agility plays in performance, but also the specific nature of agility. In other words, although aspects such as strength and power can be assessed generically, agility is different as it manifests itself directly in the performance environment: hence agility capacities should be judged against how effectively they allow the athlete to perform the skills and play the game rather than as a generic capacity.[4]

Reactive agility – not so fast

The link between agility and performance has seen a great change in the way the component is viewed, trained and tested.

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'the goal is to keep the goal the goal'

Traditionally, agility has been viewed as an ability to perform a discrete movement pattern: typically a change in direction. Training used to be dominated by the performance of closed drills and tests typically reflected an assessment of an athlete's capability to perform a pre-planned discrete movement pattern, with performance judged solely on the time taken to perform the exercise.[4] However, research has consistently shown that effective agility blends perceptual and decision-making components with the ability to apply effective movement.[10] This has led to the development of more inclusive definitions of agility that reflect a reactive element, with Sheppard and Young[7] defining agility as a 'rapid, whole body movement with change of velocity or direction in response to a stimulus'.

These developments have in turn led to the concept of reactive agility, and the development of training methods designed to develop this capacity and of tests designed to assess this component. Although this has been a great step forward compared with the more closed classical view of agility, there are also a number of potential drawbacks with the concept of reactive agility, especially as it pertains to the training of athletes.[4] In particular, the concept of reactive agility being a single capacity is potentially flawed and may not reflect the context in which it is deployed. Data suggests that reactive agility is only effective at determining higher levels of performance when the stimulus is sport-specific, and that reaction to generic stimuli, such as flashing lights, cannot differentiate levels of performance.[10] Training simply to develop reactive agility may therefore be flawed; we need instead to determine which training methods best prepare athletes for performance and in order to fully assess this we need to look at the underlying purpose of agility.

Begin at the beginning

'To begin at the beginning': these opening lines of Dylan Thomas's *'Under Milk Wood'* provide us with an appropriate place to start our investigation of effective agility performance. If we are to begin at the beginning of agility training, then we must start with an investigation into the core aim of agility development. As highlighted earlier, agility is deployed directly in the performance of the sport and is intertwined with the skills and tactics of the game. Ultimately, then, the aim of any agility development programme has to be improved sport-specific movement, and thus the focus of all of our training has to be to adhere to this goal.

As Dan John eloquently declares, 'the goal is to keep the goal the goal', and as we move through a journey into agility development we must always keep in mind that the goal is to enhance sports performance. This is an important consideration, as quite often on our journey we can be diverted into realms which at first appear promising and revolutionary, but ultimately don't reflect the underlying goal. In particular, new technology will often throw up tantalising new opportunities which seem to offer the opportunity to assess and train key agility capacities, but which often fail to replicate the sport-specific nature of agility. Sports performance should always be the arena in which we ultimately determine the effectiveness of our interventions.

Given this, it is logical that the beginning should entail an investigation of sports movement.[4] This is an important diversion as starting with an analysis of sports movements helps us ensure that everything that we do in training has the maximum chance of transferring into effective performance. Although this would appear logical, it is not uncommon to look at agility from a mere definitional point of view, which leads us down the road of judging our interventions against the definition rather than judging against sports performance.[4]

When we look at movement from the sports performance point of view, a number of key factors arise:[4]

1. Movement is context-specific

2. Movement is goal-oriented, with the goal being the carrying out of a sport-specific task, and this often involves direct opposition to an opponent

The F-16, a supersonic aircraft capable of extreme manoeuvres

3. Movement has an anticipatory and/or reactive element to it

4. Movement is varied and requires a vocabulary of movement skills

5. Movement is not always performed at top speed, and instead requires optimal speed, control and sufficient precision to be able to carry out the task.

This analysis provides a context around our agility development, and provides a compelling reason why agility training should have a clear goal, with that goal being closely related to the task requirements of sports performance. It also highlights that traditional methods, although they do have some value, all too often fail to address key components of performance.

The analysis also emphasises that agility performance is multidimensional, and that simply working on one capacity cannot maximise transfer to game performance. It is for this reason that I have preferred to refer to agility training as gamespeed training, as it helps reflect the performance-related nature of agility and frees us from the dogma associated with theoretical agility development.[4] This wider perspective also helps explain anomalies whereby athletes who appear to have far greater physical capacities are outmanoeuvred by athletes who – on paper – appear far less physically gifted.[4]

How watching fighter pilots led to OODA

Insights can often come from areas that lie outside traditional disciplines.[9] The challenge of explaining how physically gifted athletes can often be outmanoeuvred by less physically gifted athletes always provides a discussion point for the strength and conditioning coach. A similar thought process was encountered by US military strategist John Boyd, in his attempt to develop a training programme for US military pilots.[9] Boyd was fascinated by the differences in air combat between MiG-15s and North American F-86 Sabres in Korea: he saw how the more physically impressive MiGs, which could fly at greater altitudes and achieve greater speeds, were consistently beaten by the less powerful but more manoeuvrable Sabres. Boyd realised that it was not pure numbers that counted, but instead the ability to manoeuvre rapidly and shift between high altitudes, high speeds and different directions. In other words, the ability to perform more manoeuvres in less time kept US pilots one step ahead.

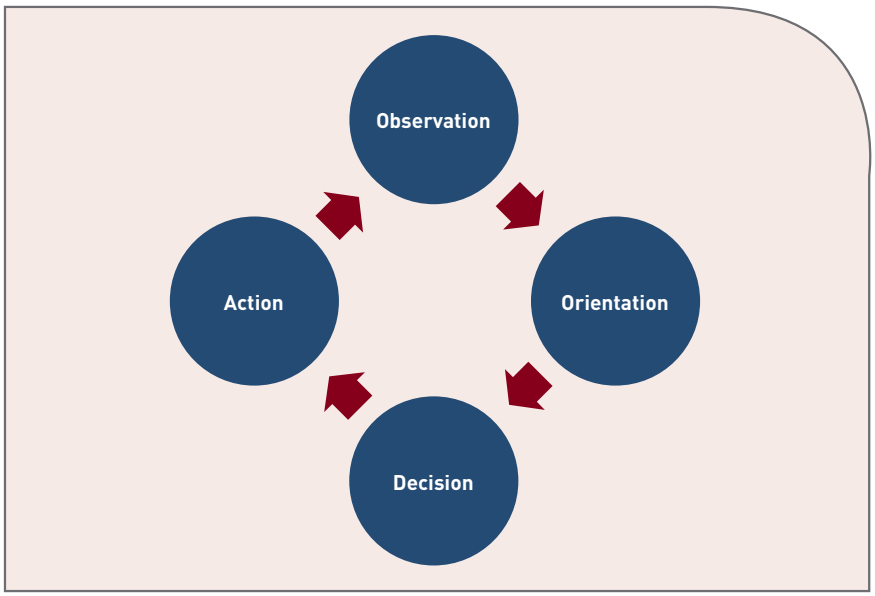


Figure 1. The OODA Loop

From these observations, Boyd went on to develop his 'Energy-Maneuverability' theory of aerial combat, which became the standard for fighter aircraft. He applied his mathematical skill and experience in the air to help design the F-16, a supersonic aircraft capable of extreme manoeuvres. In addition, he developed a system of training based on what he called the OODA loop. The OODA loop consists of four steps: Observation, Orientation, Decision and Action (see Figure 1).

The Observation phase involves perceiving what is happening and processing as much information from as many sources as possible. This collection of information is essential to the process as decisions will ultimately be dependent on this collection. Then during the Orientation stage, the information thus obtained is used to get a perception of what is evolving and what needs to be done. A key part of this is distinguishing the relevant from the insignificant, and this will be based upon a number of factors including experience. This ability to interpret information is critical as all the information in the world is of no use unless it can be interpreted. The Decision phase then involves deciding on a course of action and selecting one path, and the Action phase will then carry out this decision.

Performance is therefore dependent on the effective development and execution of each phase, and a weakness in any will reveal itself as a limit to performance, especially under the pressure of battle.

'the ability to perform more manoeuvres in less time kept US pilots one step ahead'

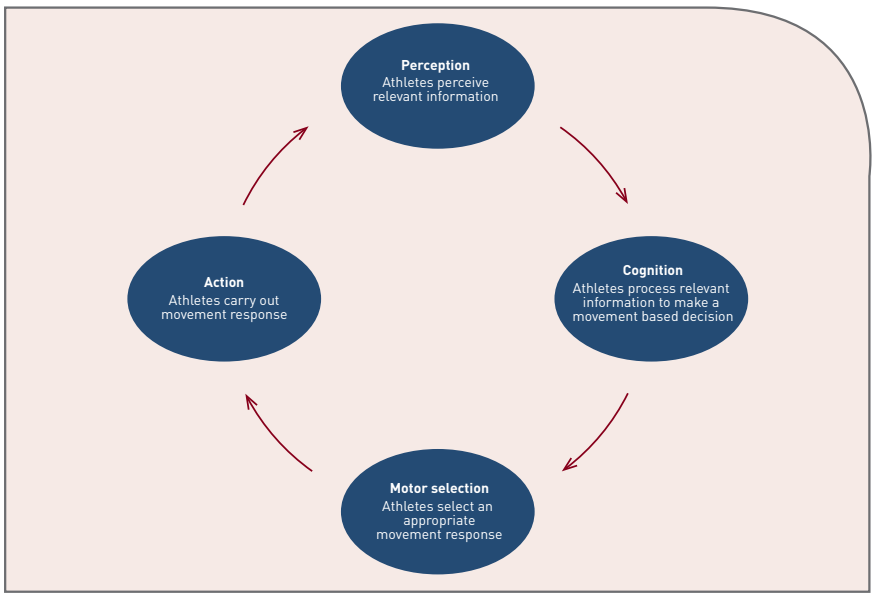
'Athletes who run the loop most effectively will be those who show the greatest gamespeed'

Importantly, Boyd stressed that action was not the end of the cycle, because the loop flows continuously, and the whole loop occurs while actively engaged in the contest.

Importantly, the OODA loop is not just about moving faster, it's about making the right decisions and carrying them out effectively. It requires being able to generate the necessary time to examine a problem before taking action.[9] This involves direct confrontation with an opponent in a rapidly changing environment, so that success is not only dependent upon the fighter's own performance but also on his ability to manipulate the opponent's performance. Here, the ability to observe, orient, decide, and act in a 'tighter loop' obscures one's own intentions while the opponent reveals his next move. In other words, by 'getting inside the opponent's OODA Loop', one can operate at a faster tempo and short-circuit his process.[9]

The advantage gained by reacting swiftly compounds over time, and in short order the challenger can overcome a more powerful opponent. Boyd calculated that by responding decisively to rapidly changing conditions, a pilot could change the dynamics of a fight before the enemy could react, thereby confusing him and controlling the situation.[9] A key component of the OODA loop is making your intentions unpredictable while simultaneously reading competitors' intentions. Critically, performance is not purely reactive in nature and instead involves constant adjustment and manipulation in order to gain an advantage over the opponent. Given that sports performance involves a similar battle between opponents, then the OODA loop, and the manipulation of the loop, has the capacity to be a key advantage in the development of effective gamespeed.

Figure 2. Perception action cycle



The perception action cycle

Although Boyd developed the OODA loop in relation to military air battle, the principles can equally be applied to the application of agility in the sports context. Indeed, looking at it from this viewpoint emphasises many of the key factors identified earlier in terms of effective sports movement. Movement is context-specific, goal-oriented, requires anticipation and reaction, involves direct interaction with an opponent, requires a range of skills and is not determined by speed alone but instead by the successful completion of the task.

Previous work on agility has suggested that application in the sports context requires the exploitation of the perception action cycle (Figure 2),[2] whereby information is garnered from the environment, the information is processed, decisions as to the best course of action are taken and appropriate actions deployed. However, the OODA loop takes this further, involving the direct confrontation between opponents. In these instances, it involves the manipulation, not only of the individual's perception action cycle, but importantly of the opponent's perception action cycle. Additionally, the orientation phase involves not only the processing of information but the start of the manipulation of space and time to directly influence the environment, through manipulating the orientation of the athlete and the manipulation of the opponent. Here, although a final decision has not been made, the orientation phase provides time for a decision to be made and increases the likelihood of a successful outcome. To understand how the orientation phase enhances this likelihood, it is useful to revisit a few key concepts that determine effective reaction and decision-making.

Revisiting Fitts and Hicks

The ability to react effectively to the competitive environment requires ability across the whole gamut of the OODA loop: it starts with the ability to differentiate critical information from noise, and goes through to the processing of this information and the ability to manipulate the environment to maximise the likelihood of making an

effective decision, to decide accurately and to act effectively to manifest the required output. It is thus clear that explaining effective gamespeed is complex, but critically all elements need to be addressed in a training programme if the athlete is to be optimally effective.

A key to understanding the ability to make effective decisions requires an analysis of the concept of uncertainty. In simple terms, all actions in the sports environment have a certain level of uncertainty to them. The greater the level of uncertainty the more difficult it is to act optimally, as this requires a greater degree of information to be processed, resulting in a greater number of options to choose from and a greater number of variables to deal with when acting.

In managing this uncertainty, two key principles play a key role. First, Hicks' law outlines how reaction time is dependent upon the number of options an athlete has and the amount of information the athlete has to process. The greater the degree of information an athlete has to process, the slower the reaction time. Athletes normally deal with this by developing the capacity to focus on key pieces of information and the ability to ignore irrelevant information. Similarly, the greater the number of potential movement solutions the athlete has to consider can also slow down reaction time. To deal with this, athletes will manipulate the environment to reduce the number of potential options they have to consider. Secondly, Fitts' law outlines the trade-off that exists between speed and accuracy. The faster the movement in general the less accurate it is. So where athletes need accuracy of application they will often have to slow down their movements.

A key to an effective understanding of how athletes deal with these dilemmas is to see how they consistently manipulate both of these laws to maximise the likelihood of successful outcome. First, for example, a defensive athlete will manipulate their body position in an attempt to cut down the number of options the offensive athlete has, thus reducing the potential outcomes and increasing the likelihood of making an effective movement intervention.

Similarly, when faced with a complex choice of options the athlete will often have to slow movement down in an attempt to maximise the chance of an effective intervention. In this way an athlete will try to reduce uncertainty by manipulating their own body position, their own movement patterns, aspects of the environment, and so on; in short they will actively try to avoid situations where movement is purely reactive. It has often been suggested that elite athletes make more frequent movements, but of less amplitude than non-elite athletes during the course of the competition.[8] Essentially, these small movements are manipulative in nature, altering key aspects of the environment to maximise the chance of sporting success. Critically, while these movements are taking place, the OODA loop is continually acting, with the movements being a key part of the orientation element, ensuring that the athlete is in the optimal position to act, but also manipulating the movements of the opponents to increase the certainty of outcome.

Developing and managing uncertainty – offensive versus defensive agility

The previous section shows that athletes do actually try to avoid purely reactive situations and instead become manipulative in their movements, to try to force opponents to undertake movements that they can predict and deal with effectively. In this way, effective agility performance requires the management of uncertainty; it requires an ability to move rapidly through the entire OODA loop, but also the ability to directly influence the OODA loop of the opponent.

Given the combative nature of field sports, it is again useful to go back to the sport and look at the key tasks the athletes are attempting to achieve. In doing this, two

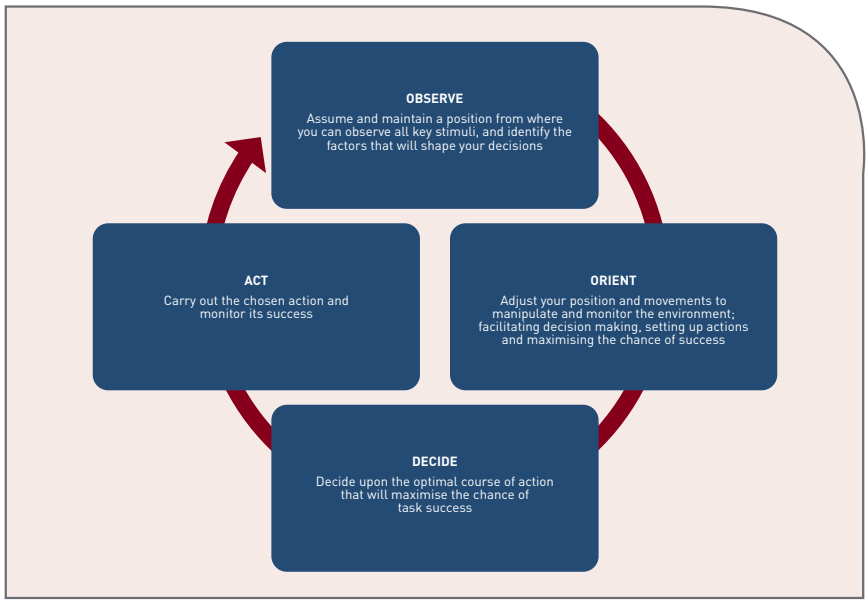


Figure 3. The Gamespeed OODA loop

broad categories stand out which are not always covered in the more traditional view of agility: offensive agility and defensive agility.[4]

Although the search for a single measure of reactive agility has developed and produced some interesting findings, it consistently fails to differentiate between these two components.[4] This is a major flaw as the fundamental aim of each is quite different and can often manifest itself in performance. Indeed, it is not uncommon to see athletes who have high levels of offensive agility, yet poor levels of defensive agility and vice versa.[4]

Clearly there must be different processes acting that explain these differences. Again the investigation of the OODA loop is useful as the differences can occur at any point throughout this loop, and the effect of practice and game experience will play a key role. In many instances offensive players are not required to carry out defensive tasks on a regular basis and so will fail to develop an effective OODA loop for defensive movement. To ensure balance, it is important that players are required to demonstrate both offensive and defensive capabilities in a game to have the opportunity to effectively develop these in practice.

It can be considered that offensive and defensive agility essentially are involved in exploiting uncertainty. John Boyd found that effective jet fighter performers destroy their rivals' perspective on the situation by initiating a series of unexpected actions. Thus offensive players develop a capability to initiate a range of actions, all of which can vary movement patterns; these patterns can be temporal or spatial in nature, but the idea is to disturb the pattern of the defensive player and place them in a sub optimal position from which to move. The ability to carry out a range of actions from similar positions therefore greatly increases the uncertainty faced by the defender. Faced with this, an opponent will often interpret the situation from a familiar standpoint and be tempted to react in a familiar manner. Offensive athletes who then have the ability to take another action before the rival can switch movements further complicate the situation for the defender and make it far more likely that an offensively successful movement can occur.

Defensively, the converse is true, and the defensive athlete should be consistently manipulating their own body position and the environment to limit the number of options available for the offensive player; essentially channelling them into the direction and the movement patterns the defenders want them to take. Critically throughout this, the defensive athlete needs to maintain a position of control from where they can initiate a range of movements in response to any change in pattern the offensive athlete may deploy. The application of an OODA loop for gamespeed is shown in Figure 3 and demonstrates how the process is cyclical, and occurring at all stages of sports movement.

'A key component of the OODA loop is making your intentions unpredictable while simultaneously reading competitors' intentions'

Developing effective practice

Effective movement is a skill and as such, needs to comply with the principles of effective practice. Eriksson[1] suggests that the key determinant of effective skill development is deliberate practice. Deliberate practice requires the following key elements:

1. a clear performance-related goal

2. progression of challenge

3. effective feedback, ideally from a skilled coach.

In developing effective gamespeed, the key starting point is to understand movements from a performance-related standpoint. It is here that the target classifications of initiation, actualisation and transition movements are particularly effective. Although these need to be developed as discrete movements, what is equally as important – given the role of the OODA

loop – is the ability to move rapidly and seamlessly between these movements. Thus key movement combinations become progressively shorter in nature, moving rapidly between movements needing to be developed. Over time these need to become progressively task-related, progressing from sports generic capabilities through to sport-specific movements. Additionally, these need to become context specific and involve multiple athletes and multiple stimuli which reflect the sports-specific task, such as working in a defensive line in football.

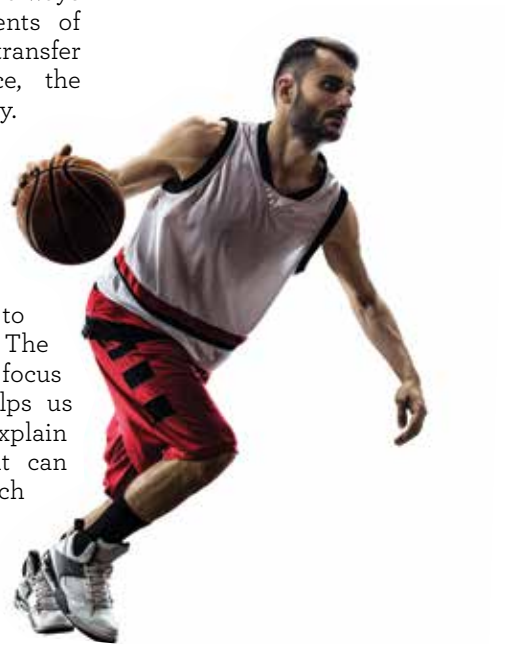
Importantly, when developing movement combinations, these combinations need to run from a more traditional sequence moving from transition movements into initiation and into actualisation sequence, but also from more non-traditional perspectives such as actualisation into transition or initiation. This reflects a key aspect of the OODA loop in that the action is not the end of the sequence and the loop must continue to act to reflect the effect that the initial action has had. So here, the ability to move from, for example, acceleration into a deceleration pattern, from acceleration into a cut pattern, from maximum speed into a curved run, from maximum speed into a deceleration with a further acceleration etc all provide sequences that may be deployed in the manipulation of the OODA loop.

All these movement combinations can produce uncertainty in the opposition and so need to be effectively developed. Additionally, movements such as accelerations and cuts can be combined with feigning-type actions to develop key offensive tools that can be deployed when in combat with a defender. Sessions can involve a range of methods from closed to open, but all should be focused on developing a capacity that reflects the application of the OODA loop into sports performance. Here, reactive elements can be sport-specific, but it is also important to remember that non-sport specific reactions can be useful if they enhance the capability to shift between movement patterns. So, although ultimately any reactive elements employed should as closely as possible reflect the sport-specific context, in the journey towards effective movement an exercise should ideally be judged on its capability to elicit the required movement responses.

Key to the development of effective movement is that any exercise, no matter how well it is designed, will only be as effective as the way it is deployed. In this way an exercise chosen needs to ensure that the movement resulting reflects the way it is carried out in the game. Importantly, the effective deployment of any exercise needs to be supported by effective feedback. This feedback needs to entail an understanding of the mechanical basis of movement, but also needs to be cognisant of the task the athlete will be required to undertake, and the likelihood of success in that task. In this way movement should never be judged solely on its speed but far more importantly on its ability to elicit the key sports-related goal that it is required to produce.

Summary

Although the concept of agility development has developed significantly over the past few years, it does not always reflect the game-based requirements of movement. If agility training is to transfer effectively to sports performance, the game must be the arbiter of quality. In this way, the game will identify the types of movement required in a sport, determine the tasks the athlete is required to achieve within the game and identify the 'combative' skills the athlete will need to develop in order to successfully achieve the task. The OODA loop concept and the focus on the concept of gamespeed helps us contextualise movement and to explain the multidimensional aspects that can potentially affect performance, which need to be incorporated into an effective gamespeed development programme. Athletes who run the loop most effectively will be those who show the greatest gamespeed.



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