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# Categorisation, Deference and Cognitive Style

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## Abstract

Despite the importance of psychological essentialism as an account of categorisation, it is unclear what import findings of individual difference have. The present study is designed to investigate individual differences in relation to deference, a key indicator of essentialist thought. This replicates previous findings of individual differences in deference, and demonstrates a strong association between deference and field dependence (Witkin et al., 1962). In spite of the status of field dependence as a cognitive style, this study finds it has highly localised influences in relation only to categorisations and categorisation-related actions that are partly social in nature. Implications for essentialism are discussed.

**Keywords:** categorization, deference, essentialism, cognitive style

## Introduction

Categorisation research has largely adopted a core methodological assumption of cognitive science that adults are sufficiently alike that it makes sense to talk of a 'typical' cognizer, and to pursue generalisations that disregard individual differences (von Eckardt, 1993). Yet from the earliest days of categorisation research, important individual differences have been found. Moreover, in recent years, studies have uncovered individual differences with regard to psychological essentialism. However, with the exception of research conducted in the middle of the last century, there have been only few studies of the basis for such individual differences, and whether their scope is restricted to or extends beyond categorisation itself. This paper reports a study designed to evaluate individual differences in relation to deference and essentialism in the categorisation of natural kinds.

Psychological essentialism represents an important and popular theoretical account of categorisation. According to psychological essentialism people believe, and act as if, category membership is determined by the possession of an essence (Medin & Ortony, 1989). People are deemed to believe that objects have essences, that essences are causally responsible for other properties such as appearance, and that essences are responsible for category or kind membership.

Findings that have been argued to support psychological essentialism include those of Keil (1986, 1989) and Rips (1989). Rips described a transformation in which a bird-like animal came to appear more like an insect as a consequence of exposure to radiation. Participants judged the animal to

be a bird still, even though they felt it was more similar to an insect. Keil reported the results of similar studies with children. For example, transformations included making a raccoon look and behave like a skunk through being painted and implanted with an odour sac. While younger children tended to categorise this as a skunk, older children considered it still to be a raccoon. Moreover, even younger children are disposed to categorise objects according to presumed essences (Gelman, 2000). Gelman & Wellman (1991) showed that 4 and 5 year old children appear to believe that an apple seed will grow into an apple tree, regardless of the environment in which this happens. Apparently children believe something inside the seed, and not contingent features of the environment, is causally responsible for the properties it later acquires.

Though largely developed to explain natural kind categorisation, the apparent explanatory success of psychological essentialism has led other researchers to seek to apply it in other domains, most notably to artefacts (Bloom, 1996; 1998; though see Malt & Sloman, 2007) and social categories (e.g., Haslam, Rothschild & Ernst, 2000, 2002; Haslam & Whelan, 2008; Rothbart & Taylor, 1992).

Of course, there have been criticisms of essentialism. Malt (1994) showed that categorisation of instances of water is not fully explained by the proportion of H<sub>2</sub>O people believe the instances contain. Braisby, Franks & Hampton (1996) showed that categorisation is at odds with predictions suggested by Putnam and Kripke's articulation of essentialism. There has also been discussion of whether essentialism is required to explain the empirical evidence cited in its favour (Ahn et al., 2001; Strevens, 2000).

## Deference and Individual Differences

Braisby (2001, 2004) also examined the further implication of essentialism that people should defer in their categorisations to appropriate experts, an implication developed by Putnam (1975) in a thesis he labelled the Division of Linguistic Labour (see also Kripke, 1980). Since, according to essentialism, categorisation is determined by micro-structural (e.g., genetic) properties, then scientists expert in the appropriate domain are likely to have more category-relevant information than lay-people. If lay people are psychological essentialists then they should rationally defer to people with more knowledge of the relevant properties, e.g., expert scientists. However, in a series of studies examining deference for biological and

chemical categories, Braisby found that participants deferred in only approximately one-third of cases for biological categories, and only slightly more than this for chemical categories. Braisby's conclusion was that the data concerning deference did not support essentialism but could be explained by a perspectival or similarity-based account of categorisation.

However, Braisby also found significant individual differences in the propensity to defer. Whereas many participants consistently switched their categorisation judgments to conform to those of experts, still others consistently maintained their categorisation judgments regardless of expert opinion. Therefore, an alternative explanation of these data is that some participants were psychological essentialists, while the judgments of others were similarity-based. Hampton, Estes & Simmons (2007) also found evidence of individual differences in essentialism. In an examination of Rips's (1989) transformation study, they found that some participants steadfastly maintained their categorisation both before and after the transformation. Only a minority of participants fitted the pattern reported by Rips.

An important question to resolve is whether such individual differences reflect deeper differences in the way that people cognize, or whether people flexibly deploy information and beliefs in making categorisation judgment depending on the task and context. Surprisingly, there is relatively little evidence to bear on this question.

There have nevertheless been demonstrations of individual differences relating to categorisation. Lewellen, Goldinger, Pisoni & Greene (1993) found that participants who scored higher on measures of lexical familiarity were more successful in rejecting foils in a semantic categorisation task. There have been a number of individual differences reported in relation to category learning. For example, McKinley and Nosofsky (1995) found individual differences both in the time course of learning, and also in the final categories learned. DeCaro, Thomas & Beilock (2008) also found that working memory influences category learning. Rule-based categories were learned more quickly by participants with a greater working memory capacity, and what they called information-integration categories were learned more quickly by participants with a smaller working memory capacity. Kalénine & Bonthoux (2006) showed that individual differences in 3-4 year olds' preferences for thematic or taxonomic matches affected their choice of superordinate categories – children showing greatest sensitivity to taxonomic relations showing superior performance in categorising living things.

While the above studies show how individual differences in cognitive processes impact categorisation, there is also a body of work which suggests that individual differences in categorisation arise from more global differences in cognitive style.

Lee, Kagan, & Rabson (1963) found that participants who adopted an analytic strategy when pairing visual stimuli (e.g., on the basis of a shared feature) learned analytic

concepts (e.g., objects with a missing leg) more quickly than relational concepts (e.g., objects related to school). Participants who did not adopt this strategy when pairing visual stimuli, however, learned analytic concepts more slowly than relational ones. Interestingly, Lee et al. related their use of the term analytic to 'field dependence' – the phrase earlier coined by Witkin, Dyk, Faterson, Goodenough & Karp (1962). Norenzayan, Smith, Kim & Nisbett (2002) found that a similar distinction – between analytic and holistic processing affected category learning and similarity judgments.

### Cognitive Style

According to Witkin, Oltman, Raskin, & Karp (1971), cognitive styles are “the characteristic, self-consistent modes of functioning which individuals show in their perceptual and intellectual activities” (p. 3). One such style, field dependence, is a construct intended to capture an individual's characteristic mode of perception (Witkin, 1975). It was initially tested using the body-adjustment test and the rod-and-frame test to assess perception of the true vertical, in a visual or postural field that may present misleading information. Typically, some people – field-independent – will accurately judge the true vertical regardless of the contents of the visual field, while others – field-dependent – would fail to do so, presumably being misled by the visual field. Witkin et al. (1962) developed other measures of field-dependence. The embedded figures test and group embedded figures test have since become commonly used. The group embedded figures test (see Figure 1) involves asking participants to find a simple geometric figure (e.g., the triangle labeled X at the top) within a more complex visual object (e.g., the geometric shape at the bottom).

Here is a simple form which we have labeled "X":



This simple form, named "X", is hidden within the more complex figure below:

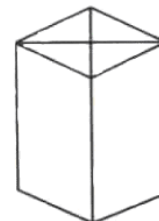


Figure 1. Sample image from the group embedded figures test

Differences in field dependence have been linked to other socio-psychological differences including, for example, identity, awareness of self and locus of control. Developmental research has suggested that children tend to

become more differentiated in their field dependence as they develop. Witkin, Oltman, Raskin & Karp (1971) suggest that field dependence in children is initially relatively fluid, but begins to crystallise around the age of ten and then appears stable during adulthood. Not surprisingly, there has been much interest in the distinction within research on education (Sternberg & Grigoernko, 1997).

Reflecting its possible status as a more global reflection of an individual's cognitive style, field-dependence-independence has sometimes been described as a distinction between global and articulated processing. However, the precise nature of the distinction remains unclear. There have been suggestions that field dependence is closely tied to underlying spatial ability (Sternberg & Grigoernko, 1997). There have also been arguments that field dependence reflects sensitivity to social information. In a complex design, Mausner & Graham (1970) asked pairs of participants to rate the speed of a flickering light, and then do so again when given information about the performance of the other member of their pair. Such reinforcement had no effect on the performance of field-independent participants. However, reinforcement led to a dramatic shift in the performance of field-dependent participants. Most strikingly, field-dependent participants who were told their estimates of speed were incorrect, but that their partner's estimates were correct, shifted uniformly and almost completely toward their partner's judgments.

This finding suggests one explanation for individual differences in relation to deference (and essentialism). Field dependent participants, sensitive to social information, including the views of others, may be more likely to shift their judgments towards those of experts. Field independent participants may be more reluctant to do so. If this is the case, then this relative difference in propensity to defer may give rise to considerable variability in the extent to which people's judgments conform with essentialism.

## Experiment

The experiment was therefore designed with a number of aims in mind. First, it was important to replicate the findings of Braisby (2001) concerning individual differences in deference, and so determine whether such differences are robust. Second, and in order to better understand such differences, it was decided to take measures of participants' field dependence. Third, although the focus of the study is categorisation, in order to determine the scope of individual differences, a number of other judgments were also sought from participants. As in Braisby (2001), the experiment examined the extent to which lay-people defer in their categorisation of biological natural kinds to experts, as predicted by essentialism.

## Method

### Design

The experiment adopted a mixed design with the factor of

Polarity (Yes, No) of expert judgment being within-subject, and Field Dependence (Field dependent, Field independent) being a between-subject factor.

### Participants

40 participants volunteered to participate, 20 of whom were undergraduate students from the University of Winchester. 20 participants were drawn from the immediate residential neighbourhood, all of whom were in employment.

### Materials

Following Braisby (2001), categories were four natural (living) kinds : apple, potato, salmon, chicken. These were chosen also to be food-stuffs so that they, and the prospect of their genetic modification, would be relatively familiar to the participants. Within these constraints, the kinds were chosen to be as typical as possible of their immediate superordinate categories (i.e., fruit, vegetable, fish, bird).

For each category, two scenarios were developed, one of which contained a positive categorisation judgment from scientific experts (biologists) and one of which contained a negative judgment. All scenarios conformed to the following pattern: "You have just bought a(n) X from a reputable retailer. On examining its packaging closely you find that it has been genetically modified. You also discover that according to most biologists the object you have bought [is/is not], in fact, an X. The object looks, feels, smells and tastes just like a X."

The group embedded figures test is a timed test and comprises a test booklet containing instructions, a practice section, and two test sections. In these two sections, 18 complex geometric shapes are provided and participants must identify in each a given simple shape.

### Procedure

Participants were tested individually. Half of the participants were presented with the GEFT first and the categorization scenarios second; the remaining participants received the categorization scenarios and then the GEFT.

When presented with the GEFT, participants were first asked to read through instructions and complete the practice section. They then completed sections 2 and 3 of the GEFT, being given a limit of 5 minutes for each section.

The 8 categorisation scenarios were untimed and presented in one of two orders. Half of the participants were presented with the scenarios in random order, and the remaining participants were presented with the scenarios in the reverse of this order. On reading each scenario, participants were asked to answer six questions, including a categorization question, as follows.

**Categorisation:** Is the object that you have bought a(n) X?

**Superordinate categorisation:** Is the object that you have bought a(n) [Superordinate]?

**Eat:** Would you eat the object you have bought (either as is or prepared)?

**Serve:** Would you serve the object you have bought at a dinner party for your friends (either as it is or prepared)?  
**Buy:** Would you continue to buy this kind of object?  
**Eat if served:** Would you eat the same kind of object as the one you have bought (either as it is or prepared) if a friend served it to you at a dinner party?

As the categorisation question was the most central to the analysis, and to minimise any interference from other questions, this question was always presented first. Participants were required to answer Yes or No to each question. Lastly, participants were asked to rate how difficult they found making their judgments on a scale of 1-7, 1 being very easy and 7 being very difficult.

### Results

Participants responses to the six Questions were recoded to express agreement with the expert judgments, and aggregated across the four categories. A median split was employed to divide participants into Field Dependent and Field Independent groups. The overall mean difficulty rating was 3.64, and this did not differ by Field Dependence.

A two-way ANOVA was conducted for each Question with Polarity (Yes, No) as within-, and Field Dependence (Dependent, Independent) as between-subject factors.

#### Categorisation

Agreement with biologists' judgments was influenced by Polarity ( $F(1,38) = 5.87, \eta_p^2 = 0.13, p < 0.05$ ), with participant's agreeing more when biologists' judgments were reported as affirmative (mean = 3.68) than when they were reported as negative (mean = 2.80). There was a significant effect of Field Dependence ( $F(1,38) = 22.81, \eta_p^2 = 0.34, p < 0.0005$ ), with Field dependents showing much higher levels of agreement (mean = 3.78) than Field independents (mean = 2.71). Polarity and Field Dependence did not interact.

#### Superordinate categorisation

Agreement with biologists' judgments was strongly influenced by Polarity ( $F(1,38) = 47.81, \eta_p^2 = 0.56, p < 0.0005$ ), with participant's agreeing the superordinate categorisation when biologists' judgments were reported as affirmative (mean = 3.89) but largely disagreeing when those judgments were negative (mean = 1.73). There was no effect of Field Dependence nor did Polarity and Field Dependence interact.

#### Eat

There were no effects of Polarity or Field Dependence, nor an interaction between them.

#### Serve

There were no effects of Polarity nor an interaction with Field Dependence, but there was a main effect of Field Dependence ( $F(1,38) = 6.95, \eta_p^2 = 0.16, p < 0.05$ ) with Field dependents showing greater agreement with biologists'

judgments (mean = 2.94) than Field independents (mean = 2.32).

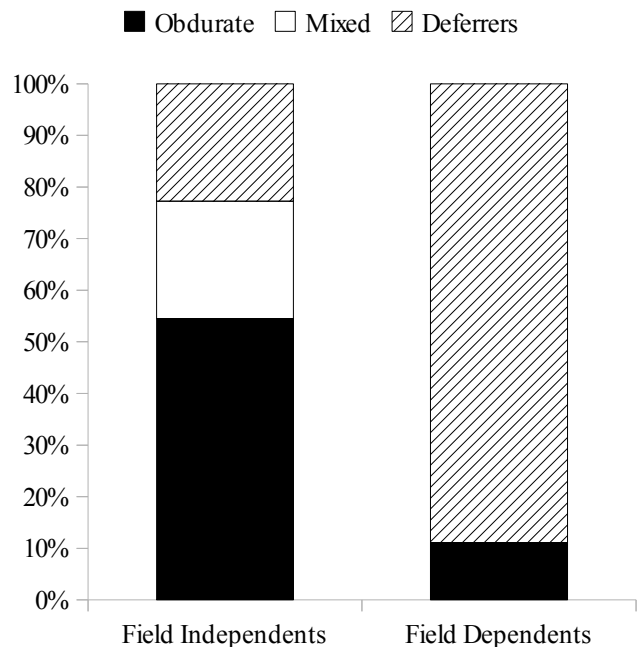


Figure 2. Proportions of participants by Deferring Style and Field Dependence

#### Buy

There were no effects of Polarity or Field Dependence, nor an interaction between them.

#### Eat if served

There was a significant effect of Polarity ( $F(1,38) = 13.86, \eta_p^2 = 0.27, p < 0.005$ ), but no interaction with Field Dependence, nor an interaction between them. Regardless of Field Dependence, more participants agreed with the biologists' judgment when this was in the affirmative (mean = 3.13) than in the negative (1.29).

#### Individual Differences

Lastly, each participant was classified according to their responses to the Categorisation question. Participants who consistently deferred to biologists' judgments in all eight scenarios were classified as Switchers; those who consistently did not switch their categorisations for any category were classified as obdurate; remaining participants were classified as mixed. This factor of Deferring Style was entered with Field Dependence in a log-linear analysis. This revealed a significant interaction between Deferring Style and Field Dependence (Chi-square (2) = 20.52,  $p < 0.0005$ ) as shown in Figure 2.

### Discussion

The first key aim of this experiment was to replicate the findings of Braisby (2001) in order to examine whether individual differences in deference are robust. Overall, 53%

of participants consistently deferred to expert judgment, 35% were consistently obdurate, and just 13% showed a mixed pattern (of deferring with some categories and being obdurate with others). Experiment 2 of Braisby (2001) obtained similar proportions: 62%, 31% and 7%, respectively. Thus, these data strongly support the view that the evidence for deference with regard to biological natural kinds is both mixed, and susceptible to substantial individual difference.

The second aim was to investigate the relationship between deference and field dependence. The data confirm that there is such a relationship and it is a strong one, with 34% of the variance in responses to the categorisation question being explained by this dichotomous factor. In this study, substantially more field dependent participants defer to expert judgment (89%) than field independents (23%). Considerably more field independent participants are obdurate when categorising in the light of expert judgment (55%) than field dependents (11%). These striking contrasts not only suggest the effect of field dependence is strong, they suggest reasons for individual differences in essentialism. Field dependents, willing to seek external frames of reference for making their categorisation judgments, appear more susceptible to externally provided information about the presence, role or value of essential properties. Field independents may by contrast tend to rely more on internally generated judgments of category membership which, given the hidden and/or unknown nature of essences, are likely to be based on a more superficial similarity judgment.

Lastly, by including other questions concerning the transformed natural kinds, it is possible to gauge the scope of these individual differences. Were field dependence to impact all measures, for example, it could be argued that it is not intimately related to categorisation, and perhaps that the influence of field dependence masks more subtle and interesting categorisation effects. However, there was no effect of field dependence on three of the five other questions asked. Indeed, only the questions concerning serving food to others, and eating it if it were served by others, showed an influence of field dependence. It is noteworthy that these two questions also involve a social dimension, while the other three questions arguably do not. Far from field dependence showing an over-powering or global impact on these results, it appears as though this factor bears only on those aspects of categorisation and categorisation-related actions that are social in nature. Indeed, when one recalls that Putnam (1975) called his Division of Linguistic Labour a socio-linguistic hypothesis, it seems hardly surprising that the quite particular feature of deference should be influenced by field dependence.

Another interpretation is that field dependence influences how participants understood the scenarios. Elements that are vague, such as the quantifier 'most', or open to different interpretation, such as the reputability of the supplier, may be particularly susceptible to different interpretations that perhaps align with field dependence. Likewise field

dependence may alter whether people judge that genetically modified exemplars continue to be members of their original categories. These are intriguing possibilities, and the current data do not rule them out. However, there are reasons to doubt these could be the whole story. First, though the literature on field dependence is considerable, the authors are not aware of evidence for an influence on language understanding. Second, the data actually suggest these possibilities are unlikely. It would be hard, for instance, to reconcile the claim that field dependent and independent people derive different understandings of the scenarios, with the evidence that, when questioned, only certain highly specific questions show such an influence. In fact, it is only those questions which have an explicitly social element that reveal an effect of field dependence. This pattern is more consistent with field dependence having a highly specific influence, related to the informational demands of the task, rather than a global influence relating to people's understanding.

Some notes of caution are in order however. This initial study, while promising, remains exploratory, and much more needs to be done to confirm the impact of cognitive style on categorisation in general. Though these data are suggestive as to the meaning of individual differences in essentialism, it is unclear whether the same relationship would be found in different domains. Of particular interest would be social domains such as sexual orientation (cf. Haslam, Rothschild & Ernst, 2000; Braisby & Hodges, 2009) where claims for essentialism are already contested.

However, these data are illuminating in that they appear to confirm of an important social dimension to psychological essentialism, and one which can lead people to different categorisations. What is less clear is whether these data might shed light on field dependence itself. While such an aim is beyond the scope of this paper, it seems clear that field dependence is more than a spatial ability. It appears to involve a sensitivity to social information and as such implies less of a gap between cognitive science and the social world than one might at first imagine.

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