

SYNCHRONIZATION OF SYNCHRONIZED SPRINGBOARD DIVERS IN DIFFERENT AGE GROUPS

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Investigation of age-related development of sport performance is an important task to reach best performance in elite sport age. Especially in synchronized diving there is the problem of how to develop different parts of performance (difficulty, movement quality and synchronization). Synchronization is measurable with criteria such as spatial synchronization and synchronization in timing. Our research in different age groups in Germany shows an increase in difficulty and quality of water entry from talent divers to elite divers. But for spatial synchronization and synchronization in timing there is no difference between the age groups. Young divers are as good as elite divers in synchronization but their dives are not so difficult. If you look at synchronized judges values, these findings can not be confirmed.

KEY WORDS: springboard diving, synchronized diving, age related, youths

INTRODUCTION:

Since Sydney Olympic games 2000, synchronized diving is part of the Olympic program. After this decision national federations focused on platform and springboard synchronized diving. To develop an elite synchronized diving team two components are important: First: good quality and high difficulty of individual dives and second: good synchronization of the two divers within their dives. Synchronized diving is also a part of training and competitions for youth divers. But there is no answer and no research on the question how to develop a young talented synchronized pair into an elite pair. What is the correct order for the components such as individual diving quality and synchronization of the two divers? To examine this question we need a method to measure synchronization in diving and then we can start a research project about synchronized diving from talent to elite.

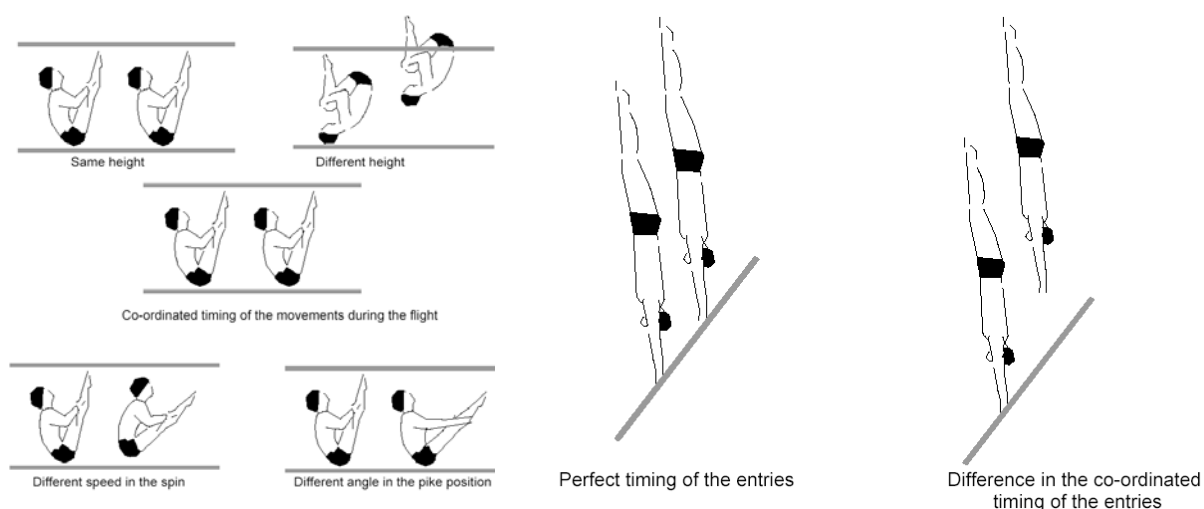


Figure 1: Illustration for Judges (Federation Internationale de Natation, 2006, p. 51)

There are a total of nine judges for the synchronized diving events, two for each diver judging the execution of the dive and five for judging the synchronicity of the divers. Research data from Koethe & Fricke (2005) showed problems concerning the independence of the two judge's values. From examining the rules of the International Federation (Federation Internationale de Natation, FINA) you can find a description how to judge

synchronized diving (Federation Internationale de Natation, 2006, p. 50). The description is supplemented by some figures (for an example see figure 1).

- „the starting position, the approach and the take-off, including the similarity of the height,
- the co-ordinated timing of the movements during the flight,
- the similarity of the angels of the entries,
- the comparative distance from the springboard or platform of the entry,
- the co-ordinated timing of the entries”

Two main criteria are important: Spatial synchronization (angels) and synchronization in timing. To measure synchronisation these criterions are the basis of the selected methods.

METHOD:

Data Collection: To analyze the dives for different age groups (see table 1), the national age group championships were recorded by two video cameras from both sides of the pool.

Table 1: Age groups in Germany for synchronized springboard diving and participants on German Championships and German age group Championships

Age group	Age	Springboard synchronicity pairs (women / men)
Youth C	12-13 years	11 (5 / 6)
Youth A/B	14-18 years	8 (3 / 5)
Elite	19 years and older	5 (2 / 3)

Data Analysis: Koethe & Fricke (2001) from our Institute modified a special diving analyzing system. This system was invented for individual dives. For quick analysis this system only measure main positions of the dive. For somersault dives these positions are:

1. take off
2. reach the tuck or pike position
3. leaving the tuck or pike position
4. stretched legs for tuck dives and 90° hip angle for pike dives
5. dive into the water (hand touch the water, water entry position).

For the individual analysis the time [ms] and the angle of somersault rotation [°] is measured in every position. Using these angles and time data some main parameters can be calculated (dive height, mean angular velocity in the tuck or pike position, water entry angle, time for water entry preparation). To measure synchronicity in synchronized diving, this system was modified. The positions for both divers were measured separately (see figure 2) and after this step differences between the two divers were calculated. As introduced we define synchronicity as spatial synchronization and synchronization in timing, that's why we calculate time differences for the same position between two divers and spatial differences (angle of somersaults) also for the dive specific position between the two divers. For the synchronisation we used the take-off position of the athlete with the first take off (see table 2). The differences are the criterion for synchronicity. The sum of the difference for the positions is the value for synchronicity of the dive.

To compare biomechanical data with the competition results, the judges values for synchronicity were used (judges values for individual performance were not considered).

RESULTS:

As defined the results are divided into spatial synchronisation and synchronisation in timing. The results separated for the positions and the age group are presented in Figure 3 (spatial) and Figure 4 (timing). There are two main results.

1. The synchronicity is better at the start and the end of the dive,
2. There is no difference between the age groups in synchronicity.

But if we look at the judges values for synchronisation (synchronisation quality, SQ) there are differences between the age groups (Table 3). Elite divers get better values than young divers.

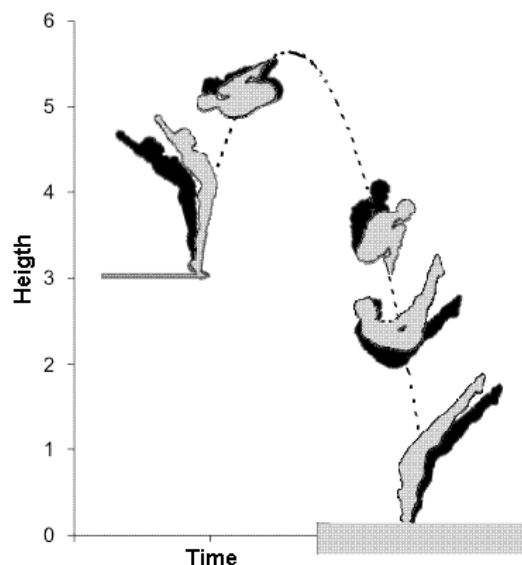


Figure 2: Positions for both divers as a base for the synchronized diving analyses

Table 2: Example (Dive 407C, 3 ½ somersaults Inward) for the differences (timing and spatial) as a criterion for synchronicity between the two divers

Position	Diver A	Diver B	Difference (synchronicity)
Take off	0 ms / 15 °	0 ms / 6 °	0ms / 9 °
reach the tuck or pike position	180 ms / 125 °	180 ms / 129 °	0 ms / 4 °
leaving the tuck or pike position	1000 ms / 963 °	1020 ms / 974 °	20ms / 11 °
stretched legs for tuck dives and 90° hip angle for pike dives	1140 ms / 1074 °	1180 ms / 1104 °	40 ms / 30°
water entry (hand touch the water)	1640 ms / 1253 °	1580 ms / 1257 °	60 ms / 4 °

Table 3: Synchronicity (spatial and timing), Degree of Difficulty (DoD) of the dives and judges value of synchronisation (SQ) for the different age groups

Age Group	M $\Delta\alpha$ [°]	M Δt [ms]	M DoD	M SQ
C	18 (\pm 13)	0,06 (\pm 0,05)	2,0 (\pm 0,4)	5,7 (\pm 1,1)
A/B	18 (\pm 12,5)	0,07 (\pm 0,05)	2,4 (\pm 0,6)	6,8 (\pm 0,8)
Elite	24 (\pm 20)	0,06 (\pm 0,03)	2,8 (\pm 0,4)	7,2 (\pm 0,8)

DISCUSSION:

There is a lack of concordance between the measured synchronicity and the judges' values. One reason is the inconsistency between the written rules for synchronicity. The quality of the dives should be independent from the synchronicity, but every judge look also at the quality of water entry.

CONCLUSION:

This study shows the performance of divers in different age groups for the criterions spatial synchronisation and synchronisation in timing. The young talents show easier dives (Table 3) but they are as good as the elite divers in synchronicity. It is possible to train synchronicity from the beginning of the divers' career. Long term studies are necessary to answer the

question about the order of training for the components individual diving quality and synchronization.

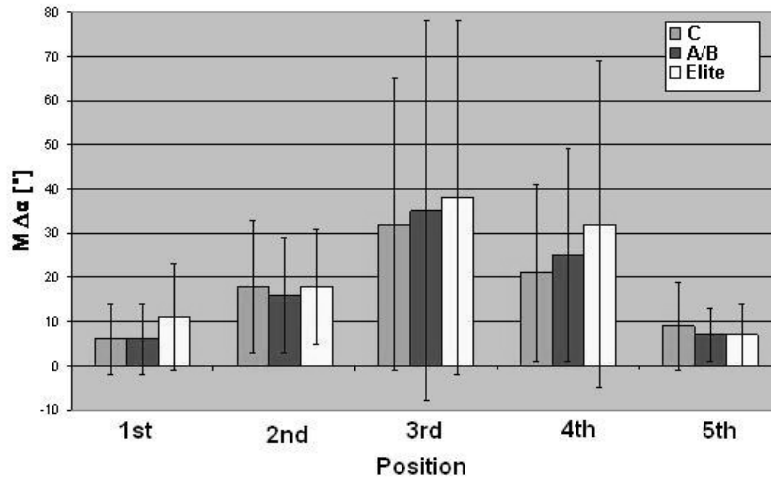


Figure 3: Spatial differences between the divers in different Positions and age groups

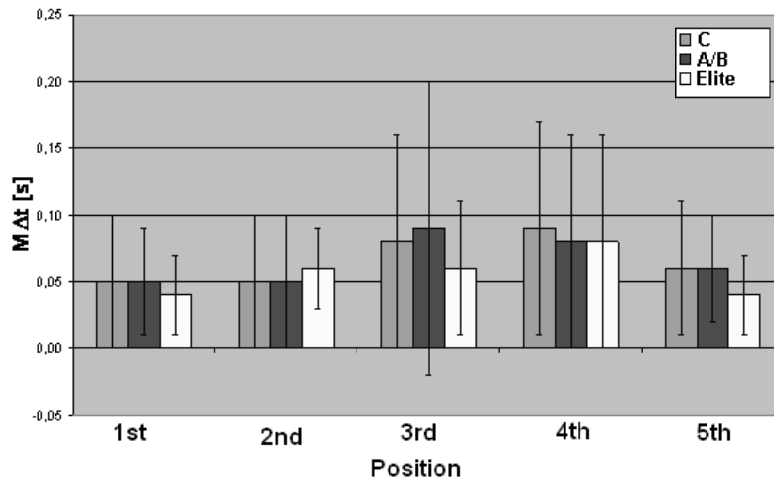


Figure 4: Differences in timing between the divers in different Positions and age groups

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