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Implicit theories of ADHD amongst professionals and lay people: A structural model incorporating characteristics and causes

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Abstract

An implicit theory contains an individual's understanding of the causes of a problem, the expected course and prognosis, and beliefs about treatment and its outcome. Implicit theories arise from the individual's personal experiences, but are primarily mediated by the individual's social and cultural environment. The study of implicit theories has been used to understand how the general population, as well as professional groups, understand problem behaviours and psychopathology such as alcoholism, depression, schizophrenia, juvenile delinquency and ADHD. Generally, such studies survey the beliefs held by large samples, and employ factor analysis to describe the dominant belief components. There has been no attempt to examine the structural relations between these components. This study surveyed 472 professionals (psychologists, medical practitioners, teachers, and allied health workers) and 139 parents. The questionnaire comprised a number of sections that assessed respondents' beliefs concerning the characteristics, causes and treatment of childhood ADHD. Structural equation modelling was employed to examine the relationships between these components. The results are discussed in terms of the applicability of this methodology for assessing the structure of implicit theories, in contrast to a methodology that focuses mostly upon description

Introduction

The Nature of Implicit Theories

Beliefs held by individuals about a problem such as attention-deficit hyperactivity disorder (ADHD), depression, juvenile delinquency or eating disorders constitute an implicit theory (or explanatory model). An implicit theory represents a model of a problem that contains the individual's beliefs about central features of the problem, which may include beliefs about (1) its defining characteristics, (2) related features, (3) its causes, (4) its course, (5) effective treatments, and (6) probable outcomes with, and without, treatment. Individuals may have an implicit theory about a problem, irrespective of whether they are personally affected by that problem or not, or whether they are professionals trained in the identification and treatment of the problem, or lay people whose sole contact with the problem is through the popular media (see Dryer, Kiernan & Tyson, 2001; Furnham & Bower, 1992; Furnham & Hume-Wright, 1992; Furnham & Kuyken, 1991; Tyson & Hubert, 2000;). Implicit theories are derived from an individual's personal and cultural experiences, and are often vague, incomplete, and may contain errors. Although cognisant of the varying relationships that exist between implicit theories, empirical research and academic debate (Furnham & Bower, 1992), research into implicit theories is not necessarily concerned with the level of concordance between these. Rather, the focus of research is often upon the level of agreement between the implicit theories of various groups, and the implications this has for communication, understanding and interaction between these groups, particularly professional and non professional groups (Dryer et al., 2001).

The Study of Implicit Theories amongst Different Populations

The study of implicit theories has been used to understand how the general population understands problem behaviours and psychopathology such as alcoholism, depression, schizophrenia, juvenile delinquency and ADHD (see Furnham & Hume-Wright, 1992; Furnham & Kuyken, 1991; Furnham & Bower, 1992; Tyson & Hubert, 2000; Dryer et al., 2001, respectively). These implicit theories of psychopathology and problem behaviour are generally termed "lay-theories" or "social representations". Using this construct, however, it has also been possible to study how implicit theories differ across different professional groups (see Kuyken, Brewin, Power & Furnham, 1992; Roskin, Carsen, Rabiner, & Marell, 1988). For example, Roskin et al. (1988) sampled 377 professionals working within an adult psychiatric setting. These comprised 101 psychiatrists, 28 psychiatric residents, 56 psychologists, 94 social workers, and 98 psychiatric nurses. They employed a questionnaire that examined the respondents' ideas about the nature of psychiatric and medical illness, pathogenesis (causal theories concerning aetiology), and treatment approaches. The results showed that there

were clear differences in the implicit theories between the different professional groups. In particular, the groups could be differentiated in terms of (a) a psychodynamic or (b) a biological approach to aetiology and treatment. These dimensions were not orthogonal, however, in that some professionals simultaneously held both biological and psychodynamic aetiological theories. Furthermore, there was a high degree of consistency between implicit theory and beliefs about treatment with persons holding primarily psychodynamic theory endorsing psychodynamic treatments, biological theory endorsing biological treatments, and persons holding both beliefs endorsing aspects of both treatment approaches.

Implicit Theories about ADHD

Dryer et al. (2001) examined the implicit beliefs concerning ADHD of professionals (paediatricians, general medical practitioners [GPs], psychologists, social workers, dieticians, teachers, and special educators) and non professionals (parents of children with, and parents of children without, ADHD). In the first phase of this study the researchers interviewed resentatives of each professional and non-professional group (n=5) in order to ascertain what were relevant assertions regarding the (1) characteristics, (2) causes, (3) life-course, (4) treatment options, and (5) sources of assistance for ADHD held by these groups. This list of assertions was extended by reference to the published literature (both scientific and popular). The resulting list of assertions was used to develop a questionnaire that was sent to a large sample of potential respondents representing the above professional and non-professional groups. Consistent with other research into implicit theories, separate principle components analyses was undertaken on the responses of all participants to the items in each of the sections examining beliefs about (a) causes of ADHD, (b) characteristics of ADHD, and (c) treatment for ADHD. Scores were calculated for all participants on factors derived from this analysis, and differences between the groups were examined. The results show a general agreement amongst the groups about what constituted the central features of ADHD, but suggest differences in the implicit beliefs about the causes of ADHD. Furthermore, Dryer, Kiernan & Tyson (2002) found that the groups differed in their beliefs about what constituted an effective treatment for ADHD, and that there appeared to be some internal consistency in that beliefs about the causes of ADHD were predictive of beliefs about how the condition should be treated (Kiernan, Tyson, & Dryer, 2002). Katon and Kleinman (1980) suggest that such conflicting explanatory models can result in problems in diagnosis and treatment.

Implicit Theories about ADHD: The current study

In this paper we present a re-analysis of a sub-set of the data presented in Dryer et al. (2001). The majority of published research examining implicit theories has focused upon the differences that exist between groups concerning the essential features (characteristics, and causes) of a problem. Little research has examined the internal consistency, or interaction amongst the components, of these explanatory models. In this analysis we use structural equation modelling (SEM) to examine the links between beliefs concerning (1) the causes of ADHD, and (2) the characteristics (or expression) of ADHD. The results of this analysis will be compared to an earlier analysis (Kiernan et al., 2002) that examined the links between beliefs concerning (1) causes and (2) treatments. The purpose of these analyses is partly exploratory in that our aim was not only to examine the internal consistency of implicit theories, but also to evaluate the utility of SEM in such an examination.

As the current analysis was primarily concerned with the structural associations between the components of implicit theories, and not with differences between groups in their implicit theories, we attempted to decrease the variance in the components examined. To do this, we preceded the SEM analysis with two cluster analyses in order to determine which groups were most homogeneous in their profiles of beliefs about both causes and characteristics of ADHD (Nunnally & Bernstein, 1994). The items of analysis were (a) the 29 items examining the causal beliefs, and (b) the 46 items examining beliefs about the characteristics of ADHD employed by Dryer et al. (2001). Once a set of participants were identified that were relatively homogeneous in their beliefs about the causes and characteristics of ADHD, separate principle components analyses were undertaken to determine the dimensions with best simple structure representing these aspects of the participants' explanatory models. Finally, structural equation modelling was used to examine the relationships between the participant's beliefs about (1) the causes of ADHD, and (2) the core features or manifestations of this condition.

Method

Participants

Participants were the 673 respondents to the initial questionnaire (Dryer et al., 2001). These comprised psychologists (n=101), general medical practitioners (n=82), paediatricians (n=22), occupational therapists (n=22), social workers (n=71), dieticians (n=20), teachers (n=135), special educators (n=10), parents of

children with ADHD (n=79) and parents of children without ADHD (n=87). Cluster analyses indicated that the groups that were most homogeneous in their beliefs about the characteristics and causes of ADHD were psychologists, general practitioners and social workers. Details concerning age and gender of the participants in these groups are presented in Table 1.

Table 1: Participants' Mean Age (standard deviation) and Gender.

Profession	Mean Age	Gender
Psychologists (n=101)	48 (9.1)	39 male 62 female
General Practitioners (n=82)	46.4 (8.1)	46 male 39 female
Social Workers (n=71)	42.3 (10.9)	8 male 63 female
Total Sample (N=254)	45.8 (9.6)	93 male 161 female

Questionnaire

All participants completed a questionnaire (Dryer et al., 2001) examining (1) causes of ADHD, (2) characteristics of ADHD, (3) treatment and management of ADHD, (4) the life-course of ADHD, (5) sources of information about, and assistance with, ADHD, and (6) participant and demographic information. Items assessing the causes, characteristics and treatment of ADHD were rated on a 5-point scale from 0 to 4.

Procedure

The questionnaire and a reply-paid envelope were sent to 2,758 potential participants by mail. Participants' addresses were obtained from telephone directories and professional association mailing lists. The questionnaire took approximately 20 minutes to complete. The overall response-rate was 24.4%.

Results and Discussion

Separate hierarchical cluster analyses were undertaken on the 29 items assessing beliefs about the causes of ADHD, and the 46 items assessing beliefs about the characteristics of ADHD. The clustering of the groups based upon their ratings of the items for (a) causes and (b) characteristics are summarised in the dendograms

shown in Figures 1 and Figure 2 respectively. Inspection of these Figures suggested that the most homogeneous groups (i.e., based upon smallest Euclidean distances) in relation to their beliefs about the causes and characteristics of ADHD are (1) psychologists, (2) general practitioners, and (3) social workers. These groups were therefore selected for subsequent analysis.
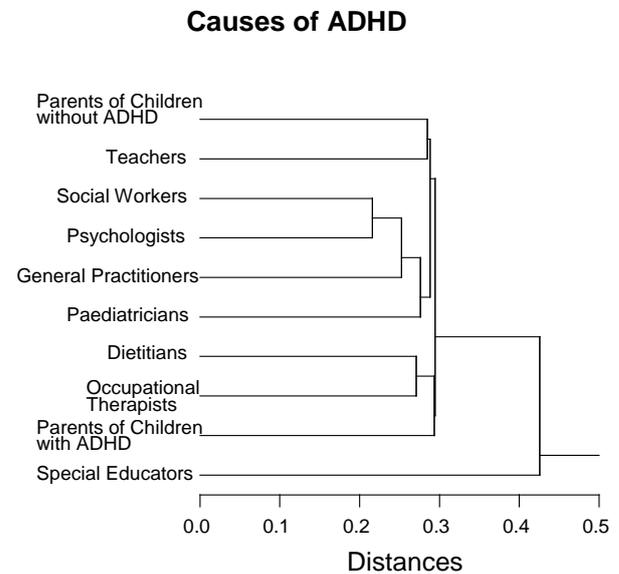
Causes of ADHD

Figure 1: Hierarchical Cluster analysis of Professional and Non-professional groups employing the 29 items assessing beliefs about the causes of ADHD.

In order to determine the components of the implicit theories of the three professional groups, the items assessing causal beliefs and the items assessing beliefs about the characteristics of ADHD were subjected to separate principle components analyses. Scree plots were inspected to indicate initial factor solutions. Additional principle components analyses were conducted where the number of factors was one more and one less than that indicated by the scree plots. The most interpretable solutions were selected. Factors that accounted for less than 4% of total variance were excluded from the subsequent analyses. This resulted in seven causal factors, and nine characteristic factors. Mean factor scores were calculated for all participants (i.e., the sum of the scores loading most highly and above 0.3 on each factor, divided by the number of scores summed).
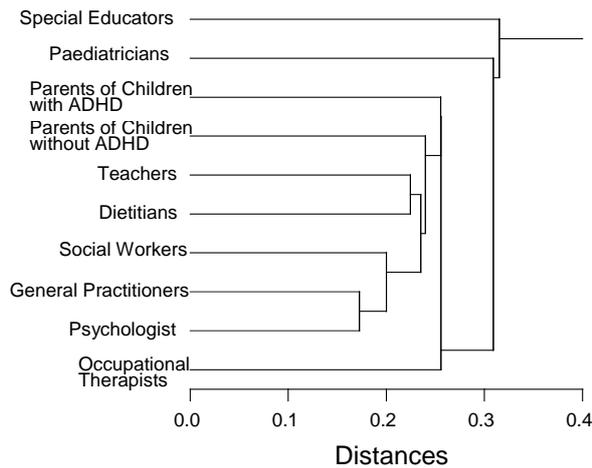
Characteristics of ADHD

Figure 2: Hierarchical Cluster analysis of Professional and Non-professional groups employing the 46 items assessing beliefs about the characteristics of ADHD.

The causal factors (and representative items) derived from the principle components analysis [and their mean factor scores] were; *home environment* (lack of parental discipline, unstable family environment), [1.85]; *brain damage* (exposure to environmental chemicals during pregnancy, birth complications, brain damage); [1.22] *developmental delay* (brain development delay, language delay), [1.80]; *school environment* (difficulty coping with school work, not fitting into educational structure), [1.46]; *brain dysfunction* (brain chemical imbalance, genetic predisposition), [2.71]; *anxiety and mood disorders* (depression, anxiety), [1.59]; *environmental stimulation* (too much TV, over-stimulating environment), [1.17]. Thus, brain dysfunction received the strongest endorsement as a cause of ADHD.

The characteristics factors (and representative items) derived from the principle components analysis [and their mean endorsement] were; *hyperactivity* (problems staying seated, impulsive), [3.21]; *cognitive problems* (poor memory, careless mistakes), [2.36]; *aggression* (aggressive, angry outbursts), [2.67]; *poor planning and organisation* (difficulty planning, difficulty following rules), [3.10]; *low self-esteem* (poor self-confidence, poor self-esteem), [2.70]; *talkative and noisy* (talkative, loud and noisy), [2.57]; *concentration and attention problems* (easily distracted, concentration problems), [3.74]; *learning problems* (difficulty keeping up at school, learning difficulties), [3.13]; *neurological problems* (poor eye-hand coordination, poor visual attention), [2.06].

Three alternative models of the relationships between the beliefs about causal factors and the characteristics of ADHD held by psychologists, general practitioners and social workers were tested using structural equation modelling. In all models the characteristics of ADHD are viewed as the direct consequences of causal factors.

Model 1 was derived from empirical research reported in the medical and psychological literature. For example, low self-esteem has been seen to be a consequence of comorbid mood disorders in children with ADHD (Schmidt, Stark, Carlson, & Anthony, 1998) and school-failure (Zinkus, 1979). Learning problems in children with ADHD are seen to be a consequence of problems adapting to the school environment (Hinshaw, 1992), developmental delay (Griffith, 1979), and problems in executive functions (Swanson, Mink, & Bocian, 1999). The 21 hypothesised causal relationships (i.e., the structural component) of Model 1 are shown in Figure 3.
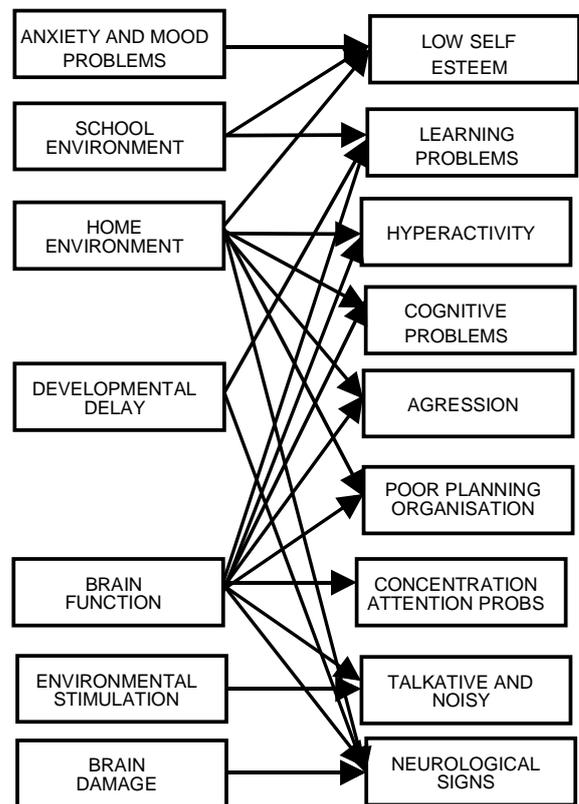

Figure 3: Structural components of Model 1. Labels in boxes represent factor scores as observed variables. Causal factors are shown on the left, and characteristics are shown on the right. Arrows represent direct causal relationships. See the text for information about correlations and error components, not shown in this figure.

Not shown in Figure 3 are (1) the unspecified components of the model, and (2) correlations between

the variables. The model assumes that the characteristic factors (i.e., the variables on the right side of the figure), in addition to being determined by the causal factors, are determined by factors not specified by the model (i.e., error components). The model also assumes correlations between the observed variables. Specifically, all causal factors (the left side of Figure 3) are assumed to be fully correlated with each other, and all error components associated with the characteristics are assumed to be fully correlated with each other.

Models 2 and 3 (not shown) differ from Model 1 in their structural components only. Model 2 represents implicit theories in which all characteristics of ADHD are seen to be caused by the three most highly endorsed causal factors. In this model, all nine characteristics factors receive causal inputs from "brain function", "home environment" and "developmental delay" (i.e., 27 potential deterministic relations between causes and characteristics). Model 3 represents a "saturated" model in which all characteristics factors receive causal inputs from all causal factors (i.e., 54 potential deterministic relations between causes and characteristics).

The models were compared by examining (1) total variance in the output variables (characteristics) explained by each model, (2) fit-statistics, including chi-square, unexplained variance (root-mean-residual; RMR), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI) (see Loehlin, 1992 for an explanation of these indices). These results are presented in Table 2.

Table 2: Mean total variance explained (mR^2); Probability for Chi-square ($p\chi^2$); Root-mean-residual (RMR); Goodness of fit index (GFI); and Adjusted goodness of fit index (AGFI) for Models 1, 2 and 3.

Model	mR^2	$p\chi^2$	RMR	GFI	AGFI
Model 1	.096	.223	.022	.973	.913
Model 2	.105	.001	.025	.968	.868
Model 3	.132	<.001	0.0	1.0	-

The results presented in Table 2 suggest that Model 1 is a reasonable fit of the data, and a better fit than Models 2 and 3, especially as indicated by the chi-square statistic. It should be noted, however, that although there is a reasonable fit between the hypothesised model, and the obtained data, as assessed against the covariance matrix, the amount of explained variance in the characteristics factors due to covariance with the causal factors is low (slightly less than 10%). There is considerable variance in the beliefs about the

characteristics of ADHD, therefore, that is not accounted for by causal beliefs as proposed by Model 1.

The causal influences on each characteristic factor by each causal factor (expressed as beta weights) are shown in Table 3. The correlations amongst the causal factors range from .72 to -.45 (lowest absolute value, .02). The correlations amongst the error components of the characteristics factors range from .69 to .14.

Table 3 Characteristics of ADHD (left column) and the causal factors (and respective beta weights) that are structurally related to them (right column).

Characteristic Factor	Causal Factor
Low Self-Esteem	Home environment (.12); Anxiety and mood problems (.38); School environment (-.24)
Learning Problems	Developmental delay (.28); Brain function (.21); School Environment (-.05)
Hyperactivity	Home environment (.27); Brain function (.25)
Cognitive Problems	Home environment (.28); Brain function (.26)
Aggression	Home environment (.39); Brain function (.15)
Poor Planning & Organisation	Home environment (.25); Brain function (.27)
Concentration & Attention Probs	Brain function (.27)
Talkative & Noisy	Brain function (.07); Environmental Stimulation (.07)
Neurological Signs	Home environment (.20); Brain function (.11); Developmental delay (.22); Brain damage (.11)

Conclusions

The results of the analysis undertaken here show that it is possible to use structural equation modelling, and demonstrate structural relationships between the components of implicit theories concerning the causes and characteristics of problems such as ADHD. In this analysis, Model 1 fitted the data when homogeneous

groups were first selected on the basis of cluster analysis to ensure that the participants included in the study were reasonably homogeneous in their beliefs about the components of the theories being modelled. Previous attempts by us to model the links between causes and characteristics within implicit theories of ADHD that employed all ten groups sampled by Dryer et al. (2001) were unable to find a model that fitted the data. This is in contrast to a similar approach that attempted to model the relationships between beliefs about the causes and the treatment of ADHD (Kiernan et al., 2002). This latter analysis found that it was possible to derive a model that fitted the data when the whole sample was employed. Although the conclusions drawn from these observations can be applied only to the groups used in the current study, there appears to be a more widespread agreement about the relationship between the causes of ADHD, and how these are affected by various treatments, than there is about the characteristics of ADHD, and how these are derived from their causal mechanisms.

Finally, it should be noted that it is unlikely that professionals hold such simplistic linear models as proposed by Model 1. It is not suggested that the model derived in this study is an adequate description of the relationships that occur in the implicit theories of the professions sampled. Rather, the significance of the current analysis is that it demonstrates that implicit theories show a level of internal consistency, and this can be examined using statistical procedures such as structural equation modelling.

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