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# A COMPARISON BETWEEN SKILL AND DECISION-MAKING ABILITY OF NETBALL PLAYERS AT CLUB LEVEL: PILOT STUDY

Bronwyn B. BOCK-JONATHAN, Ranel E. VENTER & Elizabeth S. BRESSAN
*Department of Sport Science, Stellenbosch University, Stellenbosch, Republic of South Africa*

***ABSTRACT***

*This study explored the differences in technical performance and tactical knowledge of netball players at different levels of competition in the Western Cape. The players (N=30) were divided into three groups based on their level of competition (high level n=5, middle level n=12 and low level n=13). Each player's technical performance was assessed by four skill tests. A test protocol using slides and video clips of 17 different tactical problems was used to assess tactical knowledge. The results indicated that the skill tests were able to distinguish between the three groups, with Group A performing significantly better than Group B ($p<0.5$). Groups A and B both performed better than Group C ($p<0.01$). No differences were found among the groups for tactical knowledge. Although the test for tactical knowledge may have not been sufficiently difficult to discriminate differences between the groups, it is also possible that the tactical knowledge of the players who competed at the highest level was not more sophisticated than the knowledge of those who competed at the lowest level. This highlights the importance of coaching to develop tactical knowledge as a critical feature in any comprehensive sport development plan.*

**Key words:** Netball; Technical performance; Tactical knowledge; Coaching.

## INTRODUCTION

Learning in any sport can be divided into technical and tactical aspects. From this perspective, Dunn (2006) suggested that sport skill development could be regarded as a two-fold process. It must provide players with the opportunity to acquire a range of motor skills (technical performance) as well as help players learn when and where in the game to use the appropriate skills (decision-making based on tactical knowledge). The amount of time spent on technical performance and/or tactical knowledge and decision-making during practice will depend on the level of expertise of the player and the type of sport (Thomas, 1994). With this in mind, the authors of the current study compared the technical performance and tactical knowledge of netball players who compete at different levels, in order to identify what, if any, changes in expertise are evident as the level of competition increases.

Netball is categorised as a high-strategy sport (Abernethy *et al*., 1993). Beginners in these kinds of sport must learn to deal with the demands of changing circumstances during game play, as well as acquire a variety of skills and skill combinations. As a result, beginners in high-strategy sports base their success more on their understanding of the situation than on their motor skills. The quality of their tactical knowledge base and decision-making ability can exceed their technical skills and ability to execute skills.

Both technical and tactical development characterise progress from the novice level to the expert level. Iglesias *et al*. (2005) summarised that in terms of decision-making, experts:

- have a more extensive sport-specific knowledge base.
- can use their knowledge more efficiently to identify and manipulate information.
- are faster and more consistent in processing information.
- have more insight into and control over their own mental processes.

These expert-novice differences are supported by McPherson and Thomas (1989), who found that expert tennis players, regardless of their age, performed better than novices in terms of both skill and their understanding of the tactics of the game (they also made better decisions during the game).

According to Starkes and Ericsson (2003), the ways in which skill and knowledge interact during sport performance and how that interaction develops, are not well understood. Netball players have been described as "skilful" when they can pass effectively to maintain possession, and that an accurate pass is when the ball is placed in the space ahead of the player (Stratford, 1976). Cornwell (1992) stated that good netball stems from good footwork. French *et al*. (1995) concluded that the skill component of sport significantly differentiated levels of expertise.

Technical proficiency cannot be developed in isolation because players need to know how and when to apply their skills in game situations. This involves making various decisions. Decision-making in sport is based on knowledge, and the quality of decision-making has a profound impact on the level of expertise (Lyoka, 2001). Key factors - including the number of decisions to be made, the number of response options from which to select, the total time available for decision-making and the time-cost associated with incorrect decisions - influence the speed and accuracy of the process of response selection (Abernethy, 2001). Lyoka and Bressan (2003) found that the key discriminating variables for decision-making as defined by elite coaches included anticipation, cognitive knowledge, self-knowledge and the quality of memory processes.

As a high-strategy sport, netball requires the precise execution of technical motor skills as well as the application of tactical knowledge when making decisions. Although the main aim of ball possession is to score, the tactical objective of maintaining ball possession must also be considered (Franks *et al*., 1982). When a netball player is in possession of the ball, she/he must decide whether to retain possession, pass the ball immediately or, if the position allows, shoot the ball. If the player decides to pass the ball, the choice must be made regarding which team-mate is best positioned to receive it and what type of pass to deliver. Decisions about where and when to change position on the court are made continuously by players "off the ball" when either team-mates or opponents are in possession of the ball (Smith, 1985).

The importance of looking at both the technical and tactical capabilities of netball players was confirmed by Hoare (2000), who conducted a comprehensive research study with netball players to determine if physical, physiological and skill tests could accurately predict performance in netball for under-17-year old players. She found that her tests provided a reasonable level of accuracy in predicting selection into state teams of the centre players, but were less reliable when predicting for either the goal shooter or the goalkeeper positions.

However, she concluded that variance in performance at different levels could also be attributed to additional variables, including decision-making abilities and game sense. She recommended that future research should focus on an attempt to quantify these factors.

## PROBLEM

Netball is a fast-moving game and players who aspire to compete successfully at national and international levels need to develop high levels of technical skill performance as well as decision-making ability. Technical skill performance relies on the development of a flexible repertoire of procedural knowledge and decision-making ability relies on the development of a sophisticated base of tactical knowledge (Thomas, 1994). If netball in South Africa is to remain competitive at the top level, a system of development from novice to expert levels must be created and sustained. Because netball is a high-strategy and dynamic team sport, differences should be evident in both the technical performance and the tactical knowledge of players at different levels of competition in the game. The subjects in the current study were a sample of South African netball players who compete at different levels. The authors aimed to determine if those at the higher levels were more skilful and make better tactical decisions than those at the lower levels.

## LIMITATIONS

There are limitations to this study. The group size was small and the players were from a university setting which means the group was homogeneous. Another limitation in the study was the absence of the players from the best team either due to injury or to participation on the provincial or national squads. The instrument used to assess the tactical knowledge of the players was created specifically for this research, and it must be further developed. Despite the small sample size in the current study the information gathered can provide insight to coaches at the top levels about the success of their efforts to take their players to high levels of expertise in both technical performance and tactical knowledge.

## METHOD

This is a descriptive study that compares group results in terms of technical performance and tactical knowledge in netball.

### Participants

The principal researcher made a presentation at the local university's netball club to explain the research project. The university netball club only caters for female participants and therefore there were only female participants in the current study. A total of 30 subjects (N=30) volunteered to participate (a sample of convenience). They were categorised into three different groups based on their level of competition:

- Group A played for the University's second team and consisted of five players (n=5).
- Group B played for the University's third and fourth teams and consisted of twelve players (n=12).
- Group C played for the University's fifth and sixth teams and consisted of thirteen players (n=13).

Members of the University's first team were not included in the study because they were not available due to injury or participation on provincial or national squads.

**Measurement of Technical Skill**

The purpose of the tests for technical performance was to compare the skill proficiency of players from the three different groups. A test battery identified by Handcock and Knight (1994) for Coaching New Zealand was selected. The four tests included a netball agility test (a timed course around six markers), a passing accuracy test (hitting a target from a set distance), a repeated passing test (maximum passes completed against a wall in 60 seconds) and a pivot and pass test (time to complete 10 repetitions of the task).

**Measurement of Tactical Knowledge**

It was necessary to design an original test of tactical knowledge in netball. The test included both slides and video clips of game situations in order to assess decision-making ability. The situations depicted in the slides were identified by a provincial head coach to illustrate a variety of critical moments in games when a player has to make a tactical decision. Three possible decision options were provided for each slide on a score sheet, with only one option being the "correct option."

The video clips included in the study depicted five attacking situations and five defensive situations from a test match played between Australia and South Africa in November, 2000. Once the principal researcher identified a critical situation in which a tactical choice was made, the first part of the clip (cut-off just prior to the decision-based actions taken by the players) was recorded onto a second videotape. The second tape was used for the testing. As with the slides, three possible options were provided for each clip on a score sheet, with only one option being the "correct option."

Because the rules in netball state that a player must pass the ball within three seconds from the time the ball is received (Netball South Africa, 1999, rule 13.1:viii), it was decided to present each slide to the all of the subjects in a group. Each slide was presented for two seconds, during which time they had to decide and mark their individual choice on their own answer sheet, before the presentation of the next slide which followed two seconds after completed viewing of the previous slide. When viewing the video clips, the game situation was played up to the point where a critical tactical decision had to be made. At that point, the screen went blank and subjects had two seconds in which to indicate their choice among the options. The next clip then began to play after a two second interval from the time the screen went blank for the previous clip.

Content validity for the tactical situations and the identification of options (including agreement about the correct option) was established with the help of four expert coaches from the Western Cape. They reviewed every situation in every slide and then discussed whether or not the tactical situation in the slide was clear, and they determined together the optimal choice of actions. Changes were made in the content of the slides and the video clips until the experts were satisfied with the test content and protocol.

**Procedures**

All players were tested on the same day. Each subject signed a letter of informed consent before the commencement of data collection. First, technical performance was tested on a netball court. Subjects arrived and followed a generic warm-up prior to rotating from testing station to testing station, completing the battery of four tests. The order of the tests was the same for all subjects. Second, the subjects reported to a classroom after a 30 minute cool-down period. The pencils and the answer forms for the slides and the video clips were distributed and the testing procedure explained. Subjects were given three practice trials when they were shown a slide, then had to select their decision for the tactical action they thought best, from the three options provided on the form. Following completion of this session, all answer forms were collected.

**Data Analysis**

After a descriptive analysis of the results of the tests of technical performance and tactical knowledge, a composite score for technical performance was calculated based on the creation of a 6-Sigma Standard Score table. The Mann-Whitney test was used to determine if the three groups were significantly different from each other on their technical proficiency scores, their composite technical scores and/or their tactical scores.

## RESULTS AND DISCUSSION

The purpose of this study was to describe the differences in the technical performance and the tactical knowledge of players who compete at different levels in netball in South Africa. The review of literature suggested that players at the higher levels of competition (Group A in this study) should be more skilful and have a more sophisticated tactical knowledge base in netball than players who participate at the lower levels (Groups B and C in this study). The results of the study are presented in the following tables.

*TABLE 1*. **GROUPS**: **DESCRIPTIVE STATISTICS BASED ON RAW SCORES**

| TESTS | Stats | Group A Team 2 (n=5) | Group B Teams 3 & 4 (n=12) | Group C Teams 5 & 6 (n=13) |
|---|---|---|---|---|
| Agility | Mean | 17.68 | 17.9 | 18.62 |
| | SD | 0.23 | 0.75 | 0.60 |
| Passing accuracy | Mean | 18.00 | 15.25 | 12.92 |
| | SD | 3.87 | 2.63 | 3.43 |
| Repeated passing | Mean | 49.80 | 45.67 | 46.08 |
| | SD | 3.42 | 5.10 | 2.63 |
| Pivot and pass | Mean | 30.92 | 30.05 | 34.41 |
| | SD | 0.83 | 3.64 | 1.90 |
| Tactical knowledge | Mean | 9.20 | 10.33 | 9.46 |
| | SD | 2.17 | 1.87 | 1.90 |

Group A = Highest level Group B = Middle level Group C = Lowest level

Table 1 presents the descriptive statistics for the tests of technical performance and tactical knowledge. In terms of technical performance, the scores on the tests of agility and passing

accuracy demonstrated the expected trend in which Group A performed better than Group B, and Group B performed better than Group C. On the repeated passing test, Group A performed better than B, but Group C also performed better than Group B, which was not expected. On the pivot and pass test, Group C performed at a lower level than either Group A or B, which was expected. However, Groups A and B were similar in their performance, with Group B actually performing at a slightly quicker rate. The scores on the tests of tactical knowledge also yielded unexpected results. Group B had the best scores, and the scores for Groups A and C were quite similar. In fact, Group A had the lowest score.

In order to compare performances on the different tests, a standard score scale was created using 6-Sigma statistics (see Table 2). This technique was based on identifying the maximum and the minimum score on each test, then spreading the distribution of the scores along a scale with a top score of 100 and an interval of 5.

*TABLE 2.* **STANDARD SCORE SCALE (6-Sigma) FOR ALL PARAMETERS FOR TOTAL GROUP (N=30)**

| **Standard Score** | **Agility** | **Passing accuracy** | **Repeated passing** | **Pivot and pass** | **Tactical knowledge** | **Standard Score** |
|---|---|---|---|---|---|---|
| **100** | 16.0 | 25 | 59 | 22.2 | 15 | **100** |
| **95** | 16.2 | 24 | 58 | 23.2 | | **95** |
| **90** | 16.4 | 23 | 56 | 24.2 | 14 | **90** |
| **85** | 16.6 | 22 | 55 | 25.2 | | **85** |
| **80** | 16.9 | 21 | 54 | 26.2 | 13 | **80** |
| **75** | 17.1 | 20 | 53 | 27.1 | | **75** |
| **70** | 17.3 | 19 | 51 | 28.1 | 12 | **70** |
| **65** | 17.5 | 18 | 50 | 29.1 | 11 | **65** |
| **60** | 17.7 | 17 | 49 | 30.1 | | **60** |
| **55** | 18.0 | 16 | 48 | 31.0 | 10 | **55** |
| **50** | 18.2 | 15 | 47 | 32.0 | | **50** |
| **45** | 18.4 | 14 | 45 | 33.0 | 9 | **45** |
| **40** | 18.6 | 13 | 44 | 34.0 | | **40** |
| **35** | 18.8 | 11 | 43 | 35.0 | 8 | **35** |
| **30** | 19.1 | 10 | 42 | 36.0 | 7 | **30** |
| **25** | 19.3 | 9 | 40 | 37.0 | | **25** |
| **20** | 19.5 | 8 | 39 | 38.0 | 6 | **20** |
| **15** | 19.7 | 7 | 38 | 38.9 | | **15** |
| **10** | 19.9 | 6 | 37 | 39.9 | 5 | **10** |
| **5** | 20.2 | 5 | 36 | 40.9 | | **5** |
| ***$C_{(i=5)}$** | 0.22 | 1.08 | 1.22 | 0.98 | 0.57 | ***$C_{(i=5)}$** |

*C = Constant for an interval of 5

Table 3 presents the descriptive statistics for the standard scores achieved on each of the tests by the teams involved in this study.

*TABLE 3.* **DESCRIPTIVE STATISTICS BASED ON STANDARD SCORES**

| TESTS | Team A (n=5) | Team B (n=12) | Team C (n=13) |
|---|---|---|---|
| **Agility** | | | |
| Mean | 61.4 | 56.4 | 39.8 |
| SD | 5.0 | 17.9 | 14.1 |
| **Passing accuracy** | | | |
| Mean | 64.0 | 51.9 | 41.3 |
| SD | 19.4 | 12.0 | 14.8 |
| **Repeated passing** | | | |
| Mean | 64.0 | 46.6 | 48.8 |
| SD | 13.87 | 26.1 | 11.0 |
| **Pivot and pass** | | | |
| Mean | 55.60 | 59.9 | 38.4 |
| SD | 4.45 | 22.8 | 9.8 |
| **Technical performance (results of the four skill tests combined and equally weighted)** | | | |
| Mean | 61.60 | 53.8 | 42.0 |
| SD | 8.59 | 5.4 | 5.1 |
| **Tactical knowledge** | | | |
| Mean | 47.0 | 57.9 | 49.9 |
| SD | 18.91 | 16.8 | 17.6 |

Table 3 presents descriptive statistics based on the standard scores on each of the tests for the players in each group. A composite technical performance score was calculated for each group as the average of the standard scores on the four skill tests, so that a comparison could be made between technical performance and tactical knowledge. In terms of technical performance, the expected trend appears in which Group A, who plays at the highest level, had the highest scores. Group C, who plays at the lowest level, had the lowest scores. Group B was the middle group, both in terms of the league in which they play and their composite skill performance score. As noted earlier, the scores for tactical knowledge did not follow the expected trend, with Group A scoring lowest, Group C in the middle, and the highest scores were earned by Group B.

*TABLE 4.* **SIGNIFICANCE OF DIFFERENCE* BETWEEN INDEPENDENT GROUPS FOR ALL MEASUREMENTS**

| Measures | Group A vs B | Group A vs C | Group B vs C |
|---|---|---|---|
| Agility | ND | **0.01** | **0.05** |
| Passing accuracy | ND | **0.01** | **0.05** |
| Repeated passing | **0.05** | **0.05** | ND |
| Pivot and pass | ND | **0.01** | **0.01** |
| Technical Performance# | **0.05** | **0.01** | **0.01** |
| Tactical knowledge | ND | ND | ND |

***** Based on Mann-Whitney Test (Non-parametric: ranking of raw scores)
# Using standard score mean score for four skill tests

Table 4 presents the significance of differences found when comparing the three groups in terms of their technical skill performance, their composite score of technical skill performance and their tactical knowledge. Group A scored significantly better than Group B in repeated passing ($p<0.05$) and their overall technical performance ($p<0.05$). Because the repeated passing test requires muscle endurance, it is possible that Group A was more physically conditioned than Group B, rather than more skilful at the task. Group A plays at a higher and more intense level of netball and that could have an impact on muscle endurance.

There was no significant difference found between Group A and Group B for any of the other technical tests (agility, passing accuracy and pivot and pass). Agility is a complex variable. There is debate in the sport science community surrounding a precise definition for agility, and the term is applied to a broad range of sport contexts with great inconsistency (Sheppard & Young, 2006). It is possible that the agility test used in this study was not sufficiently specific to netball. The test of passing accuracy did not require the players to execute their passes in a limited amount of time, which is the case in netball. This potential weakness in ecological validity could have affected the results. It is recommended that a time limit should be built into this test. For the pivot and pass test, players were required to collect a ball from a chair, pass it to a player standing ten metres away and then pivot, run and jump over a bench to collect the ball on the other side. The players needed to complete ten trials in the shortest amount of time. Although muscle endurance is involved, it is possible it was not sufficiently challenging to discriminate between the highest level and the middle level players.

Group A scored significantly better than Group C on all measures of skill performance, including the overall technical performance score ($p<0.01$). Group B scored significantly better than Group C on all measures of skill and overall technical performance ($p<0.01$), with the exception of repeated passing where no significant difference was found. Because of the involvement of muscle endurance in repeated passing, it is possible that the two groups are similar in their fitness in relation to this task. These findings confirm previous research that has found that technical skill performance can discriminate between players at the higher level and lower level in team sports (Thomas, 1994; French *et al*., 1995; Hoare, 2000).

The lack of significant difference found between the technical performances of Groups A and B should not be too quickly attributed to fitness differences or the need to find more "ecologically valid" tests. It could also be that there are not sufficient differences in the technical performances of players at different levels in South African netball. If this is the situation, then the skills development programme needs attention and a close look at the quality of practice sessions at the higher levels is required. More research is clearly needed in order to interpret these results.

There were no significant differences found between the any of the groups in terms of their tactical knowledge. This was an unexpected result since previous research had found that more expert players had greater tactical understanding and made better decisions than less expert players (Thomas, 1994; French *et al*., 1995). The ecological validity of using slide and video protocols for testing tactical knowledge can be challenged (Starkes & Lindley, 1994). The correct response to the situations in the protocol could also have been too obvious. The assessment of tactical knowledge and its relationship to decision-making is regarded as an immature area in sport science (Gréhaigne *et al*., 1999), and the equivocal results of the assessment effort in this study support the call for more sophisticated research on the topic.

## CONCLUSION

Hoare (2000) recommended that netball research include quantifying psychological and tactical aspects of the game in addition to developing physical testing procedures. This research was an attempt to do this within the context of South African netball. The tests of technical performance used in this study could discriminate between the highest and the lowest levels, but not the middle level. This could mean that these tests, or other tests, should be developed so that they can discriminate better between skill levels. This same challenge applies to the development of a test to assess tactical knowledge and decision-making.

The implications of the findings from this study are not only for sport scientists interested in measurement and evaluation. The lack of significant differences found in the tactical knowledge of players at any level in this study is still troubling. Coaches responsible for netball development must ask themselves if there are substantial differences in the technical performance and tactical knowledge of players at different levels. The research is clear that there should be. In order to create this difference, a careful look at the content and sophistication of practice sessions and the expertise of coaches is recommended. Tactical knowledge in particular requires consideration. A focus on decision-making and development of tactical knowledge is common at elite level sport. According to Slocombe (1997), some of the greatest lessons learned by England's hockey team at the Atlanta Olympics were those regarding decision-making and the training of players. If netball in South Africa is to progress, it would benefit from the advice of Pauline Harrison (1998: 19) who gave her view regarding England netball and its "plans to be the best":

> Coaches must learn new ways…Our key priority and challenge must be to help coaches learn new methods, so that they can comfortably operate within the new system. It is also essential that they become familiar with the world's best practice, that they understand and are able to coach to world class standards.

## RECOMMENDATIONS

The results from this research indicate that assessing tactical knowledge remains challenging. Future research should focus on the differences between the tactical knowledge of elite and novice netball players. This study can be described as a pilot study and hence a follow-up study is necessary to address the methodological limitations. It will also be valuable to modify and build on the existing tactical knowledge measuring instrument. Future tactical knowledge measuring instruments should focus on designing tactical situations on digital video discs (DVD) so that players can be tested individually and/or in a group setting using computers.

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Ms. Bronwyn B. Bock-Jonathan: Department of Sport Science, Stellenbosch University, Private Bag X1, Matieland 7206, Republic of South Africa. Tel.: +27 (0)21-8084771 (w), +27 (0)21-8082457 (h), Fax.: +27 (0)21-8084817, E-mail: bronwyn@sun.ac.za

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# DIE MOTORIESE VAARDIGHEDE VAN EERSTEJAAR ONDERWYSSTUDENTE IN MENSLIKE BEWEGINGSTUDIES

Dina J. CLOETE, Antoinette BOTHA, Johann L. CLOETE &
Elmarie M. VAN WYK
*Skool vir Onderwysersopleiding, Departement Kunste, Tale en Menslike Bewegingstudie-onderwys, Universiteit van Pretoria, Pretoria, Republiek van Suid-Afrika.*

***ABSTRACT***

*The facilitating of Human Movement Studies form an important part of a learner's total development. The World Health Organization found that more than two thirds of young people are not sufficiently physically active (Brundtland, 2002: 2). This lack of movement above all entails inadequate physical development. The aim of this study is to determine the level of the motor skills of first year students by using a test battery which was developed by the researchers. The level of motor skills was recorded by means of a five point scale. It was found that more than half of the respondents' motor skills were insufficiently developed. The article concludes with the recommendation that physical education students and teachers need to improve their own levels of motor skills in order to develop movement activities significantly. There should also be a clear distinction between movement activities as part of the formal academic programme and activities as part of an extra mural activity plan.*

**Key words:** Motor skills; Movement; Physical development; First year students.

## INLEIDING

Elke mens verrig elke dag veelvuldige motoriese funksies wat onwillekeurig uitgevoer word. Onder andere opstaan, loop, hardloop, eet en spring. Baie van hierdie vaardighede word uit gewoonte uitgevoer en word nie doelbewus beheer nie, maar daar word tog aanpassings en oordeel van elke individu vereis. Nel (1998b) meen 'n persoon met beter ontwikkelde motoriese vaardighede sal in staat wees om onmiddellik die nodige aanpassings by veranderde omstandighede te maak. Hy meen verder dat elke mens oor die vermoë beskik om meer gevorderde vaardighede aan te leer en dat hierdie vermoë bepaal word deur die individu se sintuiglike funksies, kinestetiese aanvoeling, koördinasie en balans. Dit bepaal weer die mate van sukses wanneer hy deelneem aan spel, sport of ander vorme van rekreasie.

Volgens Willis en Cambell (1993) is een van die grootste probleme van vandag om die bevolking van enige land te motiveer om een of ander vorm van fisieke aktiwiteit te beoefen. Die Wêreldgesondheidsorganisasie het bevind dat meer as twee derdes van alle jongmense nie bevredigend aan fisieke aktiwiteite deelneem nie (Prakash, 2002). Ook in Suid-Afrika wil dit voorkom asof dit vir die meeste individue (kinders sowel as volwassenes) moeilik is om aktief te word en te bly.

Vroeër het navorsers soos Casebeer (1978) daarop gewys dat verstedeliking, groot geboue en gebrek aan ruimte, kinders van die voorreg ontneem om boom te klim, te rol, te spring en te hardloop. Munro (1985) onderskryf hierdie bevinding en is ook van mening dat dit noodsaaklik is dat hierdie vaardighede in die skool aangeleer word. Tegnologie speel ook