Levels of Organization in the Structure of Awareness of Sport

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1. Title of Paper

Levels of organization in the structure of awareness of sport

2. Problem

Mullener and Laird (1972) have suggested that the levels-of-organization conception employed in theories of science (Feibleman, 1954) memory (Craik and Lockhart, 1972) and cognitive development (eg. Piaget, 1976) can be applied to an analysis of the structure of interpersonal knowledge as well. Levels-of-organization theory assumes that a single situation can be experienced at different levels hierarchically arranged. Higher level experiences are defined as experiences of relations between lower level experiences. That a level is "higher," however, does not entail that it be more complex or informative than a lower level. Different levels take note of a different set of relations; higher levels are not more encompassing nor are lower levels more basic.

The Mullener and Laird study identified five hierarchial levels of organization for the awareness of persons (self and other), ranging from experiences of motionless body parts (Level 1) to experiences of dispositions, abilities, long-term motives, beliefs and attitudes (Level 5). The study found that differences in levels of awareness were a direct function of the information needs of observers, either as manipulated in the experiment or as a function of the observer's relationship to the object person.

In the Mullener and Laird study, all subjects appeared to be able to become aware of any of the levels studied, presumably because all levels were within the range of competence of ordinary adults. However, the general levels-of-organization conception is explicitly developmental and assumes that a given level cannot be mastered until a reasonably high level of competence has been achieved at the immediately lower level. The purpose of this study was, then, to examine one implication of this developmental conception, in the domain of action.

Development in general realms like knowledge of people, presumably depends on experiences which are available to all, and a developmental analysis of this realm of knowledge would require a longitudinal or cross-sectional look at children such as a recent study by Teske, (1980). An alternative strategy, employed here, was to look at differences in the level of organization at which people could function in a realm where experience was less common. Where experience is less available, the level at which people could perceive would be expected to be a function of their degree of experience with the phenomena. In the general domain of action, sports performances provide an excellent example. Such performances may be perceived at a variety of levels of organization, but only those who have had sufficient experience in participating or observing the sport would be expected to be able to perceive the higher levels of organization. The study consisted of presenting subjects who varied in their basketball experience with a film of a basketball game, and asking them to answer questions about the action.

Various levels of organization of basketball knowledge were characterized by logical analysis of the concepts, and it was expected that differences in athletic awareness would vary directly as a function of subjects' basketball experience. It was hypothesized that basketball players at higher skill levels or with greater experience would perceive their sport more accurately (at each level of organization), but also that more experienced basketball players would be able to perceive events at higher levels of organization as well.

3. Subjects

Subjects were 48 male undergraduate volunteers. The subjects were classified into one of six categories of basketball skill and one of four categories of time they had played organized basketball.

4. Procedure

Subjects were run in groups ranging from five to thirteen. The subjects

were told that their general "basketball knowledge" was to be tested and were then shown a videotape recording of a local college basketball game (without sound). The tape was halted and "stilled" at various points. Subjects were asked to answer 57 questions of five different types. Eight questions dealt with form and technique (Level 1), 13 questions concerned basketball positioning or shot selection (Level 2), 10 questions dealt with individual plays or types of offenses and defenses (Level 3), and 12 questions asked about manipulation, "reading" the floor, tempo control, and other aspects of basketball strategy (Level 4). Additionally, in order to assess level of response in more open-ended questions, 14 more questions were asked which could be answered at any of the four levels.

5. Results

Answers were scored on two dimensions: whether they were correct and more importantly, the level to which the answers corresponded. For each of the four question levels, the total number of correct answers at or above the level at which the questions were asked were tabulated for each subject. These proportions (after arcsin transformation) were analyzed in two-way anovas with 4 levels of question type and 6 levels of skill. Additionally, the questions which could be answered at any level were also scored as to correctness and answer level. For the open-end questions, a mean level of correct response was calculated for each subject.

As one would expect, there was a significant main affect for skill (F (5,168) = 55.57, $p < .001$, indicating that more skilled subjects answered more questions correctly, whatever the level of organization of the question. There was also a significant main affect for question levels, F (3,168)= 44.02, $p < .001$. Indicating as one would expect, that higher level questions were less often answered correctly. Most important, however, was a significant interaction between skill level and question level, F (15,168)=2.83, $p < .001$, supporting the prediction

of the differentially greater ability of more skilled subjects to answer the increasingly higher level questions. The same pattern of results appeared when amount of experience rather than skill was used as the between subjects variable. There was a significant main effect of experience (see Table and Figure 2), F (3,176)=23.97, p .001, and question levels, F (3,176)= 24.76, $p < .001$.

Subjects' performance on the open-end questions provided a measure of their ordinary level of awareness of the game. As expected, more skilled subjects consistently answered the flexible questions at higher levels, F (5,42)= 29.57, $p < .001$. Similarly, subjects with greater experience also answered the flexible questions at higher levels F (3,44)= 13.88 $p < .001$.

6. Implications and Conclusions

As predicted, differences in athletic awareness varied directly with the subjects' exposure to the sport: highly skilled or greatly experienced athletes perceived their sport not only more accurately but also at higher levels of organization than less skilled or experienced athletes. In effect, more skilled subjects saw a different game which contained events which less skilled subjects were unaware of.

This pattern of results is consistent with the general levels-of-organization conception, and supports the logical analyses which ordered the categories of awareness originally. Thus, these results provide additional support for the general hypothesis that the varieties of knowledge and experience of ordinary people can be usefully described as a logical hierarchy of levels of organization.

With respect to sports in particular, the results suggest an extension of our usual notions of skill. Certainly a part of skill is physical dexterity and the capacity to perform complex movements. However, a major additional component of skill has long been recognized to consist of "knowing the game." These results suggest that knowledge of the game may actually be the ability to perceive higher levels of organization of the game's activities.

Table 1

Percentage Correct per Skill Level

Question Level	Never Played	Not Currently Playing	Intra-mural	Junior Varsity	A Level	Varsity
1	21.5%	36.3%	57.2%	73.4%	86.5%	91.2%
2	66.6	76.0	84.6	85.8	82.2	93.1
3	36.3	33.5	54.8	79.6	79.5	98.1
4	7.2	14.3	24.5	57.3	67.2	70.6
Mean Total	32.9	40.0	55.3	74.0	78.9	88.3
Open level questions	26.6	38.1	51.4	64.9	75.9	80.0

Table 2

Percentage Correct per Experience Level

Question Level	0-3 yrs	4-6 yrs	7-9 yrs	10+13 yrs
1	37.6%	53.3%	77.5%	83.1%
2	76.1	81.7	83.1	89.7
3	43.2	49.3	79.4	90.0
4	22.6	33.2	49.6	60.6
Mean Total	44.9	54.4	72.4	80.9
Open level questions	37.5	52.0	66.0	75.5

This paper is formally about the organization of knowledge about action, but in real sense it is also an attempt to explain why Larry Bird is such a great basketball player. I think that what I mean by the first, formal version of our purpose can be best explained by elaborating on the second, real version.

For those of you who don't follow professional basketball, or who live outside the Boston Celtics' sphere of influence, I should explain that Larry Bird is an extremely good player who is especially noted for his ability to pass the basketball to his teammates in unexpected and effective ways. Bird has all of the usual attributes of good basketball players, such as being gargantuan and being able to shoot a basketball through the hoop from a quarter of a mile away. The important thing is that these are not the reasons he stands out. In fact, on those dimensions he is not any better than a number of other professional basketball players. What distinguishes Bird is that he seems to be able to "see" possibilities that other players cannot, and can anticipate what is going on better than most of the other players. That is what we were interested in, the understanding of action, in this case, basketball action.

I have to confess at this point that in our research we did not actually study the game at the level of Larry Bird, although we did have among our subjects some very good basketball players. And furthermore, we didn't start out to find out what distinguished Larry Bird from the rest. We started out by trying to understand how people understand each other in general, including how they understand actions, and we hit on basketball as a good medium of study because it seemed to be appropriately complex. So, we began with some strong theoretical assumptions about the nature of knowledge about people.

In particular, we believed that the levels-of-organization conception employed in theories of the philosophy of science (Feibleman, 1954) memory (Craik and Lockhart, 1972) and cognitive development (eg. Piaget, 1976) can be applied to an analysis of the structure of interpersonal knowledge as well. Levels-of-organization theory assumes that a single situation can be experienced

at different levels hierarchically arranged. Higher level experiences are defined as experiences of relations between lower level experiences. That a level is "higher," however, does not entail that it be more complex or informative than a lower level. Different levels take note of a different set of relations; higher levels are not more encompassing nor are lower levels more basic.

A couple of examples might help here. First, consider what I am doing right now. I am making noises. I am also saying words. Notice that this is not two different things that I am doing right now, but two different ways of thinking about what I am doing. The difference between you thinking I am making noise as opposed to you thinking I am saying words is that in the second case, you are paying attention to the particular patterns of noises, and noticing that I am making some particular patterns which belong to a language, in this case, English. Thus, to recognize that I am saying words is to attend to a pattern of the noises.

Now, I am also speaking sensible sentences (or at least I hope I am). When you think that I am speaking sentences, you are recognizing a pattern in the words that I have been saying, which are in turn patterns in the noises I have been making. I am also at this point <u>explaining</u> these ideas, and when you think about me as explaining, you are paying attention to the patterns among my sentences. In this example then, at this moment I am making noise, saying words, speaking sentences, and explaining ideas. But I am not, like some circus act, doing four things at once, like juggling three balls, balancing a stick, standing on my head and singing the national anthem. Instead of doing four things at once, I am doing one thing which can be thought of in four different ways. And these four different ways of thinking represent what we call four different levels of organization. They are levels because the higher levels depend on the lower, but notice that they do not contain them. For example, I couldn't be explaining if I wasn't doing anything at all. If

I am asleep, I can't be explaining. However, explaining doesn't require a particular lower level activity. I could, for instance, explain by writing and not be speaking at all. Or I could be forming words by sign language without making noise. Hopefully at this point the way we are using the idea of levels of organization is clear, but if it isn't, perhaps it will become clearer in a couple of minutes when I give you some basketball examples.

First let me give you some of the theoretical background for the study itself.

In an earlier study, Mullener and Laird identified five hierarchial levels of organization for the awareness of persons (self and other), ranging from experiences of motionless body parts (Level 1) to experiences of dispositions, abilities, long-term motives, beliefs and attitudes (Level 5). The study found that differences in levels of awareness were a direct function of the information needs of observers, either as manipulated in the experiment or as a function of the observer's relationship to the object person.

In the Mullener and Laird study, all subjects appeared to be able, if they needed, to become aware of any of the levels studied, presumably because all levels were within the range of competence of ordinary adults. However, the general levels-of-organization conception is explicitly developmental and assumes that a given level cannot be mastered until a reasonably high level of competence has been achieved at the immediately lower level. The purpose of this study was, then, to examine one implication of this developmental conception, in the domain of action.

Development in general realms like knowledge of people, presumably depends on experiences which are available to all, and a developmental analysis of this realm of knowledge would require a longitudinal or cross-sectional look at children such as a study being reported somewhere else today by John Teske, (1981). An alternative strategy, which we adopted, was to look at differences in the level of organization at which people could function in a realm where

experience was less common. Where experience is less available, the level at which people could perceive would be expected to be a function of their degree of experience with the phenomena. In the general domain of action, sports performances provide an excellent example. Such performances may be perceived at a variety of levels of organization, but only those who have had sufficient experience in participating or observing the sport would be expected to be able to perceive the higher levels of organization. The study consisted of presenting subjects who varied in their basketball experience with a film of a basketball game, and asking them to answer questions about the action.

Various levels of organization of basketball knowledge were characterized by logical analysis of the concepts, and it was expected that differences in athletic awareness would vary directly as a function of subjects' basketball experience.

We actually did this by showing a videotape of a basketball game and freezing the action at some point and asking the subjects questions based on what had happened up to that point. For example, the frozen moment of action might include a picture of a player shooting a jump shot. At that moment, however, the action could be understood at a variety of levels. For example, at lower levels were the way he was shooting, or, slightly higher, whether that was a wise choice of shots, or still higher, what kind of offensive or defensive play the shot was contained in, or at the highest level at which we worked, how that shot reflected the effectiveness of a particular strategy of play. Before you start thinking about asking me difficult questions about the higher levels of awareness, I should explain that I am not a basketball player, and that we were very fortunate to have lots of help from Wally Halas, the basketball coach at Clark. (Wally is a very successful coach; his teams have been among the top four in New England in his division every year he has coached, and this year were ranked sixth in the nation) and he was very nice in telling us what was going on. We then, with his help, analyzed his comments into the

various levels or organization represented. He also, most importantly, told us what the correct answers are. Then we showed this tape to people. We expected that basketball players at higher skill levels or with longer experience would perceive their sport more accurately (at each level of organization), but also that more experienced basketball players would be able to perceive events at higher levels of organization as well.

The subjects were 48 male undergraduate volunteers. The subjects were classified into one of six categories of basketball skill and one of four categories of time they had played organized basketball.

Subjects were run in groups ranging in size from five to thirteen. The subjects were told that their general "basketball knowledge" was to be tested and were then shown the videotape recording (without sound). When the tape was halted and "stilled" subjects were asked to answer 57 questions of five different types. Eight questions dealt with form and technique (Level 1), 13 questions concerned basketball positioning or shot selection (Level 2), 10 questions dealt with individual plays or types of offenses and defenses (Level 3), and 12 questions asked about manipulation, "reading" the floor, tempo control, and other aspects of basketball strategy (Level 4). Additionally, in order to assess level of response in more open-ended questions, 14 more questions were asked which could be answered at any of the four levels.

Results

Answers were scored on two dimensions: whether they were correct and more importantly, the level to which the answers corresponded. For each of the four question levels, the total number of correct answers at or above the level at which the questions were asked were tabulated for each subject. These proportions (after arcsin transformation) were analyzed in two-way anovas with 4 levels of question type and 6 levels of skill. Additionally, the questions which could be answered at any level were also scored as to correctness and answer level. For the open-end questions, a mean level of correct response was

calculated for each subject.

As one would expect, there was a significant main affect for skill ($F(5,168) = 55.67$, $p < .001$, indicating that more skilled subjects answered more questions correctly, whatever the level of organization of the question. This is a pretty obvious result, of course, but it is reassuring since it indicates that our test does have something to do with basketball knowledge. There was also a significant main affect for question levels, $F(3,168) = 44.02$, $p < .001$, indicating as one would expect, that higher level questions were less often answered correctly. This was also reassuring, because it indicated that the questions were ordered. In effect, it shows that the higher the level as we analyzed them, the more difficult across the whole population. Finally, most important, however, was a significant interaction between skill level and question level, $F(15,168) = 2.83$, $p < .001$, supporting the prediction of the differentially greater ability of more skilled subjects to answer the increasingly higher level questions. This interaction represents two effects, one the expected extra advantage of the most skilled players in answering the highest level questions. The other was that subjects in the lower three skill levels especially did not do best at the lowest "fundamental" level, but at the next level above that. This result is consistent with developmental data (Teske, 1981) which show that the lowest levels identifiable by logical analysis seem to be unfamiliar, and therefore less accessible to subjects at lower developmental levels.

These results for the fixed level questions are consistent with our expectations, and indicate that subjects who are more skilled are able to experience higher levels of organization of the action of basketball. In other words, they tell us about capacity. The open-level questions, on the other hand, tell us something about how people ordinarily do experience the game. In these questions, subjects could answer correctly at any of the four levels, so we were now able to get a measure of what level they would naturally respond. The results are quite clear. The greater the subjects' skill level, the higher the level at

which they answered these questions. In short, more skillful subjects (F (5,42) = 29.57, $p < .001$) were automatically "seeing" things that the other subjects did not.

Incidentally, the same pattern of results appeared when amount of experience rather than skill was used as the between subjects variable. In fact, they are so similar it isn't worth going into detail about them.

So just as we expected, differences in athletic awareness varied directly with the subjects' exposure to the sport: highly skilled or greatly experienced athletes perceived their sport not only more accurately but also at higher levels of organization than less skilled or experienced athletes. In effect, more skilled subjects saw a different game which contained events which less skilled subjects were unaware of.

This pattern of results is consistent with our expectations and the general levels-of-organization conception, and supports the logical analyses which ordered the categories of awareness originally. The general point is that the varieties of knowledge and experience of ordinary people consists of a logical hierarchy of levels of organization.

With respect to sports in particular, the results suggest an extension of our usual notions of skill. Certainly a part of skill is physical dexterity and the capacity to perform complex movements. However, a major additional component of skill has long been recognized to consist of "knowing the game." These results suggest that knowledge of the game may actually be the ability to perceive higher levels of organization of the game's activities. What sets Larry Bird apart, then, may be that he really "sees" things happening that most other players cannot.