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They Do What They Are Told to Do: The Influence of Instruction on (Chess) Expert Perception—Commentary on Linhares and Brum (2007)

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Abstract

Linhares and Brum (2007) argue that they provide evidence for analogy as the main principle behind experts' acquisition of perceptual knowledge. However, the methodology they used—asking players to pair positions using abstract similarity—raises the possibility that the task reflects more the effect of directional instructions than the principles underlying the acquisition of knowledge. Here we replicate and extend Linhares and Brum's experiment and show that the matching task they used is inadequate for drawing any conclusions about the nature of experts' perception. When expert chess players were instructed to match problems based on similarities at the abstract level (analogy), they produced more abstract pairs than pairs based on concrete similarity. However, the same experts produced more concrete pairs than abstract ones when instructed to match the problems based on concrete similarity. Asking experts to match problems using explicit instructions is not an appropriate way to show the importance of either analogy or similarity in the acquisition of expert knowledge. Experts simply do what they are told to do.

Keywords: Analogy; Chess; Chunking; Expertise; Human experimentation; Memory; Pattern recognition; Perception; Representation; Similarity

1. Introduction

Expert knowledge and the underlying principles of its acquisition have been a central theme of research ever since the seminal works of de Groot (1978-1946) and Chase and Simon (1973). It is generally accepted that this knowledge captures, among other things, the

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statistical structure of the environment using principles based on perceptual similarity (Bilalić, McLeod, & Gobet, in press; Chase & Simon, 1973; Gobet & Waters, 2003). Linhares and Brum (2007) have challenged this view and argued that analogy at an abstract level (Hofstadter, 2001; Linhares, 2005), and not similarity at the surface level, is central in the way experts encode situations taken from their domain of expertise. That is, unlike novices, experts ''perceive'' deep strategic meanings in problems that go beyond mere surface features and similarities.

In order to support their view empirically, Linhares and Brum (2007) carried out an experiment in which players were asked to match chess positions in pairs. Players were given the explicit instructions ''to look for 'similarities of strategic vision,' 'essence, not appearance,' and their particular 'feelings for how the positions will evolve strategically'''' (p. 996). This inevitably tells experts to match the problems on a deep, abstract, and meaningful level. Thus, we do not know whether the behavior shown by Linhares and Brum's participants is due to genuine perceptual, analogical processes or whether it mostly reflects the type of instructions used. To address this question, we present an experiment where we used the same material and instructions as those used by Linhares and Brum, but where we also asked the same players to pair the problems using static properties and other features at the surface level.

2. Method

2.1. Participants

Twelve experts (*M* age = 39, *SD* = 11; *M* chess rating = 2,195, *SD* = 173) and 10 novices (*M* age = 34, *SD* = 15; *M* chess rating = 1,293, *SD* = 171; four novices had no official rating) voluntarily participated in the study.

2.2. Material

We used the same 20 problems as Linhares and Brum (2007). These problems were selected in such a way that it was possible to make 10 pairs of problems based on their abstract role, although the problems look quite different. Ten of these positions also acted as control problems; that is, the problems of this subset could also be paired with another position using similarity at the surface level (see Fig. 1A for examples of the two types of pairings).

2.3. Design and procedure

We followed exactly the same procedure as that used by Linhares and Brum (2007), with the difference that we added a condition where players had to pair positions using concrete similarity. The experiment had two parts. The first part, a familiarization phase, required players to say whether the problem was a win for White, a draw, or a win for Black, and to indicate the best solution. The second part required players to pair each of the 20 problems

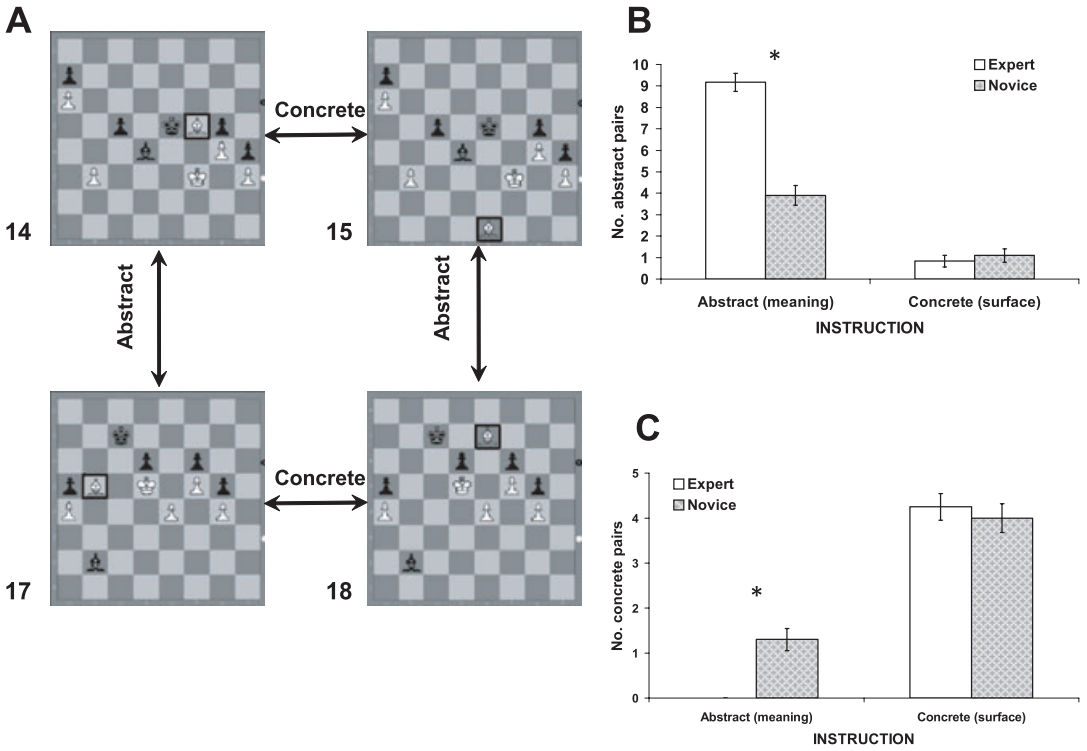

Fig. 1. Sample problems and results. (A) Examples of four problems that can be paired on the basis of abstract meaning and concrete surface features. Problems 14 and 15 look almost identical with the only difference being the placement of the bishop (highlighted in the picture). The same can be said for problems 17 and 18 where again the only change is the place of the bishop (highlighted in the picture). These two pairs, 14–15 and 17–18, are based on *concrete surface features* pairs. The pairs, however, cannot be matched based on their abstract meaning. In problem 14 neither side can make any progress because of the opposite-color bishops. The same is the case in Problem 17. On the other hand, in Problems 15 and 18 the bishops are on the same color, which gives White an easy win with 1.Bd2 in Problem 15 and 1.Bxd6 in Problem 18. Although not similar on the concrete level, pairs 14–17 and 15–18 connect deep abstract meaning. (B) Number of *abstract* pairs (out of 10) correctly matched by Experts and Novices in the conditions with abstract and concrete instructions; error bars show standard error of the mean; $*p < .001$. (C) Number of *concrete* pairs (out of five) correctly matched by Experts and Novices in the conditions with abstract and concrete instructions; error bars show standard error of the mean; $*p < .001$.

with another one. It is here that our procedure deviates from that of Linhares and Brum, who only asked players to find pairs using similarities at an abstract, strategic level (*abstract meaning* condition). In addition to this, we also had a second condition where we asked players to look for pairings based on concrete, surface similarity (*concrete surface* condition). The instructions in the second condition were to look specifically for ''similarities at a surface level, appearance and not essence, and that it is important what they think about positions now, at the moment.'' Thus, all players went through two conditions: (a) pairings based on the abstract meaning level, and (b) pairings based on the concrete surface level. The order of the conditions was counterbalanced.

3. Results

Fig. 1B shows the number of *abstract pairs* obtained out of a maximum of 10. In the abstract meaning condition, experts matched more than twice as many pairs as novices—$t(20) = 8.4$, $p < .001$, Cohen's $d = 3.8$. This replicates the key finding of Linhares and Brum (2007). Experts' better performance in matching abstract pairs is directly related to their performance in the long familiarization phase where they grasped the essence of the problems better than novices. Novices could not understand many problems completely, which prevented them from correctly pairing those problems in the subsequent matching task. However, when we instructed players to look for surface similarities, both groups found an equally low number of abstract pairs ($t[20] = 0.6$, *ns*).

Fig. 1C shows the number of concrete pairs found in the five *control pairs* that can be both paired at concrete surface and abstract meaning levels. When the players were instructed to look for abstract pairs, the concrete pairs were virtually nonexistent with experts, but they occasionally cropped up with novices ($t[20] = 3.9$, $p < .001$, $d = 1.75$), which replicates Linhares and Brum's (2007) result. When the same players were asked to look for concrete pairs, both groups found on average about 4 pairs out of 5 ($t[20] = 0.6$, *ns*).

4. Discussion

Just like Linhares and Brum's (2007) results, our results show that experts are better than novices at finding deep analogies between problems when instructed to do so and when given plenty of time to familiarize themselves with these problems. However, when asked to match the problems based on *surface similarity*, the difference between experts and novices disappeared. Thus, the very same experts who could successfully pair the problems based on analogy in one condition could successfully pair them using concrete similarity when asked to do so. A simple change in the instructions was enough to make the underlying principle of experts' performance flip from abstract analogy to surface similarity. It is likely that both surface and abstract similarity influence people's perception (Gentner & Markman, 1997; Markman & Gentner, 1993), and it may well be that analogy is central to expert cognition (Hofstadter, 2001; Linhares, 2005). This cannot, however, be demonstrated by asking experts to look for analogy in problems. Experts will, as we have shown here, simply do whatever they are told to do.

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