AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF ADULTS AND CHILDREN

by

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THESIS ABSTRACT

It has long been acknowledged that hallucinations occur in the normal population. The first paper of this thesis explores this phenomenon further. It describes some of the studies that have looked at the prevalence of hallucinations, putting it at between five and 71 per cent. Some cross-cultural differences are noted. One of the major models of hallucinations is the reality discrimination model. This was developed by integrating previous research into the different factors and mechanisms involved that lead to experiencing hallucinations. Studies testing this model using ambiguous stimuli are described. Differences between normal and psychotic hallucinations are discussed. Hallucinations are also experienced by children, although the prevalence has not been measured. It may be that there is an association between hallucinations and the presence of imaginary companions. Finally, implications for further research are discussed.

The second paper describes a study that tests four hypotheses, through the administration of a hallucination questionnaire to children and adults and the presentation of ambiguous stimuli to the adults. The results gave support to the reality discrimination model of hallucinations, through the association between the tendency to fail in reality discrimination when presented with ambiguous stimuli and hallucinations experienced in everyday life. Prevalence of hallucinations in children and adults was found to be the same, supporting the notion of a continuum of experience from childhood into adulthood. Prevalence in the UK was found to be the same as in the USA. There was an association between hallucinations experienced and the presence of an imaginary companion.

REVIEW OF THE LITERATURE ON AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF ADULTS AND CHILDREN

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REVIEW OF THE LITERATURE ON AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF ADULTS AND CHILDREN

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ABSTRACT

This review examines the phenomenon of auditory hallucinations in the normal population. Prevalence has been put anywhere between five and 71 per cent. Some of the studies looking at prevalence are described and other factors such as cross-cultural differences and gender effects discussed.

One of the major models of hallucinations is the reality discrimination model. This suggests that hallucinations result from a failure of metacognitive skills that determine whether a mental image results from an internal (imaginary) or external (real) source. One way to test this model is to present people with ambiguous stimuli that can lead to failure in reality discrimination. Some of the possible differences between psychotic and normal hallucinations are discussed.

The paper goes on to look at the evidence for hallucinations in childhood. This suggests that children do experience hallucinations but studies so far have only looked at the clinical population so the prevalence is not clear. It is possible to generate hallucinations in children from the normal population by exposing them to ambiguous stimuli, in the same way as has been done with adults. There may be an association between hallucinations and imaginary companions.

Finally, future directions for research are discussed.

REVIEW OF THE LITERATURE ON AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF CHILDREN AND ADULTS

Introduction

Hallucinations have been described as part of the human experience as far back as written records exist. Preuss (1975) described examples of mental illness and symptoms such as hallucinations in the Bible and Talmud. Jaynes (1976) discussed hallucinations experienced by ancient populations such as the Greeks during the Trojan war, as described in the Iliad, and more recently by, for example, Joan of Arc. Jaynes even suggested that the hallucinations of ancient populations formed an integral part of the development of their cultures. There is also evidence to say that cave paintings are in fact representations of the hallucinatory experiences of early man (Lewis-Williams & Dowson, 1993).

Hallucinations were only distinguished from other disorders of perception in 1832 by Esquirol (cited in Bentall, 1990). Generally, they have been seen as a pathological phenomenon, particularly associated with schizophrenia (Slade & Bentall, 1988) but also in other psychiatric diagnoses such as the affective psychoses and mania. In schizophrenia hallucinations are usually regarded as the 'ultimate defining criterion' (Sarbin, 1967). The quality of voices heard by people with schizophrenia and those with affective disorder does not differ significantly (Romme, Honig, Noorthoorn & Escher, 1992). Moreover, there have long been ideas about a possible continuum between normal mental imagery and hallucinations, for example as proposed by Galton

(1880) (cited in Bentall, 1990), Launay and Slade (1981) and van Os, Verdoux, Maurice-Tison, Gay, Liraud, Salamon and Bourgeois (1999). These ideas are mirrored by work looking at the continuum of delusional ideation from the normal to psychotic population (Peters, Day, McKenna & Orbach, 1999).

More recently studies have looked at the prevalence of hallucinations in the normal population, among those who are psychologically well and who have no apparent impairment to their functioning. These studies place prevalence anywhere between five per cent (Eaton, Romanoski, Anthony & Nestadt, 1991) and 71 per cent (Posey & Losch, 1983).

Over the years there have been many attempts to describe a model of hallucinations. For example Bentall (1990) suggests that hallucinations result from a failure in the metacognitive skills of reality discrimination. This model suggests that there is a process that continually checks the content of consciousness to determine the origin of that content. A judgement that the origin is external means that the contents are treated as perceptual information whereas a judgement that the origin is internal means that the contents are assumed to be an image. Hallucinations are thought to be images that are misidentified by the reality discrimination process as perceptions.

Studies of the prevalence of hallucinations have been limited to the adult population. The general view has been that hallucinations are a rare occurrence in children or adolescents (Schreier, 1998). The few studies that do look at hallucinatory experiences in children or adolescents have looked either at clinical populations (Schreier, 1999) or groups of children or adolescents already identified as experiencing hallucinations (e.g.

Escher, Romme & Buiks, 1998). Most studies have also looked at fairly small groups (e.g. Garralda, 1984a). It is apparent from these studies that hallucinations in children and adolescents do occur, but the prevalence is not clear. There have been attempts to link these hallucinations with the experience of imaginary companions in children (Pearson, 1998).

This review will look at all these issues in greater detail and discuss some of the areas where future research would be helpful.

Definitions of 'hallucinations'

There are various definitions of hallucinations in the literature. An early example is West (1948) who defined the experience of hallucinating as "when believing oneself to be completely awake, a vivid impression of seeing or being touched by a living being or inanimate object, or hearing a voice; which impression, so far as one could discover, was not due to any external physical cause." Similarly, DSM IV (1994) (page 767) states that an hallucination is "a sensory perception that has the compelling sense of reality of a true perception but that occurs without external stimulation of the relevant sensory organ etc." It also makes the point that "transient hallucinatory experiences may occur in people without a mental disorder." This definition specifically excludes hypnagogic (occurring when falling asleep) and hypnopompic (occurring when awakening) hallucinations. It also states that no distinction is made between hallucinations where the source of the voice is perceived as being inside or outside of the head.

Slade and Bentall (1988) defined hallucinations as "any percept-like experience which (a) occurs in the absence of an appropriate stimulus, (b) has the full force or impact of the corresponding actual (real) perception and (c) is not amenable to direct voluntary control by the experiencer" (p. 23). This definition has several advantages: it only requires the absence of appropriate stimulus, given that hallucinations can occur in the presence of certain kinds of stimulation and it acknowledges that most hallucinations are felt to be beyond the individual's control. It also points out that hallucinations have the impact of actual perception whilst avoiding the notion of sensory perception occurring without a stimulus of any kind.

Stevenson (1983) discussed the possible need for a new word instead of 'hallucination.' He suggests that since 'hallucination' was used originally to refer to unshared sensory experiences of people who are mentally ill, another word is needed for those unshared sensory experiences of people who are not mentally ill. He suggests 'idiophany' from the Greek *idios* (private) and *phainomai* (appear). This idea was raised more recently by Scott (1997), who suggested the phrase "inner voices." Although appropriate, this concept has not been taken up, but the idea of finding a way to distinguish between the hallucinations experienced by psychotic and non-psychotic people, and research into the similarities and differences between these experiences has been studied and is discussed further below.

Hallucinations in the normal population

Survey measures

For many years papers have been published describing the phenomena of hallucinations in the normal population, that is in the absence of any psychiatric illness. The earliest reported was a survey done by the Society for Psychical Research in the late 1800s (Sidgewick, 1894). They assessed 17,000 participants over the age of 21, mainly in England, but also in Russia and Brazil. The aim of the study was to prove the existence of telepathic phenomenon but the researchers went to considerable effort to eliminate the potential positive bias in reporting of hallucinatory experiences this may have led to. They found that the prevalence of hallucinations was about ten per cent in this sample, with twice as many visual hallucinations as auditory.

West (1948) reported on a wide scale survey he completed in an attempt to replicate the Sidgewick study. He also found that approximately ten per cent of respondents had experienced at least one hallucination, mainly either visual or auditory. However, there were many methodological problems in this study, for example it was found after the data were collected that many of the voluntary researchers had misunderstood the study and looked only for people with experiences of hallucinations and had not recorded negative responses.

The Sidgewick (1894) study was also used as a comparison group in a more recent study on the same scale by Tien (1991), with the help of the National Institute of Mental Health Epidemiological (NIMH) catchment area programme. Tien found a

slightly higher rate of hallucinations (13%) in this sample, although this did not differ significantly from Sidgewick. This study used a fairly stringent criterion for including reports of hallucinations, which might have brought the incidence down somewhat. Tien also looked at the proportion of hallucinations experienced as distressing. By this he meant hallucinations not attributed to drugs or a medical problem but resulting in either telling a professional about the experience, taking medication more than once or interfering with life or activities a lot. They found that the level of non-distressing hallucinations was significantly higher than distressing hallucinations and that the difference was greatest in the auditory modality.

A study by Eaton, Romanoski, Anthony and Nestadt (1991) gives the results of interviews screening for psychosis with a large sample of participants who were interviewed as part of the NIMH survey used by Tien (1991) and were samples of populations of five geographic areas. Eaton et al., used symptoms relating to schizophrenia and a number of other psychotic disorders, which often have psychotic manifestations such as mania and bipolar disorder. They found that hallucinations not associated with psychosis were reported by five per cent of their sample. The authors stated that this was an "unexpectedly high prevalence."

Questionnaire measures

The studies above collected data through face-to-face interviews with participants. Posey and Losch (1983) constructed a questionnaire incorporating some items from papers published on hallucinations in the normal population and some generated by participants in their pilot study. They ended up with fourteen items such as hearing a

voice calling one's name, hearing one's thoughts spoken aloud or holding a conversation with a relative who has died. They administered the questionnaire to 375 college students. Those items believed to be the best measure of non-hypnagogic/ hypnopompic voice hallucinations were selected as a measure of hallucinations. The results of the study showed that 71 per cent of the sample had experienced at least one hallucination, 42 per cent at least two and one participant responded positively to all six of the selected items. The most common experiences were those of hearing one's name called and hearing one's thoughts aloud. However, the rate of hallucinatory experiences such as voices or conversations heard in the car whilst driving alone and conversations with deceased relatives was between ten and 15 per cent. This is closer to the finding of the other studies described above. The rate of hypnagogic and hypnopompic hallucinations was 41 per cent.

Some of the participants were asked whether any of those who had had some of the experiences on the questionnaire would agree to be interviewed by the researchers. Twenty participants were interviewed and given the Minnesota Multiphasic Personality Inventory (MMPI), in order to examine whether the hallucinations they reported were due to pathology of some kind. Of the 20 participants who were interviewed, 19 showed no evidence of hearing deficit or history of psychosis and one showed some suggestion of a possibility of schizophrenia in their MMPI profile. None of them appeared to have misunderstood the directions, for example mislabelling an image as an hallucination so the high rates of hallucinations reported do not appear to be a result of over reporting.

The authors suggest the existence of five general types of auditory hallucinations in the

normal population: hypnagogic/hypnopompic events; hearing one's name called; hearing one's thoughts aloud; hearing a voice giving advice or comfort and hearing a voice as if in conversation. Comments made by participants indicate that although many regarded hallucinations as being a frightening experience, this was not always the case; indeed some participants regarded them as a positive experience, offering guidance, comfort or company. An association was found between level of reported hallucinations and a high performance in skills associated with right hemisphere functioning, such as music, drawing, painting, poetry or maths.

This study was replicated and expanded on by Barrett and colleagues in a series of studies (Barrett & Etheridge, 1992; Barrett, 1993; Barrett & Etheridge, 1994; Barrett & Caylor, 1998). In their first study (Barrett & Etheridge, 1992) they used the questionnaire developed by Posey and Losch, adapting it slightly so that ten out of 13 items were identical. They administered it to 586 college students. After the first 241 participants had completed the questionnaire, including writing a description of their experience, a seven-point scale rating the frequency of occurrence of the hallucinatory experience was added. This ranged from 'just once or twice ever' to 'at least once a day.' They found that the levels of hallucinations reported did not differ significantly from the Posey and Losch (1983) study. Ratings of frequencies showed that 23 per cent of participants who reported hallucinations indicated that they only occurred once or twice ever while 45 per cent indicated that the event occurred between once a day and once a month.

Barrett and Etheridge (1992) also tested two possible explanations for the phenomenon of hallucinations. They suggested that rather than reflecting an actual normal conscious

experience, reports might be a result of social conformity, that is the possibility that participants were telling the experimenter what they believed he or she wanted to hear rather than reporting actual conscious experience. The hallucinations reported might also be a sign of psychopathology, either overt or incipient. However, no relationship was found between the level of hallucinations reported and either measures of social conformity or of psychopathology. Therefore, they suggest that their results and those of Posey and Losch (1983) represent reports of actual conscious experience.

In the subsequent studies Barrett and his colleagues looked at other aspects of verbal hallucinations in the normal population. Verbal hallucinators were found to have more vivid imagery, across all sensory modalities, than non-hallucinators (Barrett, 1993). It was suggested that this might be one of the factors underlying reports of hallucinations in the normal population. Hallucinators and non-hallucinators in this study did not respond differently to demand characteristics in an imagery task. This adds to the evidence that participants are telling the truth about their experiences, not responding in what they perceive to be a socially desirable way.

Verbal hallucinators scored more highly on two factors, factors one and four, from the Millon Clinical Multiaxial Inventory (MCMI), a tool designed to measure dysfunctional personality characteristics (Barrett & Etheridge, 1994). This suggests that compared to non-hallucinators, hallucinators could be characterised as emotionally more depressed, anxious and not satisfied with their life. They have a self-image in which they feel relatively misunderstood and unappreciated leading to feelings of isolation and rejection by others and they are socially more passive and submissive and afraid of social conflict because they view themselves as relatively powerless and incompetent.

This suggests that if somebody experiences verbal hallucinations, it might be an indicator of emotional difficulties that could, in time, warrant professional help. The question that remains is whether there is a causal relationship, in either direction, between hallucinations and these social and emotional difficulties; do they have a common cause or is there some other explanation for this relationship? A possible link is the level of stress experienced, as it is known that increased stress is associated with increased hallucinations. This issue is discussed further below.

In the most recent of this series of studies, Barrett and Caylor (1998), the perceived reality characteristics of verbal hallucinations reported by college students were compared with hallucinating patients with schizophrenia. The reality characteristics they used were taken from Aggernæs (1994). He examined reality testing in people with and without schizophrenia and describes certain characteristics that distinguish normal from faulty reality discrimination. Barrett and Caylor (1998) concluded that the experiences reported by the college students were true hallucinations, rather than images. College students were more likely to report the positive reality characteristic of 'publicness,' described by Aggernæs, that is the students believed that another person with appropriate sensory systems could also have experienced the event. They were also less likely to report the positive reality characteristic of 'involuntarity,' that is the students believed that they had some control over altering the experience if they wished.

Another more recent study looking at the incidence of hallucinations in the normal population using a questionnaire method is Bentall and Slade (1985a), who used a version of the Launay-Slade Hallucination Scale (described further below) with a group of 136 undergraduate students. They found that over 15 per cent of the participants

reported hearing a voice when no one had been present to account for it and over 17 per cent said they had often heard their thoughts spoken aloud.

One question that arises from these studies is why the recent studies (e.g. Posey & Losch, 1983; Barrett & Etheridge, 1992) have found prevalence rates so much higher than the other studies. A likely explanation is the difference in the measuring tools used. These recent studies used a questionnaire that gave descriptions of different hallucinatory experiences and asked participants if they had ever experienced anything similar. This contrasts with survey type studies where participants were simply asked if they had ever had a hallucinatory experience, requiring some self-definition of hallucinations (Barrett & Caylor, 1998). It may also be important that in the survey studies participants were interviewed face-to-face, whereas the questionnaires all had the option to be completed anonymously. Therefore, the stigma associated with reporting hallucinations might have influenced responses.

As mentioned above, Stevenson (1983) suggested replacing the word 'hallucination' with 'idiophany' for people without mental illness who experience hallucinations. This would allow for these experiences to be discussed more openly, without the possible stigma attracted by labelling people who are not mentally ill with the word 'hallucination.' This new word has not been widely taken up but the point remains that perhaps it is worth considering how people are encouraged to openly discuss their experiences without fear of prejudice. Sarbin (1967) discussed the question of what would lead a person to describe their experiences in such a way that another (probably professional) person would describe them as hallucinations. He suggested that there are in fact three questions to consider: what conditions lead to the person having

hallucinatory experiences; what conditions lead to them publicly reporting these experiences; and what criteria lead to some reported experiences being judged to be hallucinations?

Gender effects

Apart from Posey and Losch (1983) and Barrett and Etheridge (1992), who found no effect from gender, and Eaton et al. (1991), who did not report on gender effects, all of the studies mentioned above found that the prevalence of hallucinations was greater in females. For example Tien (1991) said that in both his study and that of Sidgewick (1894) the prevalence of hallucinations was about 50 per cent higher in females. West (1948) found that the gender difference was more marked when the participant had experienced multiple hallucinations than when they had only experienced one. However, Tien (1991) suggested that although his results showed higher prevalence in females, he felt that this might be due to gender differences in recall or reporting rather than higher incidence.

Cross cultural differences

Most of the studies described above were completed in the United States. Some studies have looked at the cross-cultural differences in the experience of hallucinating. Al-Issa (1995) surveyed the literature and reviewed 30 papers on the role of sociocultural factors in hallucinations. He found that in non-Western cultures, where the delineation between reality and fantasy is not as clear as that in Western cultures, rates of hallucinations are higher. He suggests this is due both to a lower threshold for noticing

and remarking on hallucinatory experiences and therefore a greater awareness of these experiences and also the fact that they are more culturally acceptable and positively valued and indeed in some cultures expected so they do not have the same stigma attached.

Examples of this phenomenon described by Al-Issa (1995) include shamans, in whom hallucinations and trance are attributed to contact with the spirits, and individuals whose hallucinations are related to culturally based concepts of guilt, which end when the society makes amends for transgressions against cultural taboos. Responses to visions in the Middle Ages were closer to this current situation in non-Western societies than Western; visions were considered as true perceptions, rather than symptoms of mental illness (Kroll & Bachrach, 1982). However, Klemperer (1995), in a letter responding to Al-Issa (1995), suggested that Al-Issa may have failed to distinguish between different types of hallucinations in non-Western cultures, where in many cases culturally sanctioned hallucinations are distinguished from those arising from mental illness.

By contrast with non-Western societies, as Sarbin (1967) pointed out, reporting hallucinations in a Western society is likely to lead to a diagnosis of schizophrenia, medication and very likely hospitalisation and stigmatisation continuing past discharge. Individuals are discouraged from focusing on their hallucinatory experiences and are even taught to ignore their existence (Al-Issa, 1978). Although these are relatively old papers, unfortunately there are few signs that things have changed a great deal since.

Romme and Escher: Empowering people who hear voices

A series of publications have described the work being done in the Netherlands by Romme and Esher and their associates (Romme & Escher, 1989; Romme, Honig, Noorthoorn & Escher, 1992; Romme & Escher, 1996; Escher, Romme & Buiks, 1998). Following an appearance on a television talk show by a patient who was troubled by hearing voices, they asked for other voice hearers to get in touch (Romme & Escher, 1989). They heard from 450 people who heard voices, of whom 300 said they could not cope with their voices and 150 said that they were able to handle their voices.

The people who responded to the television programme were asked to complete a questionnaire about how they coped with their voices. Of these they selected 20 who were able to talk clearly about how they were able to cope with their voices and these people went on to speak at a congress for people who heard voices. Some of those who attended the congress were troubled by their voices and saw them as part of mental illness. However, many others appeared competent, not disabled and not ill. Seventy per cent of the 173 respondents to the questionnaire said that they had first hallucinated following a traumatic event such as death or divorce. The coping strategies they reported using included getting angry and arguing with the voices, distraction and trying to ignore them. None of these strategies was reported to be very helpful. More helpful strategies were selectively listening to positive voices or structuring or setting limits to contact.

Romme et al. (1992) reported further on the responses to the questionnaires. The differences found between people who reported that they could cope with their voices

and the people who could not are summarised as follows. People who could cope with their voices experienced themselves as stronger than their voices, experienced more positive and less imperative voices and were able to set more limits to the voices, listen selectively to them and communicate more often about their voices. Conversely, the people who responded to the television programme who could not cope with their voices experienced themselves as weaker than the voices, experienced more negative and more imperative voices, did not dare to set limits to them and tried to escape from the voices by using more distraction techniques. The most relevant differences between copers and non-copers seems to be a feeling of being 'stronger' with respect to both the voices and their environment (Romme & Escher, 1996), that is feeling less threatened and more supported in the environment. Barrett and Caylor (1998) similarly found that hallucinating college students believed they had more control over their hallucinatory experiences than did hallucinating patients with schizophrenia.

Romme and Escher (1996) described some of the differences between the respondents to the questionnaire who were, or had been, psychiatric patients and those who had never been patients. They found that the non-patients were more likely to be married than patients, experienced or perceived more support than patients and were more likely to discuss their voices with other people than were patients. It is not clear whether these are protective factors, a result of being able to cope with their voices or, perhaps most likely, a combination of both.

Another result of the congress was that it appeared that all of the people who heard voices experienced problems with the societal taboo factor associated with them (Romme & Escher, 1996). Therefore, Romme and Escher highlight the importance of

working both with individuals and on a societal level. To try and achieve this, and empower people who hear voices, they are organising annual conferences, information meetings in psychiatric hospitals and conducting interviews with patients and non-patients on television and in popular magazines, as well as doing individual work with patients.

Through working with individuals who hear voices, Romme and Escher (1996) suggested examples of the contextual factors in peoples' lives that they have found to be related to the onset of voices. These are: intolerable or unsatisfying living conditions; recent traumas; aspirations or ideals; childhood trauma and emotional intolerance and control. It is also important to look at the dynamics of the interaction between the voices and the life history of the person hearing them, for example the identity of the voices; the characteristics of their communication with the person; what triggers the appearance or disappearance of the voices; what important change in the individual's life was related to the onset of hearing voices or the characteristics of a person's upbringing and childhood including any special experiences. The focus of working with people who hear voices should not only be on coping with hearing voices but on coping with other problems in their life.

Models of hallucinations

Much effort has been put into finding a model to explain the experience of hallucinations. These have ranged from looking at anatomical differences in the brain, initially by post-mortems and more recently through the use of imaging techniques such as functional Magnetic Resonance Imaging (fMRI) which allows researchers to identify

which parts of the brain are involved when people are experiencing hallucinations (e.g. Dierks, Linden, Jandi, Formisano, Goebel, Lanfermann & Singer, 1999) to theoretical and experimental work looking at variables in the individual and/or the environment (e.g. Slade, 1976; Bentall, 1990). Some of this work is presented below.

Slade's four-factor model

Slade (1976) outlined a hypothetical four-factor model in which hallucinations are understood in relation to the factors of: psychological stress, degree of hallucinatory predisposition, environmental stimulation and reinforcement. He suggested that prior to experiencing hallucinations, people tend to experience heightened psychological stress, following an event that increases tension or anxiety, which may act as a trigger. The increased internal arousal level due to stressful events then interacts with predisposing factors within the individual. Slade suggested that these are a combination of two factors: vivid mental imagery and poor reality testing. The third factor hypothesised is the level of external stimulation to which the individual is currently responding. This views consciousness as having a limited capacity to allocate between internal and external stimuli. High external stimulation would therefore inhibit the effect on the conscious experience of auditory hallucinations as capacity would be taken up with processing the external stimuli and conversely, sensory deprivation would lead to an increase in hallucinations experienced. The final factor in Slade's model is reinforcement. He suggested that following an experience of hallucinations his clients reported an improved mood state so the effect of the experience may be to reduce anxiety and therefore reinforce the preceding hallucination.

Subsequent studies have looked at these factors. Stress does appear to be associated with increased frequency of hallucinations. One example of this is the links between stressors and the onset and content of hallucinations described by Romme and Escher (1996). Work on the effect of increased interpersonal stress in the form of familial expressed emotion also links stress to an increased risk of relapse in people with schizophrenia (Vaughn & Leff, 1976; Barrowclough & Tarrier, 1984). Barrett and Etheridge (1994) reported that their hallucinators from the normal population showed various emotional difficulties in comparison to non-hallucinators. There is a possibility that some of the stress associated with hallucinations may be a result of experiencing hallucinations, perhaps if they are a novel experience, an extra stressor on top of life stressors or a familiar experience that has changed in its nature for example becoming more hostile than previously.

Hallucinatory predisposition has been studied through looking at possible genetic factors but results with respect to hallucinations are not conclusive (Bentall, 1990). Predisposition to hallucinate was examined by Launay and Slade (1981), who developed a tool called the Launay-Slade Hallucination Scale (LSHS), to measure predisposition to hallucinations. They were also testing the possible link between the experience of auditory hallucinations in psychotic patients and high levels of aggression. A questionnaire was devised covering auditory and visual hallucinations, vivid and intrusive thoughts, dream experiences and vivid daydreams. This was refined, following administration to normal control and patient groups, to a 12-item scale, which contained items concerned with vivid intrusive thoughts and daydreams and auditory and visual hallucinations. They found that there was an association between aggression, as measured by Eysencks' Psychoticism (P) Scale, and

predisposition to hallucinate.

The use of this measure of hallucinatory predisposition in subsequent research has shown that individuals predisposed to hallucinate are more responsive to suggestions to perceive objects (Jakes & Hemsley, 1986) or words (Feelgood & Rantzen, 1994) in response to ambiguous stimuli where no objects or words are present.

A series of studies by Heilbrun and colleagues (Heilbrun, 1980; Heilbrun, Blum & Haas, 1983; Heilbrun & Blum, 1984) has suggested that there are cognitive differences between psychiatric patients with and without hallucinations. The hallucinating patients were found to be worse at recognising their own thoughts, recorded verbatim a week earlier (Heilbrun, 1980) and poor at detecting the spatial location of sounds (Heilbrun, Blum & Haas, 1983). On a task requiring participants to guess the meaning of words spoken against decreasing levels of white noise (Heilbrun & Blum, 1984), hallucinators responded rapidly but made more errors than controls. They suggested that perceptual errors produced by premature judgement and limited consideration of alternative meanings for misperceptions could be predisposing factors for auditory hallucinations. This research has not been replicated in the normal population but is an area that warrants further research.

A study by Margo, Hemsley and Slade (1981) looked at the effects of environmental stimulation. Seven patients with schizophrenia and auditory hallucinations were exposed to various conditions of auditory stimulation varying in interest, structure and meaning, for example listening to boring or interesting prose, passages in a foreign language, music and meaningless sounds and reading aloud a passage of prose.

Participants rated the duration, loudness and clarity of the auditory hallucinations during exposure. Their results showed that hallucinations increased on all three ratings with decreased meaningfulness of the stimulus, suggesting that it is not stimulation in itself but the extent to which structure is present and attended to that is important in determining the occurrence of hallucinations.

The final factor in Slade's (1976) model was reinforcement. The research in this area has, however, been contradictory (Bentall, 1990) in that different studies reported described both positive and negative reinforcement as playing a part in hallucinations persisting.

Mechanisms of hallucinations

Bentall (1990) discussed the various theories of the possible mechanisms of hallucinations by categorising them into four categories. These are: conditioning theories about the role of classical conditioning in hallucinations; seepage theories suggesting that hallucinations result from a seepage of normally preconscious material into consciousness; imagery theories that hallucinations result from either abnormally vivid mental imagery or poor mental imagery which leads to occasional vivid images being misattributed to an external source; and subvocalisation theories where hallucinators misattribute inner speech to an external source.

However, having presented the various theories that have been put forward under these categories, Bentall (1990) found that evidence tended to be contradictory and that none of them are able to satisfactorily account for the mechanisms of hallucinations.

Reality discrimination model

The reality discrimination model integrates the previous research into factors and mechanisms of hallucinations into one theory that encompasses all modalities of hallucinations (Bentall & Slade, 1985b; Bentall, 1990; Bentall, Haddock & Slade, 1994). The theory is that hallucinations result from a reality discrimination failure, that is a failure of the metacognitive skills involved in discriminating between self-generated and external sources of information.

Bentall and Slade (1985b) used the method of signal detection theory to investigate whether there was a difference between hallucinators and non-hallucinators in their skills of reality testing. The task involved listening to a tape of white noise and saying whether they heard a voice in the white noise. A voice was presented in half of the trials but was set at a level that was very difficult to detect against the white noise. They found that normal participants who showed a high predisposition to hallucinate, according to the Launay-Slade Hallucination Scale (Launay & Slade, 1981), and psychiatric patients who experienced hallucinations differed from non-hallucinators in their willingness to believe that a stimulus is present. This provided some evidence for the hypothesis that hallucinations could result from a failure of reality discrimination, in that hallucinators were more likely to believe a stimulus to be present when it was not.

Bentall (1990) discussed this theory further. He argued that whilst a hallucination is by definition a mistaken attribution of an internal, imaginary event to an external, real, event, it is a mistake to simply assume that under normal circumstances it is always possible to distinguish between real and imagined events. He argues that a theory of

hallucinations must explain how this judgement normally takes place and why mistakes sometimes occur, resulting in hallucinations. It appears that people continually check the contents of consciousness to judge the origin of those contents and make this judgement on the basis of a range of evidence. A judgement that the origin is external means that the contents are treated as perceptual information whereas a judgement that the origin is internal means that the contents are assumed to be an image. People tend towards errors in judgement when the evidence is ambiguous. The skill of making this judgement about the source of an event, reality discrimination, is therefore part of the domain of knowledge about cognition or metacognition. Failure in this skill could lead to errors ranging from being unsure whether an event really took place and seeking further evidence to misattributing an imagined event to an external source, that is, experiencing hallucinations.

This model would account for the phenomena described previously in this paper. Reality discrimination, in common with other cognitive and metacognitive skills, would presumably vary between individuals. In this case some individuals from the normal population would be more prone to hallucinate than others, explaining the prevalence of hallucinations found in the normal population (Posey & Losch, 1983; Tien, 1991; Barrett & Etheridge, 1992). There would also be a continuum from those whose reality discrimination fails rarely to those whose metacognitive skills fail frequently.

Reality discrimination would also vary within the individual as other factors change, meaning that an individual might vary in how prone they are to hallucinations. For example hypnagogic and hypnopompic hallucinations might occur because meta-cognitive skills do not function as well as a person is falling asleep or waking up. As

discussed above, stress might also impact on the functioning of metacognitive skills, due to the effect of stress-induced arousal on information processing (Bentall, 1990).

Barrett's (1993) finding that participants who hallucinated also experienced more vivid imagery could also be explained in terms of this model. If the contents of consciousness contain a great deal of sensory information, it may be hypothesised to be more likely to lead to the conclusion that these contents are an external perception.

Cross cultural differences can also be explained as it is assumed that expectations about what kind of events are likely to be 'real' are encoded in cultural practices, for example people see ghosts because they believe in them or because they are a culturally recognised image (Bentall et al., 1994).

Hallucinatory experiences following suggestion

It is possible to cause some people to hallucinate simply by telling them to. Barber and Calverley (1964), in their so called 'White Christmas test' told participants to first close their eyes and to hear a recording of 'White Christmas' although no such recording was played. They were then told to open their eyes and to see a cat sitting in their lap. Participants reported that they did indeed have these experiences. Some participants were then allocated to a 'task motivated' group, where they were told they had not done well, that the task was easy and that all the other participants had been able to do it. The task motivated participants rated their hallucinations as significantly more 'real' than controls.

Bowers (1967) replicated this study. The forty participants gave mean ratings of between two and three out of four as to the reality of their hallucination, suggesting that most participants had some degree of hallucinatory experience.

Young, Bentall, Slade and Dewey (1987) repeated this study and compared participants according to their scores on the Launay-Slade Hallucination Scale (LSHS) (Launay & Slade, 1981). They found that participants with a high propensity to hallucinate were more likely to report hearing, in this case, 'Jingle Bells' and to see a cat in their lap than participants with a low propensity to hallucinate. However, participants from the normal population did not report that they thought the stimulus had really been present, although they experienced them, whereas psychiatric patients in the same situation did report an experience they actually believed had occurred.

The experience of hallucinations following suggestion is also reported by Al-Issa (1995) who described situations in which members of certain societies are expected to experience hallucinations as part of a ritual, for example initiation or coming of age. Sometimes drugs are taken to facilitate the experience.

The phenomenon of folie à deux is an example of hallucinations occurring as a result of suggestion. A case of folie à deux in a married couple, where a man with paranoid hallucinatory psychosis induced similar symptomatology in his wife was presented by Dantendorfer, Maierhofer and Musalek (1997). Both partners experienced auditory hallucinations. The original patient recovered following treatment with a combination of psychotherapy and medication whereas his wife was cured through psychotherapy and the recovery of her husband alone.

Bentall (1990) suggested that the fact that some people respond to suggestions is probably indicative of their willingness to describe imagined events as real.

Generating hallucinations in response to ambiguous stimuli

One of the ways in which the reality discrimination failure model has been tested is by presenting people with ambiguous cues to see if this can generate hallucinations in people with a propensity to hallucinate, according to the Launay-Slade Hallucination Scale (LSHS) (Jakes & Hemsley, 1986; Feelgood & Rantzen, 1994). The model would suggest that ambiguous cues, which do not give a great deal of information on which to base a judgement about the internal or external origin of stimuli, would lead people with a propensity to fail in reality discrimination to make more errors. As Bentall (1990) suggested, "As the decision about whether an event is real or imaginary is likely to be more difficult when the individual is attempting to detect sensory information against a background of considerable sensory noise, it is under these circumstances that the hallucinator's tendency to mistake the source of perceptual experiences will become most evident."

Jakes and Hemsley (1986) looked at reactions to ambiguous visual stimuli of eleven participants from the normal population. Participants were shown a changing random pattern of dots and told that at certain points patterns had been programmed to appear which they should try to detect. No such patterns were programmed. People who scored highly on the LSHS were found to also report more complex patterns, that is meaningful objects or integrated scenes.

Feelgood and Rantzen (1994) also used the LSHS to distinguish between people with a high or low propensity to hallucinate. They presented 136 participants with ambiguous auditory and visual stimuli, the former a five minute tape of a human voice in randomly spliced one second sections played backwards and the later a random pattern of black dots on a white computer screen. They suggested that this situation would be less likely than the 'White Christmas' test described above to elicit demand characteristics from participants as they would not know what sounds or patterns the experimenters were expecting them to perceive. However, they did instruct participants that there were words on the tape for them to hear and patterns in the dots. Therefore, it cannot be ruled out that their results could be confounded by suggestibility. Young et al. (1987) assessed their participants for suggestibility and did not find a difference between participants with high or low propensity to hallucinate.

Feelgood and Rantzen (1994) found that the high propensity to hallucinate group heard significantly more words and saw significantly more complex patterns than the low propensity to hallucinate. They stated that their finding on the auditory task was a "finding without precedent" because apart from the questionable results of Young et al. (1987) there are no other reports of verbal hallucinations being elicited in a laboratory situation from people from non-psychiatric populations.

The results obtained by Feelgood and Rantzen (1994) suggest that ambiguous environmental cues generating hallucinations is due to the ambiguous cues contributing to a discrimination failure. However, there is another possible explanation; it could be that participants are looking for meaning in ambiguity and that their hallucinations are due to this, rather than mistakes in self-other discrimination.

What are the differences between normal and psychotic hallucinations?

There are obvious differences between people from the normal population who are experiencing hallucinations and people with psychosis. By definition, people with psychosis have symptomatology of mental illness, such as hallucinations or other symptoms and are people who have difficulty functioning in society without professional help. It is not yet clear whether there is a difference between the hallucinations experienced by people with and without psychosis. However, it may be that there is a difference in people's beliefs about their hallucinations, that is whether or not they believe that someone or something else is causing the hallucinations and that they are 'real.' Maybe non-psychotic hallucinators are less likely to believe their hallucinations to be real.

Romme and Escher (1996) raised this question and suggested that there could either be a connection between specific characteristics of hearing voices and the existence of psychiatric illness or there may be a connection between hearing voices and problems in a person's life history. This could mean that the person with psychiatric illness has experienced more problems in their life or that they have had more difficulty coping with problems. It is recognised that hallucinations can persist for many years following trauma, such as childhood sexual abuse (Heins, Gray & Tennant, 1990). If content of hallucinations reflects a person's life history, these are obviously likely to be distressing and therefore, perhaps, more difficult to cope with.

Romme and Escher (1996) also highlighted the differences between patients and non-patients who hear voices and between people who can and cannot cope with the voices

they hear, as described above. These were mainly differences in how people perceive their voices and the coping strategies they use, rather than a difference in the actual hallucinations experienced, with the exception that the non-copers experienced more negative and more imperative voices.

Another factor might be the age of onset of hallucinations. The possibility that hallucinations are often experienced from childhood (Romme & Escher, 1989; Pearson, 1998: see further discussion below) might mean that those people who experience an onset of hallucinations in adult life become more distressed and find it more difficult to cope because hallucinations are a novel experience.

Hallucinations in children

There has been research into the experience of auditory hallucinations in children but these have tended to be either with small groups of children (e.g. Garralda, 1984) or with children already identified as experiencing hallucinations (e.g. Escher, Romme & Buiks, 1998). Apart from Escher et al., all studies of hallucinations in children have been from clinical reports (Schreier, 1999). The prevalence of hallucinations in children is not clear.

Romme and Escher (1989) found that when people who responded to a television programme about hearing voices (described further above), six per cent reported that their experience of hearing voices began before the age of six and for ten per cent between the age of ten and 20. In a more recent study (Escher, Romme & Buiks, 1998) they reported on a programme that followed up their work with adults. They recruited

80 children who reported hearing voices, aged from eight to 18, through publicity on television and in the media. Half of the children were receiving psychiatric treatment for their voices. This research is not yet complete, but the authors do report some initial findings. The attitude of the children and their parents to the voices seems to be important in how the children cope with their voices. Voices in children did not seem to be a continuous condition, and were not related to age.

Hallucinations have been generated in children by Pearson, Burrow, FitzGerald, Green, Lee and Wise (2001b) who replicated the Feelgood and Rantzen (1994) study. They found that hallucinations could be generated in children aged from eight to 12 years. Therefore, it is possible to cause metacognitive reality discrimination skills to fail in children. It is not clear at what age these skills are acquired. Indeed, Aggernæs (1994) found that the reality discrimination errors found in normal three-year-old children were similar to people with schizophrenia. However, it is possible that as soon as a child has developed these skills, they could experience hallucinations due to their metacognitive skills failing. Pearson et al.'s experiment suggests that this reality discrimination failure can be found in children under laboratory conditions.

Hallucinations have been reported in non-psychotic children. They have been described in children with affective syndromes and migraines (Schreier, 1998); Tourette's disorder (Dowling Bruun & Budman, 1999); mood disturbance and anxiety (Kotsopoulos, Kanigsberg, Côté & Fiedorowicz, 1987) and conduct and emotional disorders (Garralda, 1984). Most of these studies describe very distressing hallucinations and often a poor outcome (Schreier, 1999).

Several studies have discussed the phenomenon of hallucinations in children with early onset schizophrenia (McKenna, Gordon, Lenane, Kaysen, Fahey & Rapoport, 1994; Russell, 1994; Volkmar, 1996). The Russell (1994) paper is a review of three major studies of childhood onset schizophrenia. He suggests that there is a continuum from childhood onset schizophrenia to (young) adult onset forms of the disorder. However, he contrasts the high incidence of insidious onset as opposed to acute onset in adolescence.

Hallucinations in children are also associated with trauma. For example, a case of visual and auditory hallucinations in a five-year-old girl following sexual abuse is described by Kaufman, Birmaher, Clayton, Retano and Wongchaowart (1997). The person she heard and saw in the hallucinations was the perpetrator of the abuse. These hallucinations responded well to psychotherapy and were not associated with symptoms that would suggest a diagnosis of schizophrenia, such as negative symptomatology like withdrawn behaviour or blunted affect, or formal thought disorder. The authors argue that this is typical of children who report hallucinations following trauma and that these children form a distinct group from those who show early signs of schizophrenia.

There are also links between childhood trauma, post traumatic stress disorder and dissociation, which can present as very similar to hallucinations if the person is experiencing intrusive thoughts or flashbacks which lead to them re-experiencing past sensory experiences in the present. For the individual these are 'real' experiences, as are hallucinations. Van der Kolk, van der Hart and Marmar (1996) described a model that illustrated the link between trauma and PTSD. It consisted of three levels of dissociation: primary, secondary and tertiary. In this model primary dissociation, where

sensory and emotional elements of the trauma are not integrated into normal memory leading to intrusive thoughts, nightmares and flashbacks, is thought to be characteristic of PTSD.

These studies do demonstrate that children experience hallucinations. However, none of them give any indication of the prevalence of these experiences.

Imaginary companions

One possible model, put forward by Pearson (1998), of the development of auditory hallucinations in children suggests an association with the presence of an imaginary companion. Imaginary companions are experienced by up to 50 per cent of children between the ages of five and 12 (Pearson, Rouse, Doswell, Ainsworth, Dawson, Simms, Edward & Faulconbridge, 2001a).

Pearson (1998) found that the experiences described by children in relation to their imaginary companions were qualitatively very similar to the experiences described by adults in relation to auditory hallucinations. According to the definitions of hallucinations mentioned above, the experiences described by the children when talking about their imaginary companions fit the definition of auditory hallucinations; they have the sense of reality of a true perception without the external stimulation of a true perception. Some of the similarities between children's imaginary companions and adult's hallucinations, as described in previous studies, highlighted by Pearson (1998) were: approximately half of voices were heard from inside the head and half from outside in children and adults; about a third of each group had heard their own thoughts

aloud and about 60 per cent had heard their own name; approximately half of each group felt that they had some control over the imaginary companion/voices and felt that they were stronger and over half of each group reported the experiences as having been present for a long time, over a year for children and over five years for adults. Therefore, imaginary companions could be the same phenomenon as adult auditory hallucinations with a different label.

Imaginary companions have generally been associated with younger children (Pearson et al., 2001a). However, Seiffge-Krenke (1997) found that socially competent and creative adolescents with good coping abilities were particularly prone to report the presence of an imaginary companion. They have been reported in other cultures, for example Native American Navajos (Proskauer, Barsh & Johnson, 1980) and also in older adults (O'Mahony, Shulman & Silver, 1984).

Further research

There are several areas where further research is indicated. At present it is not known what the prevalence of hallucinations is in children. Studies of children with various psychological difficulties demonstrate that they do experience hallucinations. Pearson (1998) suggested that there are similarities between experiences of children with imaginary companions and adults with auditory hallucinations. This would seem to imply that hallucinations are an experience that starts in childhood and continues into adulthood. However, is this at the same level as the adult participants in the studies described above? If children without mental illness were found to experience hallucinations, what are the similarities and differences between the hallucinations

experienced by children and adults? Is there a continuum or are they completely different, how often are they experienced, is there any connection between the experience of hallucinations and the presence of a current or past imaginary companion?

Recent studies of prevalence of auditory hallucinations in the normal population have looked at samples of participants in the United States. There is evidence that there might be differences between cultures in the prevalence of hallucinations but these are mainly between Western and non-Western cultures. Therefore it would seem that in other cultures such as the United Kingdom the prevalence would be the same as in the USA. However, this research, along with comparing the types and frequency of hallucinations experienced, has not been done.

Another question relates to the use of ambiguous stimuli to elicit hallucinations in the normal population. Although these have been shown to distinguish between people with a high or low propensity to experience hallucinations, they have not been looked at with respect to actual reports of hallucinations in everyday life. Now that there is a tool for measuring hallucinations, the Hallucinations Questionnaire developed by Posey and Losch (1983) and Barrett and Etheridge (1992) it would be possible to examine whether people who report hallucinations in everyday life also show a failure of reality discrimination in the laboratory.

Conclusions

The literature described above suggests that auditory hallucinations occur naturally in the normal population and can be generated in response to ambiguous stimuli. This phenomenon is explained by the reality discrimination model; on occasions people fail to distinguish between real and imagined images and misattribute imagined internally generated material for real external material, that is they hallucinate.

Hallucinations also occur in children and can be generated in response to ambiguous stimuli, as in adults. These hallucinations are associated with the presence of imaginary companions and may indeed be the same phenomenon with a different label. The prevalence of auditory hallucinations in normal child populations is not known.

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Empirical Paper:

AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF CHILDREN AND ADULTS: THE REALITY DISCRIMINATION MODEL, PREVALENCE IN THE UK AND THE DEVELOPMENTAL CONTINUUM

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AUDITORY HALLUCINATIONS IN NORMAL POPULATIONS OF CHILDREN AND ADULTS: THE REALITY DISCRIMINATION MODEL, PREVALENCE IN THE UK AND THE DEVELOPMENTAL CONTINUUM

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Running title: Auditory Hallucinations in Normal Adults and Children

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SUMMARY

Hallucinations occur in normal populations of adults. They can also be generated in response to ambiguous stimuli. The prevalence of hallucinations in children is not known but they also hallucinate when presented with ambiguous stimuli. These phenomena are explained by the reality discrimination model; people mistake imagined, internal images for real external stimuli. This study aims to test this model, look at the prevalence of hallucinations in adults and children and look for an association between auditory hallucinations and imaginary companions. Groups of 250 year ten children and 246 first year undergraduates were given an hallucination questionnaire and the adults were exposed to an ambiguous stimulus, a white noise tape.

The results gave support to the reality discrimination model of hallucinations, through the association between the tendency to fail in reality discrimination when presented with ambiguous stimuli and hallucinations experienced in everyday life (Spearman's $rho = 0.177$, $p < 0.005$). Prevalence of hallucinations in children and adults was not significantly different, supporting the notion of a continuum of experience from childhood into adulthood. Prevalence in the UK (75%) was found to be very similar to the USA (71%). There was an association between hallucinations experienced and the presence of an imaginary companion ($Z = -5.158$, $p < 0.001$). Clinical and research implications of these findings are discussed.

INTRODUCTION

Throughout history auditory hallucinations have been reported in the normal population (Preuss, 1975; Jaynes, 1976). Recently studies looking at hallucinations in those who are psychologically well and who have no apparent impairment to their functioning have put prevalence anywhere between five per cent (Eaton, Romanoski, Anthony & Nestadt, 1991) and 71 per cent (Posey & Losch, 1983). There have long been ideas about a possible continuum between normal mental imagery and hallucinations, for example as proposed by Galton (1880) (cited in Bentall, 1990) and Launay and Slade (1981). This can be explained by the reality discrimination model (Bentall & Slade, 1985; Bentall, 1990; Bentall, Haddock & Slade, 1994), the theory that hallucinations result from a failure of the metacognitive skills involved in discriminating between self-generated and external sources of information. By presenting people with ambiguous stimuli it is possible to cause these skills to fail (Feelgood & Rantzen, 1994).

Auditory hallucinations also occur in children. Most of the studies have looked at children with psychological difficulties of some sort (Schreier, 1999). However, Escher, Romme & Buiks (1998) have shown that children from the normal population also experience auditory hallucinations. Pearson, Burrow, FitzGerald, Green, Lee and Wise (2001b) replicated the Feelgood and Rantzen (1994) study and found that hallucinations could be generated in children aged from eight to 12 years. The prevalence of hallucinations in children is not clear. It has been suggested (Pearson, 1998) that there is an association between auditory hallucinations and the presence of imaginary companions.

Definitions of hallucinations

The definition of hallucinations contained in DSM IV (1994) (page 767) is "a sensory perception that has the compelling sense or reality of a true perception but that occurs without external stimulation of the relevant sensory organ etc." It also makes the point that "transient hallucinatory experiences may occur in people without a mental disorder." This definition specifically excludes hypnagogic (occurring when falling asleep) and hypnopompic (occurring when awakening) hallucinations. It also states that no distinction is made between hallucinations where the source of the voice is perceived as being inside or outside of the head.

Models of hallucinations

The reality discrimination model integrates research into hypothesised factors and mechanisms of hallucinations into one theory that encompasses all modalities of hallucinations (Bentall & Slade, 1985; Bentall, 1990; Bentall, Haddock & Slade, 1994). The theory is that hallucinations result from a reality discrimination failure, that is a failure of the metacognitive skills involved in discriminating between self-generated and external sources of information

Bentall and Slade (1985) used the method of signal detection theory to investigate whether there was a difference between hallucinators and non-hallucinators in their skills of reality testing. They found that normal participants who showed a high predisposition to hallucinate, according to the Launay-Slade Hallucination Scale (Launay & Slade, 1981), and psychiatric patients who experienced hallucinations

differed from non-hallucinators in their willingness to believe that a stimulus was present. This provided some evidence for the hypothesis that hallucinations could result from a failure of reality discrimination, in that hallucinators were more likely to believe a stimulus to be present when it was not.

Bentall (1990) discussed this theory further. He argued that a theory of hallucinations must explain how the judgement of whether something is real or imagined normally takes place and why mistakes sometimes occur, resulting in hallucinations. It appears that people continually check the contents of consciousness to judge the origin of those contents and make this judgement on the basis of a range of evidence. A judgement that the origin is external means that the contents are treated as perceptual information whereas a judgement that the origin is internal means that the contents are assumed to be an image. People tend towards errors in judgement when the evidence is ambiguous. The skill of making this judgement about the source of an event, reality discrimination, is therefore part of the domain of knowledge about cognition or metacognition.

This model would account for the prevalence of auditory hallucinations in the normal population (Posey & Losch, 1983; Tien, 1991; Barrett & Etheridge, 1992). Reality discrimination, in common with other cognitive and metacognitive skills, would presumably vary between individuals. In this case some individuals from the normal population would be more prone to hallucinate than others. There would also be a continuum from those whose reality discrimination fails rarely to those whose metacognitive skills fail frequently.

Reality discrimination would also vary within the individual as other factors change, meaning that an individual might vary in how prone they are to hallucinations. For example hypnagogic and hypnopompic hallucinations might occur because metacognitive skills do not function as well as a person is falling asleep or waking up. Stress might also impact on the functioning of metacognitive skills, due to the effect of stress-induced arousal on information processing (Bentall, 1990).

How the reality discrimination model can be tested

It is possible to cause some people to hallucinate simply by telling them to. Barber and Calverley (1964), in their so called 'White Christmas test' told participants to first close their eyes and to hear a recording of 'White Christmas' although no such recording was played. They were then told to open their eyes and to see a cat sitting in their lap. Participants reported that they did indeed have these experiences.

A variation on this, and one of the ways in which the reality discrimination failure model has been tested, is presenting people with ambiguous cues to see if this can generate hallucinations in people with a propensity to hallucinate, according to the Launay-Slade Hallucination Scale (LSHS) (Jakes & Hemsley, 1986; Feelgood & Rantzen, 1994). The model would suggest that ambiguous cues, which do not give a great deal of information on which to based a judgement about the internal or external origin of stimuli, would lead people with a propensity to fail in reality discrimination to make more errors. As Bentall (1990) suggested, "As the decision about whether an event is real or imaginary is likely to be more difficult when the individual is attempting to detect sensory information against a background of considerable sensory

noise, it is under these circumstances that the hallucinator's tendency to mistake the source of perceptual experiences will become most evident."

Jakes and Hemsley (1986) looked at reactions to ambiguous visual stimuli of participants from the normal population. Although they had a very small group of participants, they did find that people who scored highly on the LSHS also reported seeing more complex patterns, that is meaningful objects or integrated scenes.

Feelgood and Rantzen (1994) also used the LSHS to distinguish between people with a high or low propensity to hallucinate. They presented 136 participants with ambiguous auditory and visual stimuli, the former a five minute tape of a human voice in randomly spliced one second sections played backwards and the later a random pattern of black dots on a white computer screen. They suggested that this situation would be less likely than the 'White Christmas' test described above to elicit demand characteristics from participants as they would not know what sounds or patterns the experimenters were expecting them to perceive. However, they did instruct participants that there were words on the tape for them to hear and patterns in the dots. Therefore, it cannot be ruled out that their results could be confounded by suggestibility. Young, Bentall, Slade and Dewey (1987) assessed participants in a similar study for suggestibility and did not find a difference between participants with high or low propensity to hallucinate.

Feelgood and Rantzen (1994) found that the high propensity to hallucinate group heard significantly more words and saw significantly more complex patterns than the low propensity to hallucinate. They stated that their finding on the auditory task was a

"finding without precedent" because apart from the questionable results of Young et al. (1987) there are no other reports of verbal hallucinations being elicited in a laboratory situation from people from non-psychiatric populations.

The results obtained by Feelgood and Rantzen (1994) suggest that ambiguous environmental cues generating hallucinations is due to the ambiguous cues contributing to a discrimination failure. However, there is another possible explanation; it could be that participants are looking for meaning in ambiguity and that their hallucinations are due to this, rather than mistakes in self-other discrimination.

This study will test the reality discrimination model by looking at the levels of auditory hallucinations generated in response to ambiguous stimuli and comparing them to actual hallucinations reported in everyday life, rather than propensity to hallucinate.

Hallucinations in the normal population

The earliest study of the prevalence of hallucinations in the normal population was Sidgewick (1894). He, and subsequent studies replicating this work (West, 1948; Tien, 1991) all put prevalence at around ten per cent. These studies used survey measures and collected data in face-to-face interviews.

Other studies have used questionnaire measures. Posey and Losch (1983) constructed a questionnaire incorporating some items from papers published on hallucinations in

the normal population and some generated by participants in their pilot study. They ended up with fourteen items such as hearing a voice calling one's name, hearing one's thoughts spoken aloud or holding a conversation with a relative who has died. They administered the questionnaire to 375 college students. Those items believed to be the best measure of non-hypnagogic/hypnopompic voice hallucinations were selected. The results of the study showed that 71 per cent of the sample had experienced at least one hallucination, 42 per cent at least two and one participant responded positively to all six of the selected items. The most common experiences were those of hearing one's name called and hearing one's thoughts aloud. However, the rate of hallucinatory experiences such as voices or conversations heard in the car whilst driving alone and conversations with deceased relatives was between ten and 15 per cent. This is closer to the finding of the other studies described above. The rate of hypnagogic and hypnopompic hallucinations was 41 per cent.

Posey and Losch interviewed 20 participants. Nineteen of these showed no evidence of hearing deficit or history of psychosis and one showed some possibility of schizophrenia. None of them appeared to have misunderstood the directions, for example mislabelling an image as an hallucination so the high rates of hallucinations reported do not appear to be a result of over reporting.

The authors suggest the existence of five general types of auditory hallucinations in normals: hypnagogic/hypnopompic events; hearing one's name called; hearing one's thoughts aloud; hearing a voice giving advice or comfort and hearing a voice as if in conversation. Comments made by participants indicate that although many regarded hallucinations as being a frightening experience, this was not always the case; indeed

some participants regarded them as a positive experience, offering guidance, comfort or company.

This study was replicated and expanded on by Barrett and Etheridge (1992). They used the questionnaire developed by Posey and Losch, adapting it slightly so that ten out of 13 items were identical. They administered it to 586 college students. After the first 241 participants had completed the questionnaire, including writing a description of their experience, a seven-point scale rating the frequency of occurrence of the hallucinatory experience was added. This ranged from 'just once or twice ever' to 'at least once a day.' They found that the levels of hallucinations reported did not differ significantly from the Posey and Losch (1983) study. Ratings of frequencies showed that 23 per cent of participants who reported hallucinations indicated that they only occurred once or twice ever while 45 per cent indicated that the event occurred between once a day and once a month.

Barrett and Etheridge (1992) also tested two possible explanations for the phenomenon of hallucinations. They suggested that rather than reflecting an actual normal conscious experience, reports might be a result of social conformity, that is the possibility that participants were telling the experimenter what they believed he or she wanted to hear rather than reporting actual conscious experience. The hallucinations reported might also be a sign of psychopathology, either overt or incipient. However, no relationship was found between the level of hallucinations reported and either measures of social conformity or of psychopathology. Therefore, they suggest that their results and those of Posey and Losch (1983) represent reports of actual conscious experience.

Hallucinations in children

There has been research into the experience of auditory hallucinations in children but these have tended to be either with small groups of children (e.g. Garralda, 1984) or with children already identified as experiencing hallucinations (e.g. Escher, Romme & Buiks, 1998). Apart from Escher et al., all studies of hallucinations in children have been from clinical reports (Schreier, 1999). The prevalence of hallucinations in children is not clear.

Romme and Escher (1989) found that when they asked about the experiences of adults who responded to a television programme about hearing voices, six per cent reported that their experience of hearing voices began before the age of six and for ten per cent between the age of ten and 20. In a more recent study (Escher, Romme & Buiks, 1998) they reported on a programme, which followed up their work with adults. They recruited 80 children who reported hearing voices, aged from eight to 18, through publicity on television and in the media. Only half of these children were receiving psychiatric treatment for their voices. Therefore, hallucinations do occur in normal populations of children.

Hallucinations have been generated in children by Pearson, Burrow, FitzGerald, Green, Lee and Wise (2001b) who replicated the Feelgood and Rantzen (1994) study. They found that hallucinations could be generated in children aged from eight to 12 years when they were presented with an ambiguous stimulus, a white noise tape. Therefore, it is possible to cause metacognitive reality discrimination skills to fail in children.

This study will look at the prevalence of auditory hallucinations in children and compare this to an adult sample.

Cultural factors in hallucinations

Most of the studies of hallucinations in the normal population have been completed in the United States. Where there have been studies looking at cross-cultural differences, they have mainly focussed on the differences between Western and non-Western cultures (Al-Issa, 1995). There are no suggestions that there are likely to be differences between two similar Western cultures, such as the United States and the United Kingdom.

Cross cultural differences can be explained by the reality discrimination model as it is assumed that expectations about what kind of events are likely to be 'real' are encoded in cultural practices, for example people see ghosts because they believe in them or because they are a culturally recognised image (Bentall et al., 1994).

This study will look at the prevalence of auditory hallucinations in the UK, compared to the studies described above completed in the USA using the same questionnaire.

Imaginary companions

Pearson (1998) put forward the suggestion that the phenomenon of imaginary companions in children is qualitatively the same as auditory hallucinations in adults. According to the definitions of hallucinations mentioned above, the experiences

described by the children when talking about their imaginary companions fit the definition of auditory hallucinations. Some of the similarities between children's imaginary companions and adult's hallucinations, as described in previous studies, highlighted by Pearson (1998) were: approximately half of voices were heard from inside the head and half from outside in children and adults; about a third of each group had heard their own thoughts aloud and about 60 per cent had heard their own name; approximately half of each group felt that they had some control over the imaginary companion/voices and felt that they were stronger and over half of each group reported the experiences as having been present for a long time, over a year for children and over five years for adults. Therefore, imaginary companions could be the same phenomenon as adult auditory hallucinations with a different label.

Up to 50 per cent of children aged from five to 12 have imaginary companions (Pearson, Rouse, Doswell, Ainsworth, Dawson, Simms, Edward & Faulconbridge, 2001a).

This study will look for an association between auditory hallucinations and imaginary companions.

Aims

The aims of this study are to investigate the relationship between auditory hallucinations deliberately generated in response to an ambiguous stimulus and those reported by participants in their everyday experience. It will also investigate whether there is a continuum of hallucinations between adolescence and young adulthood, that

is do these two groups experience the same levels of hallucinations and how do the types and frequency of hallucinations compare? By using the same questionnaire as previous studies it will also be possible to compare the prevalence of auditory hallucinations in UK samples of adolescents and young adults with samples from the USA. A supplementary exploratory study of the association between auditory hallucinations and imaginary companions will also be reported.

Research questions

1. Do those who fail in reality discrimination when listening to ambiguous stimuli show higher rates of hallucinations in everyday life?
2. Do the rates of hallucinations differ significantly in adolescents and young adults?
3. Is the prevalence of auditory hallucinations the same in the UK as the USA?
4. Is there a positive association between auditory hallucinations and imaginary companions?

METHOD

Design

This study consists of both a within group and a between group design.

Participants

There were two groups of participants, adolescents and adults. The adolescent group was recruited from a local school. Parents of year ten pupils were sent a letter (Appendix II) containing information about the study and asking for their consent to their child participating in the study. Passive consent was sought, i.e. if the parents did not object their consent was assumed. No parents responded to refuse consent. This process of consent has been used before in schools in this LEA (Pearson et al. 2001b). Schools received an information sheet and information for participants, including contact details in case they had questions following the study, was displayed on posters in the school (Appendix II). Two hundred and fifty adolescents took part in the study, 101 male and 148 female (one person did not indicate their gender). Their mean age was 14 years and 8 months (*sd* = 3.55 months). They ranged in age from 14 years and 0 months to 15 years and 5 months. All spoke English as a first language.

The adult group was recruited from undergraduates in the first year of their degree course in business studies. They were given a consent form (Appendix II) and an information sheet (Appendix II). Two hundred and forty six adults participated in the study, 118 male and 128 female. They had a mean age of 20 years and 11 months (*sd*

= 52.3 months), and they ranged from 18 years and 0 months to 60 years and 1 month. Thirty-two participants reported that their first language was not English.

The number of participants in each group was chosen in order to have comparative numbers of participants to previous studies (Barrett & Etheridge, 1992; Posey & Losch, 1983).

Measures

Both groups of participants were asked to complete a questionnaire (Appendix III). This was based on the work of Posey and Losch (1983) and Barrett and Etheridge (1992). The only difference between the questionnaire given to each group in this study was that the school pupils were not asked the two questions about hearing a voice whilst driving a car or the question about hearing the voice of God as it was felt from previous experience that parents might object to this question. The items omitted were numbers 12 to 14. As these items were at the end of the questionnaire they did not influence answers to previous questions and results were analysed 'like with like' by including or excluding relevant questions. The original questionnaire included an item about imaginary companions and some supplementary questions were added to that item for the purposes of this study.

Adult participants were asked to listen to a three-minute tape of white noise produced from the human voice, which was used as the ambiguous stimulus. The recording was a replication of that used by Feelgood and Rantzen (1994). The tape was made from a professional recording of a human voice, which was spliced into one-second sound

bites, randomly mixed and then played backwards. The recording was played on a Sony CFD-S28L stereo with the sound piloted and adjusted to provide adequate volume to be heard throughout the room. Participants were instructed to write down any words or phrases that they heard in this noise. This method replicated that used by Feelgood and Rantzen (1994) and Pearson et al. (2001b).

No pathology screen was used for several reasons. Previous studies have not had exclusion criteria, even where they have screened for pathology (Posey & Losch, 1983; Barrett & Etheridge, 1992). It would have been ethically difficult to ask children about symptoms of pathology. Moreover, since all participants were functioning well enough to be attending full time education they were unlikely to be experiencing severe pathology. The fact that nobody contacted the telephone numbers or email addresses available on the poster or information sheet would seem to confirm this. Having said this, one person was excluded from the adult sample because, having experienced schizophrenia in the past he was still taking neuroleptic medication and it was felt that this could have affected his answers to the questionnaire and response to the ambiguous stimulus.

Procedure

Adolescent group

Questionnaires were distributed during a registration period so that the pupils were in their form groups to complete the questionnaires. They were read the instructions from the front of the questionnaire as follows:

"We would like you to answer the following questions. Each question describes an experience that you may or may not have had. Please circle YES if you have had this experience and NO if you have not. There are no right or wrong answers; we are interested in your own experiences, everyone will answer differently. If you answer YES, please then indicate how often you have this experience by ticking the box by the relevant phrase. We also have left space at the end of the questionnaire for you to describe your experience if you would like to. Please include the question number you are writing about. This is NOT a test so please take your time, read each question carefully and work on your own. Your answers will be different from other people's in your class."

Questionnaires were administered by members of the child psychology department on the Isle of Wight over two days, with the aim of reducing the opportunities for the pupils to discuss the study before completing the questionnaire. They were given the opportunity to ask questions at the time of completing the questionnaire and afterwards posters were displayed in the school thanking them for their participation and giving a telephone number and email address for any questions or concerns following the study.

Participants were asked to write their English set on the front of the questionnaire. This was because an undergraduate sample who would, of course, have been selected for their intellectual ability was being compared with a full school year who would not have been selected on this basis. The assumption was made that the English set the pupils had been assigned to would correspond approximately to their intellectual ability and therefore the effect of such ability on their responses to the questionnaire

could be examined, to ensure that it was valid to compare the two groups.

Adult group

The undergraduates were asked to listen to the ambiguous stimulus tape and then complete the questionnaire. They were approached and the measures were administered during tutorial groups, ranging in size from ten to 23. They were given the following instructions:

> "I am going to ask you to listen to a three minute tape and write down any words you hear and then after the tape is finished complete a short questionnaire. This is for a research project and there are no right or wrong answers. Please listen to the tape and write down any words you might hear. Don't worry about whether you hear any words; some people do and some don't. After the tape is finished please read the instruction on the front of the questionnaire then answer the questions."

Participants wrote down any words they heard on a customised form (Appendix IV) whilst listening to the tape.

Data Analysis

Questionnaire

Results from the questionnaire were entered into SPSS. For each participant scores were calculated as follows, in line with the methodology used by Posey and Losch

(1983) and Barrett and Etheridge (1992). For all participants a score was calculated for items one to 11 (the items given to everyone) by summing the items they answered 'yes' to. For adult participants a score for all items one to 14 was also summed. A score out of a maximum of six was also calculated for all participants for the items they completed that were selected by Posey and Losch and Barrett and Etheridge as those that best represent a measure of actual verbal hallucinations in a normal state of consciousness. They were items 2, 3, 4, 11, 13 and 14. Items 13 and 14 were omitted from the questionnaire given to the school children as they related to driving a car so their scores for the selected items are out of a maximum of four.

Ambiguous stimulus tape

Following the methodology of Feelgood and Rantzen (1994) and Pearson et al. (2001b), the raw data was refined by excluding any words that did not appear in the "Collins English Dictionary" (1994). Foreign words were excluded due to the difficulties in verifying whether they were proper words. In order to minimise the risk of illusions being included, that is words heard due to a sound on the tape or noise in or near the room that sounds like a word, any word repeated by more than 10% of participants in one session or of the total population was excluded. For each participant, the number of remaining words they heard was summed. Data were then entered into SPSS.

RESULTS

Participants

Adolescents

English set did not affect the reported level of hallucinations (Chi-square = 3.876, *ns*). Therefore, the assumption has been made that the possible difference in intellectual ability between a cross section of adolescents and a self-selected sample of undergraduate adults is not relevant in this study.

Adults

Thirty-two adult participants reported that their first language was not English. First language being other than English had a significant affect on both the total score on the questionnaire ($Z = -2.022$, $p < 0.043$) and on the number of words heard when listening to the tape ($Z = -2.234$, $p < 0.025$). None of the adolescent group had a first language other than English. The 32 participants in the adult group with a first language other than English were excluded from the analyses relating to the hypotheses in order to avoid the possibility of this difference between the groups affecting the results.

The age range in the adult group is much greater than that in the adolescent group. Therefore, the possible effect of age on the scores of the adult participants was examined. There was found to be no significant correlation between age and score on

the questionnaire (Spearman's *rho* = 0.007, *ns*) or between age and the number of words heard on the tape (Spearman's *rho* = 0.069, *ns*). Comparing the adult participants over the age of 300 months (25 years) with those below, there was no significant difference in the score on the questionnaire ($Z = -1.162$, *ns*) or the number of words heard ($Z = -0.638$, *ns*). Therefore, no participants in the adult group have been excluded from the calculations relating to the hypotheses due to age.

The two groups were combined to look at the effects of gender. Females showed a higher rate of hallucinations on both the whole questionnaire ($Z = -4.394$, $p < 0.001$) and the selected items ($Z = -2.108$, $p < 0.035$). They also heard a higher number of words on the tape in the adult group ($Z = -3.858$, $p < 0.001$). This finding reflects that in previous studies, for example Tien (1991).

Results from questionnaire

Participants' responses to the questionnaire are summarised in table 1. This includes the results from previous studies completed in the USA using the same questionnaire (Posey & Losch, 1983 and Barrett & Etheridge, 1992).

Insert table 1 about here

Both Posey and Losch and Barrett and Etheridge also calculated scores for each participant on a limited number of items selected as being those most likely to reflect non-hypnagogic/ hypnopompic hallucinatory experiences. The items they selected correspond in this study to items 2, 3, 4, 11, 13 and 14. Adolescent participants did

not complete items 13 and 14 so they had a maximum possible score of four on the selected items, adults a maximum possible score of six. The frequencies of scores for the selected items are shown in table 2.

Insert table 2 about here

Participants were also asked that for those items where they had had the experience, they also indicate the frequency of the experience. The responses to the selected items are shown in table 3.

Insert table 3 about here

Number of words heard in response to the ambiguous stimulus

The mean number of words heard by the adult participants on the 'human white noise' tape was 8.56 (*sd* = 10.41), with a range from 0 to 51. Frequencies are shown in figure 1 and summarised in Appendix V.

Insert figure 1 about here

Some of the words were heard in phrases, the longest of these five words long. The most common word heard by this group, who were undergraduates coming up to their first University exams, was 'understand.' One participant withdrew from the study after listening to the tape. He reported that he had been offended by the extremely racist words he had heard on the tape.

Test for normal distribution

The dependant variables were all tested for normal distribution using the Kolmogorov-Smirnov test. None of them had a normal distribution: for the questionnaire scores for the whole group (items 1 to 11), $Z = 3.551$, $p < 0.001$; for the questionnaire scores on all items for the adult group, $Z = 2.497$, $p < 0.001$ and for the number of words heard on the tape by the adult group, $Z = 2.319$, $p < 0.001$. This demonstrates that none of these data sets are drawn from a normal distribution and, therefore, non-parametric tests are used throughout.

Research question 1

Do those who fail in reality discrimination when listening to ambiguous stimuli show higher rates of hallucinations in everyday life?

A one tailed correlation showed a strong association between the rates of hallucinations reported on the questionnaire by the adult participants and the number of words participants heard when listening to the 'human white noise' tape. This was the case for both the total hallucination scores (Spearman's *rho* = 0.177, $p < 0.005$) and for the selected items (Spearman's *rho* = 0.144, $p < 0.019$). Participants were also allocated, on the basis of their scores on the selected items, into two groups of 50 non-hallucinators, who scored zero, and 44 hallucinators, who scored three or more. The non-hallucinators heard a mean of 7.48 words (*sd* 10.49) and the hallucinators heard a mean of 10.93 words (*sd* 10.28). This method replicates that of Feelgood and Rantzen (1992) and Pearson et al. (2001b). The number of words heard by the hallucinators

was significantly higher ($Z = -2.125$, $p < 0.034$). Therefore, those who fail in reality discrimination when listening to ambiguous stimuli do show higher rates of hallucinations in everyday life.

Research question 2

Do the rates of hallucinations differ significantly in adolescents and young adults?

The scores of the adolescent and adult groups on questions 1 to 11 of the questionnaire and on the selected items were compared using a Mann-Whitney test. No significant difference was found on items 1 to 11 ($Z = -1.299$, $p < 0.194$) or on the selected items ($Z = -0.602$, $p < 0.547$); indeed the high p values show that the two groups were very similar in their scores on the questionnaire. The correlation between the two groups was also highly significant (Spearman's *rho* = 0.891, $p < 0.001$), suggesting that the results for individual items were very similar. Therefore, the rates of hallucinations do not differ significantly in adolescents and young adults. Data from the current study is also shown in figure 2.

Insert figure 2 about here

Research question 3

Is the prevalence of auditory hallucinations the same in the UK as the USA?

The scores of the adult participants were compared with the results found by Posey &

Losch (1983) and Barrett and Etheridge (1992). Both studies used the same questionnaire as the current study, Posey and Losch with 375 college students (125 male, 249 female, 1 no response) at Murray State University in the USA and Barrett and Etheridge with 585 participants, 198 male and 387 female.

As can be seen from the graph in figure 2 the results for individual are very similar for the individual items. Comparison of the selected items shows that in the Posey and Losch study 71 per cent of participants answered yes to at least one of the items; in the current study 77.2 per cent of adults and 73.2 per cent of adolescents answered yes to at least one item. Correlations between the four sets of data were all significant and are shown in table 4.

Insert table 4 about here

Frequencies were compared with those found by Barrett and Etheridge. Collapsing frequencies across all items, Barrett and Etheridge found that 23 per cent of hallucinations reported were isolated events and 45 per cent were regular events. In the current study, of the hallucinations reported by adolescents, 36.7 per cent were isolated events and 39.2 were regular. For adult participants 35.2 per cent were isolated events and 29.0 per cent regular events. Overall, the current study sample reported 36.0 per cent isolated events and 34.2 per cent regular events. The British sample showed a slightly lower frequency of hallucinations.

Therefore, the prevalence of auditory hallucinations is approximately the same in the UK as the USA.

Research question 4

Is there a positive association between auditory hallucinations and imaginary companions?

Scores from both groups from the selected items on the questionnaire, which did not include item 8, the question about imaginary companions, were compared with responses to item 8. Comparing scores of the 354 participants who have never had an imaginary companion with the 110 who have, those who have had an imaginary companion also have significantly higher levels of hallucinations ($Z = -5.158$, $p < 0.001$). Thirty-six participants, including ten adults, reported having a current imaginary companion. This group had significantly higher levels of hallucinations than those without a current imaginary companion ($Z = -5.039$, $p < 0.001$). Therefore, there is a positive association between auditory hallucinations and imaginary companions.

DISCUSSION

Research questions

The results of this study suggest that those participants who failed in reality discrimination when listening to ambiguous stimuli did show higher rates of hallucinations in everyday life. The findings in relation to the experiences reported in response to the ambiguous stimulus give support to the model of hallucinations based on the idea of a failure of reality discrimination (Bentall, 1990). According to this model, participants who report higher rates of hallucinations in everyday life have a tendency to make errors in distinguishing between internally generated images and perception of external stimuli. They are more likely to make these errors when there is little information on which to base their decision and when they are trying to make this decision in the presence of background interference (Bentall, 1990). In this study, this tendency to make errors was generated in response to an ambiguous stimulus, the human white noise tape.

There is a possibility that the phenomenon observed was generated not by failures in reality discrimination but by participants 'search for meaning' in ambiguity. There have been suggestions that people who hallucinate are likely to make more rapid decisions in their search for meaning in the world around them. Heilbrun and Blum (1984) suggested that hallucinators were more likely to make perceptual errors due to this premature judgement and to limited consideration of alternative meanings for misperceptions. They based this suggestion on work with psychiatric patients; it has not yet been replicated with normal population hallucinators. It is not possible in the

present study to distinguish whether hallucinations are due to a failure of the 'self-other' judgement or to a 'search for meaning' in ambiguity. However, these ideas are not necessarily mutually exclusive and it may be that both processes are involved: participants strive to impose meaning on the world around them and in some cases this meaning is mistakenly attributed to an external rather than an internal source.

The rates of hallucinations did not differ significantly in adolescents and young adults. Therefore, this study suggests that children and adults experience the same degree and type of hallucinations, providing strong evidence that there is a continuum not only between normal and pathological hallucinations but also between children and adults. Hallucinations could, therefore, be considered as lifelong experiences, not confined to adulthood.

The prevalence of auditory hallucinations was the same in this UK sample as in the USA. The results of this study suggest that seven out of ten people in the normal population will at some point in their life experience hallucinations. One third of people will experience regular hallucinations, that is at least once a month and up to weekly or even daily. The rates of hallucinations in these British samples are the same as the North American studies (Posey & Losch, 1983; Barrett & Etheridge, 1992).

There was a positive association between auditory hallucinations and imaginary companions. Therefore, there does seem to be an association between the experience of auditory hallucinations and the presence of imaginary companions at some time in the person's life. Indeed if this sample is typical it may be that one out of 25 young

adults have a current imaginary companion. However, this finding is somewhat tentative as the methodology used does carry the risk that the experiences reported on the questionnaire, such as hearing one's name, which were assumed to be hallucinations are in fact due to imaginary companions. This would mean that the comparisons made are actually comparing the same experience. If the idea that they are the same phenomenon with a different label (Pearson, 1998) is correct, then one would expect participants to have difficulty attributing experiences to imaginary companions or to auditory hallucinations; they would experience them as the same thing.

Clinical implications

From the current sample a quarter, or 125 people, experience hallucinations on a regular basis, between monthly and daily. Previous studies that have looked at the level of distress experienced, for example Tien (1991) suggest that there is a proportion of people who experience hallucinations and who are not distressed by them. Posey and Losch (1983) did not measure distress but did include quotes from participants about their experiences. One example from Posey and Losch of the phenomenon of experiencing hallucinations not found to be distressing was a comment from a participant who said, "I'm scared of driving at night and I sometimes hear something or someone telling me to slow down and take it easy." Participants in the current study were not asked about levels of distress associated with hallucinations but the comments written by some participants suggests that although some of them experience hallucinations at times of stress or anxiety or when waiting for something to happen, others described their experiences in a very matter of fact way and do not

mention any distress or discomfort. One participant from the adult group wrote, "just after my nan died, literally that night, it was as if my nan was in my room sitting on the end of my bed telling me it would be all right."

The author's clinical experience of working with people in long stay hospitals receiving treatment for psychosis is that some clients say that they do not want to take medication prescribed to try and stop them experiencing hallucinations. They say that this is because at least some of the voices they experiencing are positive in some way; giving advice, comfort, reassurance or company. This clinical impression is confirmed by Al-Issa (1995) and Romme, Honig, Noorthoorn & Escher (1992). Clients also state on occasions that living with hallucinations that they are used to would be better than living with the effects and side effects of medication; they are then looking to professionals for help to improve their functioning. A useful source of support and information for these people are organisations such as the 'Hearing Voices Network' or MIND, where people who are living with auditory hallucinations meet to discuss their experiences, exchange ideas and offer informal support to people who are having difficulty coping. Clinical experiences of the author suggests that people are often willing to try strategies that other people who experience auditory hallucinations report as being effective for them.

Much work has been done looking at the link between hallucinations and stress. Levels of hallucinations are related to the level of stress in the person's life (Bentall, 1990) and it has been hypothesised that auditory hallucinations stem from the interaction of stress and underlying hallucinatory disposition (Slade, 1976). The work of Romme and Escher (1996) suggests that the content of hallucinations is related to

stressors in the person's life.

There is some evidence from this study that the words heard in response to the ambiguous stimulus may have some relation to stressors in participant's lives. For example one black male participant withdrew from the study, saying that he had heard extremely racist words on the tape. The researcher was present at the time and no such words were spoken aloud by anybody in the room so they must have been generated by this participant.

Therefore, current incidence of hallucinations might be an indicator of increased stress levels and the content may point towards what the particular stressors are of the individual concerned. However, perhaps it is important that clinicians question whether hallucinations are a pathological symptom of stress or mental illness, or whether in some cases they might be a coping mechanism. If this is the case perhaps they should be utilised as such and therapists could be aiming towards maximising the effectiveness of hallucinations as a coping mechanism, rather than focusing on managing or minimising them. Certainly the function of the hallucinations the person is experiencing and their ability to tolerate them should be examined.

One clinical approach where this strategy of monitoring levels of hallucinations, and associated stress, is used is in relapse prevention (Spencer, Murray & Plaistow, 2000). This approach aims to identify, with the client, clear and easily recognisable signs that they are well, becoming less well or relapsing. Strategies for the client, carers and professionals involved are then identified so that, as soon as the signs are noticed, appropriate action is taken. An example might be that if a client noticed that the level

of hallucinations they were experiencing increased they would then talk to someone about what they might be finding stressful at the time. In another case it could be the content of hallucinations that was relevant; somebody coping well with voices that had a pleasant content might find it difficult to cope with unpleasant content.

Research implications

The majority of research into auditory hallucinations has been with people in the clinical population. This has many implications. There are effects from treatment, for example psychotherapy or medication. People have experienced the stigma of being diagnosed with a mental illness. The clinical population are generally people who have had difficulty coping with their hallucinations, or whose functioning has been negatively affected in some way. They are also likely to be a group of people who are experiencing other symptoms such as delusions or negative symptoms. Conversely, these are less likely to be true of people from the normal population who experience hallucinations. Research with the normal population could yield a great deal of information and increase our knowledge base on hallucinations. This knowledge could then inform clinical work.

There are many research implications from the current study. Initial evidence for a continuum of hallucinations from children to adults has been presented but the next step is to repeat the study with younger children to see whether hallucinations are a lifelong experience or start to appear at a particular age. Most of the adult samples have been predominantly younger adults, in their late teens or 20s. Although there is some evidence from the current study that age up to 60 years does not have an effect,

it would be interesting to extend the study with older people. It might be that the stress and loneliness sometimes experienced in older life have the effect of increasing levels of hallucinations. Tien (1991) found that levels of hallucinations differed with age. Imaginary companions have been reported in older adults (O'Mahony, Shulman & Silver, 1984).

Another factor relating to the adult samples in this and other studies is that they are taken from university samples. It would be interesting, although practically difficult, to replicate the study with a non-university population sample. Further examination of cross cultural differences and similarities could be carried out by repeating the study in some different cultures, as the samples described above are from very similar cultures in the USA and UK.

The differences and similarities between hallucinations experienced by normal and clinical populations is an area that could also be studied further. The questionnaire could be used with clinical populations, both psychotic and non-psychotic, to compare the type and frequency of hallucinations experienced. Further investigation of the nature of hallucinations could be examined in a qualitative study looking at variables such as the degree of distress associated with hallucinations, their perceived function(s), the individual's attitude to their hallucinations and their locus of control. It might them be possible to design measures of these variables and carry out a quantitative study.

One other interesting area of research would be to further investigate the phenomenon of imaginary companions and its association with hallucinations. A qualitative study

could look at those people who still experience imaginary companions into adolescence or adulthood, one in 20 of adults and one in ten of adolescents in the current study. One could look at how they feel about this; is it a positive experience for them; do they worry that it is unusual or do they feel that they are lucky to have an imaginary companion; do they have any signs of pathology?

Strengths and weaknesses of study

There are certain weaknesses in the current study that should be noted. The hallucination questionnaire had not previously been used with anyone under the age of 18 years. Therefore, it would have been useful to do a pilot study with adolescents to make sure that it was readily understandable to them and that it was suitable to capture their experiences. This would have tested the reliability of the measure, although as no other measure for children and adolescents exists, it is difficult to know what test of validity, other than face validity, would have been suitable.

Another weakness, which follows from the previous point, is that the questionnaire had to be amended somewhat for use with the adolescent sample. Ideally the same questionnaire would have been used with both groups of participants. However, there was no way to avoid using a shorter version for the adolescent group, as the questionnaire contained items about driving a car and obviously it was not appropriate to ask the adolescent sample about experiences they should not have had. The questions about hallucinations whilst driving were viewed by Posey and Losch (1983) and Barrett and Etheridge (1992) as integral to the questionnaire, and were included in the selected questions, so it was decided to include these items in the questionnaire

given to the adult sample. Thought was given to whether it would be possible to try to find an analogous situation for both children and adults, for example cycling or playing video driving games but these were not felt to be similar enough experiences to driving alone. The other difference between the two versions of the questionnaire was the omission of the item about hearing the voice of God. It was felt by researchers who had experience of both clinical work and research in the school concerned and with this age group as a whole that this was an item that parents might not have wanted their children being asked.

The issue of suggestibility in previous studies using ambiguous stimuli was addressed to some extent by telling participants that they *may* hear words on the white noise tape, rather than telling them there were words present that they should try to hear. However, this methodology still primed participants to expect words, rather than any other sound. It would have been better to instruct them simply to report whatever they heard on the tape. Another possible problem was that participants listened to the tape in groups and might either feel self-conscious about writing down what they heard or conversely about not having heard anything to write down, or even try to 'compete' with each other to write as much as possible.

The current study has several particular strengths. It has a straightforward methodology which would be easily replicable, and which is based on well-established precedents. It is also readily understandable both to professionals and to those participating in the study. The questionnaire has good face validity, particularly due to the fact that the items include a quote from an individual describing their own experience, rather than academics describing phenomenon they may not have

experienced.

Another benefit from this study is that it has established a tool for measuring levels, frequency and type of auditory hallucinations in adolescents. There was already a precedent established for using this measure with adults and it is now established with adolescents. However, further studies are needed to assess whether it can be used with younger children and older adults. There is no reason to suppose that it would not be suitable for these populations, where they have the capacity to understand and respond to the questions. If this tool were suitable for use with all ages it would be possible to greatly extend the knowledge base on auditory hallucinations within the general population.

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Figure 1: number of words heard in response to 'human white noise' tape.

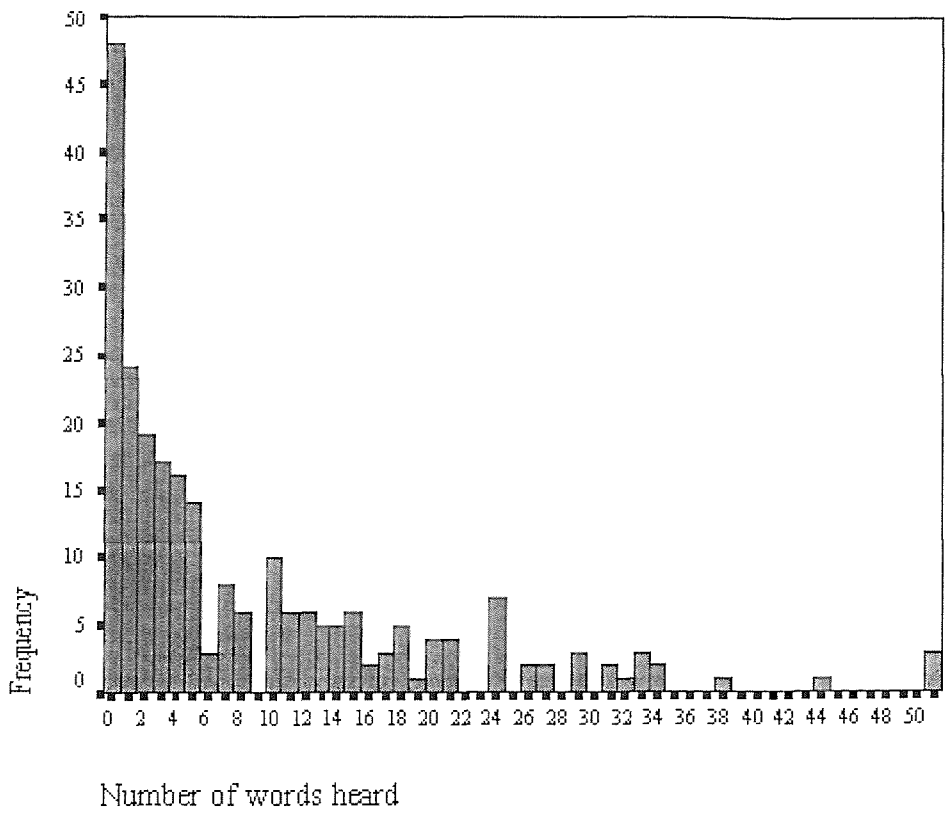

Figure 2: Percentage of 'yes' responses to questionnaire items for current and previous studies.

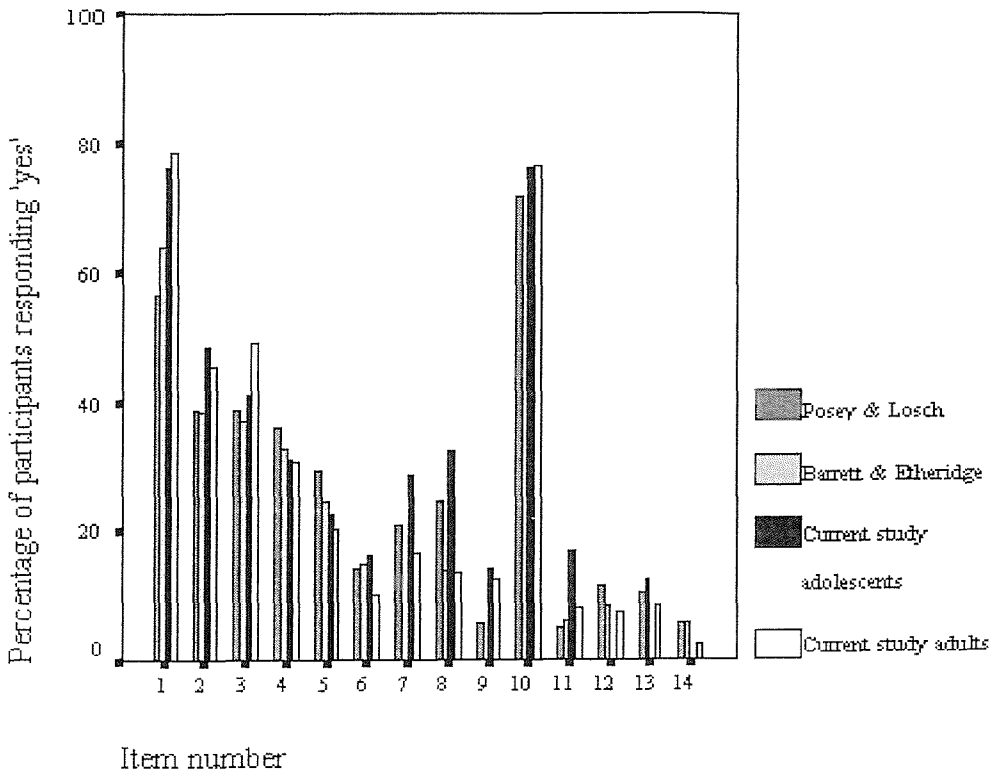

Table 1: Percentage frequencies of verbal hallucinations

Questionnaire item description	Adolescent group	Adult group	Posey & Losch	Barrett & Etheridge
1. Hear own name in shop	76.3	78.5	56.5	64.0
2. Hear own name from garden	48.4	45.3	38.7	38.4
3. Hear own thoughts spoken aloud	41.1	49.1	38.9	37.2
4. Hear own name in house alone	31.2	30.8	36.0	32.8
5. Hear own name as falling asleep	22.4	20.1	29.6	24.6
6. Hear voice as waking	16.1	10.3	14.1	15.0
7. Hear voice as falling asleep	28.8	16.4	20.8	-
8a. Imaginary companion at any time	32.4	13.6	24.5	14.0
8b. Current imaginary companion	10.4	4.7	-	-
9. Hear own name on radio	14.4	12.7	5.9	-
10. Hear telephone or doorbell	76.0	76.5	71.5	-
11. Talk with dead relative	16.9	8.4	5.3	6.3
12. Hear God's voice	-	7.5	11.5	8.7
13. Hear own voice when driving	-	8.5	10.7	12.6
14. Hear people talking when driving	-	2.4	6.1	6.1

Table 2: Participants' scores on selected items.

Score on selected items	Adolescents	Adults
0	67 (26.8%)	56 (22.8%)
1	89 (35.6%)	90 (36.6%)
2	46 (18.4%)	44 (17.9%)
3	30 (12.0%)	38 (15.4%)
4	18 (7.2%)	10 (4.1%)
5		7 (2.8%)
6		1 (0.4%)

Table 3: Percentage of participants rating the frequency of experiencing the selected items.

	Adolescents				Adults					
	2	3	4	11	2	3	4	11	13	14
Isolated event *(once or twice ever)*	38.0	31.0	36.8	26.8	39.6	29.4	35.5	44.0	34.8	44.5
Occasional event *(every 6 months to 2 years)*	30.6	30.0	22.3	24.4	38.8	34.9	42.1	36.0	30.4	33.3
Regular event *(once a month or more)*	31.4	39.0	40.9	48.8	21.6	35.7	22.4	20.0	34.8	22.2

Table 4: Correlations between current and previous studies (Spearman's *rho*)

	Posey & Losch	Barrett & Etheridge
Current study: adolescents	0.909**	0.810*
Current study: adults	0.916**	0.973**

* Significant at 0.01 level (one-tailed)

** Significant at 0.001 level (one-tailed)

APPENDICIES

Contents

Appendix I: Letters of ethical approval

- Isle of Wight Healthcare Trust
- University of Southampton

ISLE OF WIGHT HEALTH AUTHORITY

LOCAL RESEARCH ETHICS COMMITTEE

Chairman: Mrs Denise Grannum

DG/sjb

19 April 2000

Dr D Pearson
Consultant Clinical Psychologist
The Gables
Halberry Lane
Newport
Isle of Wight

RECEIVED
27 APR 2000
PSYCHOLOGY DEPT.

Dear Dr Pearson

PROTOCOL NO: 9/00 - AUDITORY HALLUCINATION EXPERIENCES IN A NORMAL CHILD POPULATION

Thank you for your above submission and for attending the Ethics meeting on 14 April.

The Committee considered your protocol and brought to your attention the following amendments - in the questionnaire Q 4 - a word was missed out, Q 8 the second part of the question was not phrased well and a heading was needed on the letter to the parent/guardian.

The Committee gave approval for your study to go ahead. Please let us have a copy of the relevant changes requested.

We wish you every success with your study and would ask you to come back and inform us of the outcome in the future.

If, for any reason, you cannot undertake your study, please inform the Committee, quoting the protocol number and the date of approval.

I enclose a copy of the Ethics Committee Composition.

Yours sincerely

Denise J. Grannum

DENISE GRANNUM
Chairman - LREC

cc Copy to John Lewis, Litigation Manager, St Mary's Hospital

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Isle of Wight Local Research Ethics Committee, Isle of Wight Health Authority, Whitecroft, Sandy Lane, Newport, Isle of Wight, P030 3ED
Secretary: Mrs Shirley Butchers - 01983 535403

MEMBERS OF THE LOCAL RESEARCH ETHICS COMMITTEE
as at 01.01.00

Administrator: Mrs Shirley Butchers

Mrs D Grannum (Chairman)
'Cedar Cottage', Swains Road, Bembridge, Isle of Wight, PO35 5XR

Vacancy (Vice-Chairman)

Mr M Cunningham (Lay Member)
Peppercorns, Whitepit Lane, Newport, Isle of Wight, PO30

Dr Mike Howell (GP member)
The Surgery, Blackgang Road, Niton, Isle of Wight, PO38

Dr Fiona Kennedy (Specialist Member)
Consultant Clinical Psychologist, Island Clinical Psychology Service, The Gables, Halberry Lane, Newport, Isle of Wight, PO30

Dr Ian Johnson (Specialist Member)
Medical Director, Earl Mountbatten Hospice, Halberry Lane, Newport, Isle of Wight, PO30 2ER

Dr Taranah Dean (Hospital Specialist Member)
Research and Development Co-ordinator, David Hide Asthma and Allergy Centre, St Mary's Hospital, Newport, Isle of Wight, PO30 5TG (Mrs Ann Dewy attends the Committee in Dr Dean's place if she is unavailable)

Mr L Merricks (Lay Member)
Chinefields, Colwell Chine Road, Freshwater, Isle of Wight, PO40 9NP

Miss Alison Charlsley
Deputy Director of Nursing, St Mary's Hospital, Newport, Isle of Wight, P030 5TG (Mr Shaun Essery attends when Miss Charsley is unavailable)

Dr Ram Seth (Specialist Hospital-based Member)
Consultant Psychiatrist, Newcroft, St Mary's Hospital, Newport, Isle of Wight, P030 5TG

Dr Eileen Finch (GP)
Cowes Health Centre, Consort Road, Cowes, Isle of Wight, PO31 7SH

Mrs Gillian Honeywell (Pharmaceutical Adviser), Pharmacy Manager, St Mary's Hospital, Newport, Isle of Wight, P030 5TG

Mr Noel Staunton (Pharmaceutical Advisor), Primary Care Group/Health Authority, Whitecroft, Sandy Lane, Newport, Isle of Wight, PO30 3ED

Mr Geoff Taylor, (Consultant Anaesthetist), St Mary's Hospital, Newport, Isle of Wight, PO30 5TG.

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21st July 2000

FAO Sarah Flury
Clinical Psychology Department
University of Southampton
Highfield
Southampton SO17 1BJ

Dear Sarah,

Re: Application for Ethical Approval

I am writing to confirm you that your ethical application titled "Auditory hallucinations within normal populations of children and adults" has been given approval by the departmental ethics committee.

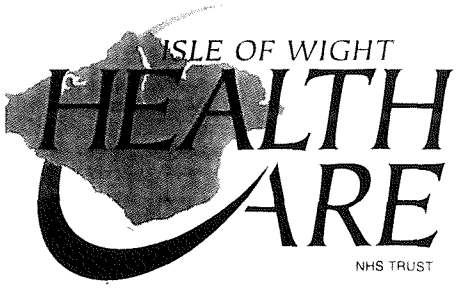
Should you require any further information, please do not hesitate in contacting me on (023) 80 593995.

Yours sincerely,

Kathryn Smith
Ethical Secretary

Appendix II: Participant information sheets and consent forms

- Schools consent form
- Schools information sheet
- Adult information sheet
- Adult consent form



Isle of Wight Healthcare NHS Trust
Island Clinical Psychology Service
The Gables, Halberry Lane
Fairlee, Newport
Isle of Wight PO30 2ER

Tel: 01983 521464 or 525326
Fax: 01983 521427

Dear Parent/Guardian

We are involved in a hospital based piece of research that is taking place on the Island. The research is looking at aspects of perception, imagination and development in children and adolescents. The study involves completing a questionnaire about various normal perceptual experiences. The study will take only a few minutes and will not effect your son/daughter's school work.

Your son/daughter will only be asked to join in this study if you are happy about it. Their name will not be recorded and all other information will only be used for this study. The person administering the questionnaire will be a member of our team at the hospital. At the end of the study we will inform all interested schools and families of our results.

Should you object to your child taking part in the study please telephone or write to me using the above address/telephone number. You can of course withdraw your son/daughter from the study at any point. If you have any questions about the study please do not hesitate to contact a member of the research team at the above address.

Please keep this letter for your information.

Thank you for your co-operation.

Yours sincerely

Dr David Pearson
Consultant Clinical Psychologist.

ISLE OF WIGHT HEALTH CARE NHS TRUST

Isle of Wight Healthcare NHS Trust
Island Clinical Psychology Service
The Gables, Halberry Lane
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Schools Information Sheet

Aim of study

This study forms part of a series of University and hospital based studies looking at perceptual experiences in children and adolescents. Studies so far have focused on imagination and creativity in mainstream school children. The age range in previous studies has been between 5 and 12 years. These studies have been submitted for publication.

The current study aims to investigate perceptual experiences in older children and young adolescents. This will allow us to formulate a continuum across childhood development.

Description of study

This study will involve asking year 10 students to complete a short questionnaire. This questionnaire is designed to look at normal perceptual experiences and should take only a few minutes to complete.

We would hope to administer the questionnaires class by class during normal school time. This should minimise disruption to the lesson.

A member of the research team, all of whom are graduate psychologists employed by the Health Trust to work with children, would administer the questionnaires.

Parents will be informed about the study and will have the right to withdraw their child if they choose. Children's names will not be recorded and all information gained will be used only for the purpose of this study.

Once the results are collated and analysed feedback will be made available to both yourselves and parents.

This study is led by Dr David Pearson, Consultant Clinical Psychologist, and has been approved by the ethics committee of the Isle of Wight Health Authority.

University of Southampton

Department of Psychology

Doctoral Programme in Clinical Psychology

University of Southampton
Highfield
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Email

Perceptual Experiences Study Information Sheet

This study is part of my Clinical Psychology Doctorate. It aims to look at some common perceptual experiences in young adults and adolescents.

You will be asked to listen to a tape and write down any words or phrases that you hear. You will then be asked to fill in a questionnaire. The whole thing should not take more than about ten minutes.

Your answers will only be used for this study. No names will be used; you are only asked to write your name when you sign the consent form but you may return the questionnaire anonymously if you wish.

If you have any questions or if you would like a copy of the results of the study please contact me at the telephone number or email address below.

Thank you for taking part in this study.

Sarah Flury

Trainee Clinical Psychologist

Tel: 01983 521464

email: sf5@psy.soton.ac.uk

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Department of Psychology

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CONSENT FORM

Perceptual Experiences Study

Have you read the Information Sheet?	Yes / No
Have you had the opportunity to ask questions and discuss the study?	Yes / No
Have you received satisfactory answers to your questions?	Yes / No
Have you received enough information about the study?	Yes / No
Do you understand you are free to withdraw from the study: • At any time? • Without having to give a reason?	Yes / No
Do you agree to take part in this study?	Yes / No

Signed: ..... Date .....

Name in block letters .....

Sarah Flury

Trainee Clinical Psychologist

Tel: 01983 521464

email: sf5@psy.soton.ac.uk

Appendix III: Hallucination Questionnaire

Perceptual Experiences Questionnaire

Age: ..... years ..... months **Gender:** ☐ **Female** ☐ **Male**

Instructions

We would like you to answer the following questions. Each question describes an experience that you may or may not have had.

- Please circle YES if you have had this experience and NO if you have not. **There are no right or wrong answers;** we are interested in your own experiences, everyone will answer differently.
- If you answer YES, please then indicate how often you have this experience by ticking the box by the relevant phrase.
- We also have left space at the end of the questionnaire for you to describe your experience if you would like to. Please include the question number you are writing about.

This is NOT a test so please take your time, read each question carefully and work on your own. Your answers will be different from other people's in your class.

Thank you for your help in filling in this questionnaire.

1 "Sometimes I have thought I heard someone call my name when I have been in a shop but when I look to see who called there is no-one I know in the shop."

Has something similar to this ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

2 "Last summer I was in the garden when I heard someone call my name from inside the house, I heard the voice clearly but when I went inside to check who had called no one had."

Has something similar to this ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

3 "I have sometimes heard my thoughts spoken aloud."

Has something similar to hearing your thoughts spoken aloud ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

4 "Sometimes when I am in the house by myself I think that I hear someone call my name, it's not scary, I think I know that there isn't anyone there, but it sounds like a real voice."

Have you ever your own name being called when you are alone? YES / NO

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

5 "Sometimes as I fall asleep I hear my name as if spoken aloud."

Have you ever heard your own name being spoken as you fall asleep? YES / NO

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

6 "When I wake up in the morning and before I get out of bed I hear a voice but I know there is nobody there."

Have you ever heard somebody speaking to you as you wake up in the morning when there is no one else there? YES / NO

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

7 "Sometimes I hear a voice as I fall asleep that is jumbled up so I can't tell what it is saying."

Have you ever heard a voice just as you were falling asleep when there was nobody there? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week
☐ Once every couple of years ☐ Once a month ☐ At least once a day
☐ Once a year

8 "Sometimes I have an imaginary friend that no-one else can see, who talks to me, I hear their voice when we talk."

a. Have you got an imaginary friend at the moment? **YES / NO**
b. If you don't have one now, have you ever had an imaginary friend? **YES / NO**

If **YES** to either question a or b, Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week
☐ Once every couple of years ☐ Once a month ☐ At least once a day
☐ Once a year

c. If you have ever had an imaginary friend did you hear their voice as if it was real? **YES / NO**

9 "Sometimes I think I hear my name on the radio when it hasn't been read out."

Has something similar to this ever happened to your? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week
☐ Once every couple of years ☐ Once a month ☐ At least once a day
☐ Once a year

10 "Sometimes I think I have heard the phone or the door bell ring when no one has rung them."

Has something similar to hearing the doorbell or phone ring when no one has rung them happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

11 "Sometimes I talk with my grandmother who is dead or hear her voice aloud."

Has something similar to hearing a relative or friend who is dead talking aloud happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

12 "I have heard God's voice, not that he made me know in my heart but as a real voice."

Has something similar to this ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

13 "When I am driving my car, particularly when I am tired or worried, I hear my own voice from the back seat. It's behind me over my left shoulder although I know it is coming from my own head. Usually it's soothing statements like 'it'll be all right'."

Has something similar to this ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

14 "I drive a lot at night. Sometimes when I am tired, I hear sounds in the back seat like people talking but I can't tell what they are saying, just a word here and there."

Has something similar to this ever happened to you? **YES / NO**

If **YES,** Please tick how often this has happened to you

☐ Just once or twice ever ☐ Once every 6 months ☐ At least once a week

☐ Once every couple of years ☐ Once a month ☐ At least once a day

☐ Once a year

If you have answered **YES** to any of the questions, please describe a time that the experience has happened to you. Write the question number you are writing about .....

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Appendix IV: Ambiguous stimulus tape response form

Perceptual Experiences Study

Age: ..... years ..... months **Gender:** ☐ **Female** ☐ **Male**

For this part of the study you will be asked to listen to a short tape. Please listen to the tape and write below any words you hear.

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Appendix V: Frequencies of words heard in response to ambiguous stimulus tape

Number of words	Frequency	Per cent
0	48	20.1%
1	24	10.0%
2	19	7.9%
3	17	7.1%
4	16	6.7%
5	14	5.9%
6	3	1.3%
7	8	3.3%
8	6	2.5%
10	10	4.2%
11	6	2.5%
12	6	2.5%
13	5	2.1%
14	5	2.1%
15	6	2.5%
16	2	0.8%

Number of words	Frequency	Per cent
17	3	1.3%
18	5	2.1%
19	1	0.4%
20	4	1.7%
21	4	1.7%
24	7	2.9%
26	2	0.8%
27	2	0.8%
29	3	1.3%
31	2	0.8%
32	1	0.4%
33	3	1.3%
34	2	0.8%
38	1	0.4%
44	1	0.4%
51	3	1.3%

Appendix VI: Instructions to authors of target journals

- Clinical Psychology Review
- Personality and Individual Differences

Clinical Psychology Review

Guide for Authors

SUBMISSION REQUIREMENTS: All manuscripts should be submitted to Alan S. Bellack, Department of Psychiatry, The University of Maryland at Baltimore, 737 W. Lombard St., Suite 551, Baltimore, MD 21201, USA. Submit three (3) high-quality copies of the entire manuscript; the original is not required. Allow ample margins and type double-space throughout. Papers should not exceed 50 pages (including references). One of the paper's authors should enclose a letter to the Editor, requesting review and possible publication; the letter must also state that the manuscript has not been previously published and has not been submitted elsewhere. One author's address (as well as any upcoming address change), telephone and FAX numbers, and E-mail address (if available) should be included; this individual will receive all correspondence from the Editor and Publisher.

Papers accepted for *Clinical Psychology Review* may not be published elsewhere in any language without written permission from the author(s) and publishers. Upon acceptance for publication, the author(s) must complete a transfer of Copyright Agreement form.

COMPUTER DISKS: Authors are encouraged to submit a 3.5" HD/DD computer disk to the editorial office; 5.25" HD/DD disks are acceptable if 3.5" disks are unavailable. Please observe the following criteria: (1) Send only hard copy when first submitting your paper. (2) When your paper has been refereed, revised if necessary, and accepted, send a disk containing the final version with the final hard copy. Make sure that the disk and the hardcopy match exactly (otherwise the diskette version will prevail). (3) Specify what software was used, including which release, e.g., WordPerfect 6.0a. (4) Specify what computer was used (IBM compatible PC, Apple Macintosh, etc.). (5) The article file should include all textual material (text, references, tables, figure captions, etc.) and separate illustration files, if available. (6) The file should follow the general instructions on style/arrangement and, in particular, the reference style of this journal as given in the Instructions to Contributors. (7) The file should be single-spaced and should use the wrap-around end-of-line feature, i.e., returns at the end of paragraphs only. Place two returns after every element such as title, headings, paragraphs, figure and table call-outs. (8) Keep a backup disk for reference and safety.

TITLE PAGE: The title page should list (1) the article; (2) the authors' names and affiliations at the time the work was conducted; (3) a concise running title; and (4) an unnumbered footnote giving an address for reprint requests and acknowledgements.

ABSTRACT: An abstract should be submitted that does not exceed 200 words in length. This should be typed on a separate page following the title page.

KEYWORDS: Authors should include up to six keywords with their article. Keywords should be selected from the APA list of index descriptors, unless otherwise agreed with the Editor.

STYLE AND REFERENCES: Manuscripts should be carefully prepared using the *Publication Manual of the American Psychological Association*, 4th ed., 1994, for style. The reference section must be double spaced, and all works cited must be listed. Avoid abbreviations of journal titles and incomplete information.

Reference Style for Journals: Raymond, M.J. (1964). The treatment of addiction by aversion conditioning with apomorphine. *Behaviour Research and Therapy, 3,* 287-290.

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Personality and Individual Differences

The Official Journal of the International Society for the Study of Individual Differences (ISSID)

Guide for Authors

Personality and Individual Differences will be published monthly.

Neither the Editors nor the Publisher accept responsibility for the views or statements expressed by authors.

Copies of referees' reports will be sent to contributors to enable them to see reasons for rejection, or suggestions for improvements. All incoming papers are subject to the refereeing process, unless they are clearly not appropriate for the "Aims and Scope" of the Journal. Correspondence regarding decisions reached by the editorial committee is not encouraged. An explanation of our editorial policies will be found in the Editorial in the first issue of the Journal.

This journal should be cited in lists of references as *Personality and Individual Differences.*

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Manuscripts should be typewritten on *one side* of the paper, *double spaced* and in triplicate (one original and three copies). The original manuscript and diagrams will be discarded one month after publication unless the Publisher is requested to return original material to the author.

Manuscripts must be carefully checked and **corrections to the proofs must be restricted to printer's errors.** Any substantial alterations other than these may be charged to the author.

Disks

Authors are encouraged to submit a computer disk (5.25" or 3.5"HD/DD disk) containing the **final** version of the paper along with the **final** manuscript to the editorial office. Please observe the following criteria:

1. Send only hard copy when first submitting your paper.

2. When your paper has been refereed, revised if necessary and accepted, send a disk containing the final version with the final hard copy. **Make sure that the disk and the hard copy match exactly.**

3. Specify what software was used, including which release, e.g. WordPerfect 5.1.

4. Specify what computer was used (either IBM-compatible PC or Apple Macintosh).

5. Include the text file and separate table and illustration files, if available.

6. The file should follow the general instructions on style/arrangement and, in particular, the reference style of this journal as given below.

7. The file should be single-spaced and should use the wrap-around end-of-line feature,i.e. no returns at the end of each line. All textual elements should begin flush left; no paragraph indents. Place two returns after every element such as title, headings, paragraphs, figure and table call-outs.

8. Keep a back-up disk for reference and safety.

The articles submitted must contain original material which has not been published and which is not being considered for publication elsewhere. Papers accepted by *Personality and Individual Differences* may not be published elsewhere in any language without the consent of the Editors.

The title of the paper, the author's name and surname and the name and address of the institute, hospital etc. where the work was carried out, should be indicated at the top of the paper. The name and address of the author to whom correspondence and proofs should be sent must be given on the first page. Where possible, the **Fax number of the corresponding author** should be supplied with the manuscript, for use by the publisher.

Summaries. A summary, not exceeding 200 words should constitute the first page of the article.

*References*should be prepared using the *Publication Manual of the American Psychological Association* for style. They should be placed on a separate sheet at the end of the paper, double-spaced, in alphabetical order.

References should be quoted in the text by giving the author's name, followed by the year, e.g. (Hersen & Barlow, 1976) or Hersen and Barlow (1976).

For *more than two* authors, all names are given when first cited, but when subsequently referred to, the name of the first author is given followed by the words "*et al.*" as for example- First citation: Nau, Caputo and Borkovec (1974) but subsequently, Nau *et al.* (1974).

References to journal should include the author'sname followed by initials, year, paper title, journal title, volume number and page numbers, e.g.

Singh, N. N. (1980). The effects of facial screening on infant self-injury. *Journal of Experimental Therapy and Experimental Psychiatry, 11,* 131-134.

References to books should include the author's name followed by initials, year, paper title, editors, book title, volume and page numbers, place of publication, publisher, e.g.

Hersen, M. & Barlow, D. H. (1976). *Single case experimental designs: Strategies for studying behavior change.* New York: Plenum Press.

or

Brownell, K. D. (1984). Behavioural medicine. In Franks, C. M., Wilson , G. T., Kendall, P. C. & Brownell, K. D. (Eds), *Annual review of behavior therapy* (Vol. 10, pp. 11-20). New York: Guilford Press.

Footnotes, as distinct from literature references, should not be used unless there are very exceptional circumstances. If they are included, they should be indicated by the following symbols: *, †, ‡, ‖, ¶, commencing anew on each page.

Illustrations and diagrams should be kept to a minimum: they should be numbered and marked on the back with the author's name. Captions accompanying illustrations should be typewritten on separate sheets. Diagrams and graphs must be drawn with black ink on plain white drawing paper or tracing linen.

Photographs and photomicrographs should be submitted unmounted and on glossy paper.

The following standard symbols should be used in line drawings since they are easily available to the printers:

(open triangle) (downward open triangle) (closed triangle) (downward closed triangle) (open circle) (closed circle) (open box) (closed box) (open circle with dot in centre) (open circle with + in centre) (open circle with x in centre) (open circle with - in centre)

Tables and figures should be constructed so as to be intelligible without reference to the text, each table and column being provided with a heading.

Tables. Captions should be typewritten together on a separate sheet. The same information should not be reproduced in both tables and figures.

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