Interpreting Electronic Voice Phenomena: The role of auditory perception, paranormal belief and individual differences

by

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Thesis Abstract

Electronic Voice Phenomena are anomalous voices that appear on audio recordings (Barušs, 2001) and various techniques have been suggested for obtaining these voices. People who investigate potentially paranormal, site based anomalies (ghosthunters) have in recent years been using techniques to obtain EVP voices, and declaring them as proof of the paranormal. Previous studies have examined the role of paranormal belief on various personality factors and on cognition, however individuals who use EVP as a technique (high-EVPers) have not previously been studied to ascertain if they differ from both the sceptical population (non-EVPers) and people who believe in the paranormal but who do not use EVP techniques (low-EVPers).

The current studies examined personality variable differences between non-, low and high-EVPers. A new questionnaire, the Paranormal Investigation Experience Questionnaire, proved capable of differentiating between non-, low- and high-EVPers, and displayed high reliability. From the current studies, it does not appear that EVPers can be classified as a separate group of individuals when compared with general paranormal believers when comparing personality traits. It is possible to define them as a group based on their experiences of EVP, but this separation is not found when investigating a number of individual difference measures which have been shown to be able to distinguish between general paranormal believers and non-believers. EVPers demonstrated higher levels of sleep related hallucinations, which may have implications for how they are interpreting noise as EVP voices.

There was a commonality in auditory test results between a number of personality factors, individuals high in these measures were all more likely to report hearing non-directional voices in noise, which may have implications for how EVPers are interpreting sound clips depending on how they are listening to those clips. High hallucinators reported hallucinated voices in their right ear, which supports previous research.

The results suggest that a number of factors are involved in causing misperception of voices in noise, but these results may be applicable to the general population rather than specifically to a population of EVP experiencers. Suggestions as to future research and comparison with other methods of apparent paranormal communication are discussed.

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Thesis Summary

Electronic Voice Phenomena are anomalous voices that appear on audio recordings (Barušs, 2001). Various techniques have been suggested for obtaining these voices, and the voices have been reported for over a century. People who investigate potentially paranormal, site-based anomalies (ghosthunters) have in recent years been using techniques to obtain EVP voices, and declaring them as proof of the paranormal. For the purposes of this thesis, people who use the technique have been termed "EVPers". There have been numerous previous studies examining the role of paranormal belief on various personality factors, and also on cognition, however EVPers have not previously been singled out to ascertain if they differ from both the sceptical population and people who believe in the paranormal.

The first study investigated a number of personality measures in participants who use EVP as a technique for contacting the spirit world, participants who believe in the paranormal but do not use the technique, and in sceptics.

It was found that a questionnaire designed for the study (the Paranormal Investigation Experiences Questionnaire) could be used to distinguish between non-EVPers and low/high-EVPers as a measure of "EVPness". All measures used showed a significant difference between non-EVPers and low/high-EVPers, however there were no differences between low-EVPers and high-EVPers apart from low-EVPers displaying a higher level of superstition, and high-EVPers displaying a higher level of Anomalous/Paranormal Experience. Males were no more likely to believe in the paranormal than females, but were more likely to report that death is final and there is no afterlife.

Study 2 was designed to measure further personality variables that have previously been correlated with paranormal belief. Both low and high-EVPers scored significantly differently from non-EVPers in a measure of positive schizotypy, reality testing deficits, fantasy proneness and auditory hallucinations. The same result was found when females were compared to males, with females displaying significantly higher levels of the above factors. There were no differences between low and high-EVPers, apart from high-EVPers displaying the highest rate of hallucination proneness.

The results of the first two studies suggest that with the exception of hallucination proneness, Anomalous/Paranormal Experiences, and Superstition, the factors used in the study cannot be used to distinguish between types of EVPers (low

vs high), and are more likely to be distinguishing on the basis of general paranormal belief.

Study 3 investigated how EVPers would respond to an auditory listening task wherein they had to distinguish a signal (a voice) from noise. There were no differences between high and low-EVPers, however when the task was introduced as an EVP task rather than a non-paranormal task, all participants were less likely to report hearing a voice. The group most likely to report hearing a voice in the noise were females in the non-paranormal primed task, and the group least likely to report hearing a voice were males in the EVP-primed task.

Study 4 looked at hallucination proneness, handedness and task condition in an auditory task where participants had to not only decide if a voice was present in noise, but also which direction the voice was coming from. High hallucinators were more likely to report hearing a voice than low hallucinators. When investigating hallucination subscales, Intrusive Thoughts appeared to have most effect on the decision making process as to whether a voice was present or not. High hallucinators were also more likely to report non-directional voices, potentially as a result of reduced language laterality.

Weak right handers were more likely to report a voice in their left ear, and less likely to report hearing a voice in their right ear. Strong right handers were more likely to miss directional voices (from right or left).

The studies show that there are some differences that can be ascertained between non-EVPers and low/high-EVPers. These factors do not appear to differ between low and high-EVPers, suggesting that there is no specific factor within the personality factors examined, that would cause low-EVPers (who believe in EVP but do not use the technique) to become high-EVPers (who use the technique to contact spirits). This may simply be due to opportunity, or there may be another factor that influences the decision to try and contact spirits this way. There are some differences apparent between low and high hallucinators, and also when handedness is taken into consideration.

1 Chapter 1

1.1 Introduction

According to a poll conducted by Gallup UK in 2005, 40% of the UK population believe houses can be haunted, with 27% believing people can hear from or communicate mentally with someone who has died. There is considerable debate as to whether these apparent paranormal phenomena are genuine manifestations of the dead, or simply misperceptions of natural phenomena (Wiseman, Greening & Smith, 2003; McCue, 2002). The possibility of "life after death", or the continuation of the personality after death, has been an ongoing theme in human history, both in a religious and non-religious context. The main world religions subscribe to some view of life continuing after death, whether that is in heaven, reincarnation, or continuation of the soul in another dimension, and this belief has been suggested as a mechanism for coping with the concept of death (Flannelly, Koenig, Ellison, Galek & Krause, 2006). Spiritualist mediums claim to communicate directly with the deceased (Beischel, 2007), however there have been a number of techniques described for contacting the spirit world that do not necessarily require the presence of a medium. Mainstream science rejects these claims of life continuing post mortem.

1.2 Electronic Voice Phenomena

1.2.1 Electronic Voice Phenomena – History and Techniques

A much debated technique of apparently communicating with the spirit world is Electronic Voice Phenomena (EVP), which was first fully described in the 1950's (Irwin, 1999) as the apparent presence of anomalous voices appearing on magnetic tape recordings (Barušs, 2001). The idea of communicating with spirits using radio technology had been proposed, although possibly not as a serious idea, by both Edison and Marconi in the late 19th century (Banks, 2001). The first documented case of capturing these anomalous voices was by an ethnologist, Waldemar Bogoras, who recorded apparent spirit voices on a phonograph in 1901 whilst observing a shamanic spirit conjuring ritual (the recording can be heard here http://www.spiritfaces.com/sounds/bogorasSpirit.mp3). One of the first attempts to try and specifically capture these voices in a more Western context was by von Szalay, a photographer who regularly heard apparently disembodied voices and tried initially

to record these on primitive disc recording devices in the 1930's (Welch, 1976). Von Szalay never documented any of his early experiments. However, he described to Welch (1976) how he managed to capture anomalous voices on a newly purchased wire recording device in 1945. Due to the voices being very faint he abandoned further experimentation until 1956 when he switched to tape recordings. Von Szalay began a series of experiments collaborating with Raymond Bayless in an attempt to discover and define these mysterious voices, which were documented in 1959 (Smith, 1977). At the same time, Friedrich Jürgenson had discovered the presence of apparently anomalous voices on tape recordings he had made of bird song, which led him to experimenting, and allegedly recording, the voices of a number of spirits, including his deceased mother as well as more famous voices such as Hitler (Jürgenson, 2004).

It was Raudive (1971) who first fully described a method for recording EVP voices, which consisted of detuning a radio so that only white noise (noise that consists of every frequency in the audio bandwidth, at equal energy levels [Kefauver, 2001]) can be heard, before placing a recording microphone close to it. Through this, questions could then be asked of the deceased whilst a continuous recording was made. The tape was subsequently played back, and any responses noted. A number of different recording techniques have been described over the years, Raudive himself developed at least five different methods of obtaining voices on tape (see Appendix C for descriptions).

One of the methods Raudive used was the Radio Method (see Appendix C), a method which utilised sweeping through radio stations until a voice was heard saying "now" or some similar word, which indicated that the current radio channel should be used for recordings. This indication was said to be voiced by a "mediator" who assisted in obtaining the recordings. However, Raudive discovered that he could obtain better results by using a radio that was not tuned to a particular station, and utilising the white noise produced, as this produced clearer voices (Raudive, 1971).

Seidl (cited in Raudive, 1971) developed another alternative take on EVP recording techniques which he named the Psychophone – this device worked as both a *broadband receiver*† [1]and *broadband transmitter*†, the idea of the device being that the

†*Underlined and italicised words are defined in the glossary (Appendix B)*

"spirits" require an energy source to produce their communications, and this device would provide this requirement.

The commonality in the majority of these methods is the requirement for some form of *carrier wave*† or carrier sound for the voices to be able to manifest over. Raudive's methods principally used white noise as produced by a de-tuned radio, however other researchers have reported hearing voices in apparently random sounds such as waves crashing on the beach, rotating ceiling fans and running water (http://www.tonbandstimmen.de/groesser.mp3).

A number of other devices have been designed over the years in an attempt to provide a more robust method of producing these apparent voices of the dead and allow a real-time dialogue with the spirits in what Bander (1972) termed 'Dial M for Mother'. The phenomenon has expanded to include almost any form of electronic communication, for example via television, video, telephone and computers, and the phenomenon is now more generally termed Instrumental TransCommunication (Barušs, 2001).

In recent years, researchers such as Cardoso have attempted to replicate the recording of anomalous voices on tapes under controlled laboratory conditions, with reportedly successful results (Cardoso, 2012). Cardoso simultaneously uses short-wave radios tuned to either the same radio frequency (which she describes as the *"Jürgenson" wave band*†) or to different frequencies. Examples of some of the voices obtained by Cardoso can be heard here http://www.itcjournal.org/index.php?option=com_content&view=article&id=50&Itemid=69&lang=en. However due to the controversial nature of the subject, mainstream institutions have yet to research the phenomenon, so the evidence remains itself controversial.

In contrast to these attempts to apply controlled conditions to investigate the phenomenon, a new method of obtaining these apparently anomalous voices has become popular with so-called "*ghost hunters*†" – people who search for evidence of ghosts and other paranormal phenomena. This method is Radio Sweep EVP (also colloquially called Ghost Box EVP), which utilises a commercially available model of radio which is altered to constantly sweep through radio bands.

†*Underlined and italicised words are defined in the glossary (Appendix B)*

The theory underlying this method of apparent spirit communication is that spirit entities utilise fragments of voices, music and noise picked up as the radio sweeps through the stations, and assemble these fragments into words, phrases or sentences to communicate with the living (Edwards, 2012). Ghost hunters use these radio sweep devices to communicate with spirits in real time – they can ask questions and receive answers from the spirits straight away (Edwards, 2012). An example of this technique can be heard here https://www.youtube.com/watch?v=P7Gf-aHg49U. This method of producing EVPs is dismissed by EVP researchers as not producing genuine EVP, except in circumstances where the spirit entities use the background noise as a carrier sound, rather than manipulating the fragments of speech and music to create messages (Butler, 2009).

Also available are a number of software applications such as EVPmaker 2.5 (available from http://www.tonbandstimmen.de/software_e.htm#EVPmaker). This software enables a user to input an audio clip of normal speech, and the program segments the audio clip into short segments and plays them back in a random order. The effect is to replicate the sound of a radio sweep device, with short segments of speech sounds being played in a random order that can be used as a background noise to record EVP over. Although the author of the software claims to disagree with the radio sweep technique, as it is very difficult to distinguish between segments of speech from a radio broadcast and paranormal messages, the sound files created within EVPMaker resemble radio sweep files. The technical difference between the two is due to the differing explanations as to how they work – EVPMaker files are meant to be used as a background noise (similar in effect to white noise) that EVP voices will manifest over, whereas in radio sweep the spirits manipulate the sound segments themselves to create messages.

Most people who record EVPs use standard recording equipment, due to the prohibitively high cost of professional recording equipment. Low frequency noise can be introduced from a number of sources such as doors, water pipes, computer fans and electrical equipment. These kinds of ambient sounds can impinge on recordings and prevent analysis of the *first speech formant*†, which will both prevent computer

†*Underlined and italicised words are defined in the glossary (Appendix B)*

analysis of any apparent voice sounds heard, and may also, when listening to sound clips, alter the perception of the sounds heard (Plitchta, 2002).

A point that most people recording EVP do not consider is the fact that tape recorders have a *noise floor*† (the level of hiss, or noise, which is present on a tape recording). In standard recording equipment particularly (although high-end equipment can have this problem as well if it is not used correctly), this noise floor will consist of white noise and machine sounds. If the recorder is wired, as opposed to a battery-operated device, it will also have a 50Hz mains hum in the cabling (in the UK, other countries may be 60Hz). If someone plays white noise as a carrier signal, then records on this recording device, it will potentially pick up the noise floor of the recorder, the white noise being played, and the noise floor present in the room. This is assuming the white noise has not also been recorded and played on another recorder. All these noise sources will combine to produce a very noisy recording, and additionally there may be a number of *harmonics*† introduced which all means the EVP tape could have a multitude of anomalous sounds on it even before the possibility of a paranormal influence is considered (OpenLearn, 2018).

Most EVP researchers use home equipment, and that includes transferring any captured sound anomalies onto a computer to analyse the sounds. However, Plitchta (2002) states that PCI multimedia soundcards on home personal computers should not be used for this purpose, as they introduce *electrostatic noise*† and distortion.

1.3 Characteristics of Electronic Voice Phenomena

Raudive (1971) explains how it is easy to distinguish spirit voices from ordinary human voices, as they speak with an unusual rhythm, and usually switch between multiple languages within a sentence. However, distinguishing the actual words is not something that can be achieved easily – Raudive (1971) suggests it can take at least three months to train the ear to distinguish the words present. The voices can speak quite rapidly but appear not to follow usual grammatical rules (Raudive, 1971), and occasionally can even be reversed so they make sense when the tape is played backwards (Cardoso, 2010). Raudive (1971) suggests that the voices use similar

†*Underlined and italicised words are defined in the glossary (Appendix B)*

linguistic patterns to the human voice to build their speech, although it can prove very difficult to resolve the patterns into actual words.

Edwards (2012) describes how he has received messages from his deceased father, but they have been recorded as a number of different sounding voices, both male and female, and differing in volume, pitch and tone. However Jürgenson (2004) describes both friends and relatives speaking in their own voices and languages on tape post mortem, as well as prominent historical figures such as Churchill and Hitler.

Cardoso (2006) quotes Daniele Gulla as stating that the EVP voices have shown particular characteristics when analysed using specialised software. He describes a number of characteristics that have been found to be common to EVP recordings, including:

- Absence or partial presence with multiple fragmentation of the *fundamental frequency*†, or if present it is only partially present and is fragmented
- The vibrations of the vocal cords that give a voice its *timbre*† are absent, and may or may not contain the fundamental frequency
- Speech *formant*† structure is altered, sometimes so the formants no longer display a *sinus wave*† pattern
- An increase of the *signal intensity*† of the second speech *formant*† and an increase in the strength of the *superior harmonics*†
- Higher than expected *fundamental frequency*† values and *upper formant frequency*† values
- A partial or complete omission of consonants
- A distortion of the *harmonics*†

1.4 EVP Listening Techniques

A key component of the listening technique according to the Raudive method was that Raudive himself would tell the listener in advance what the apparent voice would say (Raudive, 1971). The clip was then played to the participant repeatedly until either the listener agreed with Raudive's suggestion as to the speech contained in the clip, or alternatively if the listener disagreed, Raudive would class them as a poor listener and discard their results (Keil, 1980). Raudive initially studied EVP with Jürgenson, however Jürgenson stated that any voices that were not clear and

†*Underlined and italicised words are defined in the glossary (Appendix B)*

unambiguous were not worth accepting, as they were open to any interpretation (quoted in Smith, 1977), so Raudive appears to have developed the listening technique method independently.

Keil (1980) observed that Raudive was seen to make a number of "substantial errors" during listening and that rather than increasing his accuracy, the act of repeated listening was in fact causing him to start to interpret the sounds into words that he was expecting, rather than words resembling the sounds that were on tape. As an example, Keil cites a lengthy passage in German (Keil's native language) which on investigation had been recorded under radio conditions on Easter Sunday and sounded to Keil and eight other native German speakers to be a religious talk (Keil, 1980). Raudive had interpreted the passage in five different languages and had failed to spot that the entire passage was one continuous piece. However, in common with other critics, Keil (1980) does not use this evidence to completely dismiss the possibility that some of Raudive's recordings might have had a paranormal origin, rather that it is almost impossible to extract any possible paranormal utterances from the perfectly rational and explainable sounds also recorded, when Raudive seemed so unwilling to accept that any of the recordings could have a rational explanation.

Most EVP practitioners stress the importance of training in the technique of "listening", stressing that due to the unusual nature of the speech produced during EVP sessions one has to train to become an accurate listener. This argument is sometimes used as proof that the voices must be otherworldly, as this much training and effort would not be required to be able to listen to normal human voices. However, accounts provided by trained listeners working at the BBC Listening Post during World War II describe the same difficulties when trying to distinguish German broadcasts accurately, and in fact Ernst Gombrich, who was also working at that time as a Monitoring Supervisor, wrote a paper entitled 'Some Axioms, Musings and Hints on Hearing' (Renier & Rubenstein, 1986). Even EVP practitioners such as Jürgenson, who suggested that only the clearer voices were evidential, still stressed the importance of training in listening techniques (Jürgenson, 2004).

A very similar technique to the one used in software such as EVPmaker was used in the 1940's as a diagnostic tool (Grings, 1942). Vowel patterns were recorded and played repeatedly at a low intensity volume to a listener, in an attempt to influence the listener to interpret the sounds in a manner which would display certain

personality factors (Grings, 1942). The participants were told that the sound clips contained speech, but that it might not be very clear. One particular vowel pattern was interpreted by 63% of participants as being the phrase “who are you?”, with the remaining participants describing modifications of the same response. Grings (1942) suggested that this made the sample “too easy”, however he also states that inclusion of such an item would tend to both prime participants that the task does contain speech (if presented at the beginning of the task), and also to maintain an illusion of actual speech being present (if presented during the task).

Interestingly, given the tendency of the EVP voices to be interpreted as speaking in a multitude of languages, sometimes changing languages mid-sentence (Raudive, 1971), Shakow describes how schizophrenic patients report a larger number of non-English responses with a larger degree of apparent meaning when using this “verbal summator” technique (Grings, 1942).

1.5 EVP Categories

EVPs are commonly split into three different categories depending on their audibility: *Group A* are the clearest and can be heard by any listener (as long as the voice is speaking in a language understood by the listener); *Group B* is less clear, but can be heard easily by trained listeners; *Group C* are the hardest to distinguish, and Raudive describes these as conveying the most interesting information (Raudive, 1971). MacRae (2005) describes a number of steps that need to be undertaken to improve the clarity of the voices. The files need to have noise reduction applied as the voices were masked under the noise present. They need to be filtered to accentuate higher frequencies, the rationale being that EVP is deficient in consonants and in the upper part of the speech bandwidth, so accentuating the higher frequencies compensates for the missing frequencies. They need to be normalised, so all samples are of a similar loudness level to ensure that any weak sounds are made audible. Finally the files need to be slowed down as many EVP clips are reported as being spoken too fast. Of course, it can be argued that manipulating the sound clips to this extent may simply have the effect of creating apparent speech sounds where none were originally present.

1.6 Proponents of EVP

Cardoso (2012) reports a number of experiments that were carried out in professional recording studios and acoustic laboratories under shielded conditions that produced apparent EVP voices. All the voices recorded were clearer if there was noise present in the environment (for example, doors banging), rather than complete quiet. Cardoso (2012) specifically mentions human speech and metallic clicks, although a number of metallic sounds were classified as being of unknown origin, some were traced to a chair within the experimentation room. The voices also benefitted from a positive atmosphere amongst the operators during the experiment e.g. energetic and friendly. This appeared to produce better results than if the operator was focussing particularly on the experiment. This method of using a relaxed but engaged mind-set is something that has been reported as being essential in other fields of paranormal research, such as reproducing psychokinetic effects (Duggan, 2017). Certain methods for producing EVP such as EVP-maker software are dismissed by Cardoso as being likely to cause listeners to find results where none are present, and she dismisses most apparent EVPs published on the internet as being due to misperception, caused by the methodology producing ambiguity in analysis, and erroneous interpretation of the content (Cardoso, 2012).

MacRae (2004) reports that the response rate from the voices in EVPs is increased by experimenters asking questions out loud, rather than just recording in silence, he offers no explanation as to the reason this might happen. No attention was paid to any significance or meaning of the apparent replies. Looking at simple numbers of responses, rather than content, MacRae (2004) describes how holding recording sessions at the same place and time appeared to produce what he calls a "learning effect", whereby the number of responses increases over time.

MacRae uses a rather different method than traditional EVP experimenters, using a system he calls the "Alpha Interface System (AIS), which was originally developed to measure *electrodermal responses*† in mediums, but MacRae discovered apparent voices when the system was used. This system involves participants being connected to a psycho-galvanometer to monitor electrodermal activity. A device was designed that used the voltage from the participant's base electrodermal activity to

†*Underlined and italicised words are defined in the glossary (Appendix B)*

control an oscillator that produced *square waves*† that corresponded to the basic tones produced by human vocal cords. This was to replicate the formants produced in human speech. A second oscillator was connected to pick up fast electrodermal activity changes and reproduce the effect of the human vocal tract amending speech formants by resonation, the frequency changing according to the rapidity of change of the electrodermal activity. Both these feeds were then combined to provide an output. A radio receiver was used to detect the sounds and multiply them to a level that could be heard, then a tape recorder used to record any resulting output. The resulting speech sounds similar to sine wave speech (speech that is generated to reproduce frequency and amplitude variations of the first three speech formants found in natural speech). MacRae (2004) interprets the results as showing that his device produces EVP via the electromagnetic spectrum, as opposed to the voices being caused by a spirit transforming acoustic energy present in the room.

1.7 Survival Accounts of EVP

To account for the apparent voices recorded during EVP, there are opposing theories. The view taken by mainstream science is that the sounds are misperceptions and misinterpretations. The opposite view, that the voices are those of deceased spirit entities, must presuppose that some form of consciousness survives death, which retains the characteristics of the person who is deceased and is also capable of communication. The main theoretical research to support this view is being undertaken by Association TransCommunication (ATransC) in America (http://atransc.org/). The ATransC discounts apparent EVP that has been produced using the radio sweep technique, stating that EVP may be produced this way, but the radio is simply being used as a noise source for the EVP, not producing the EVP itself (http://atransc.org/journal/radiosweep_study.htm).

Currently the theory proposed for a mechanism for EVP by EVP researchers is the Trans-survival Hypothesis (http://atransc.org/theory/survival_hypothesis.htm) – this is a model that supposes that after death, a person still exists with their personality and memories, but in a form that requires a third party (EVP practitioner or observer) to facilitate the formation of words and messages on the tape. This is a similar process to

†*Underlined and italicised words are defined in the glossary (Appendix B)*

other described methods of contacting the deceased, such as mediumship, séances and Ouija boards. It might be supposed that the presence of a medium might be conducive for EVP to occur, as a number of studies appear to take place in the presence of a medium, and indeed require the presence of the medium for the phenomenon to occur (Welch, 1976), (http://www.worlditc.org/). However, most current EVP researchers state that EVPs can be obtained by anyone, and psychic or mediumistic ability is not a requirement (Cardoso, 2003).

EVP researchers have recently discussed how the voices they apparently obtain on recordings describe the "afterlife", with apparent detail and description (Cardoso, 2017). There appears to be a strict hierarchy in this described world, and spirits who communicate are bound by strict rules about what they are allowed to discuss. Cardoso (2017) does not propose reasons for this apparent censoring, but remarks that similar rules have been reported by spirit mediums communicating with the spirit world.The descriptions of this afterlife seem to fit in with the researcher's hopes and beliefs as to how they would want the afterlife to appear, and as such can only be taken with a healthy scepticism.

These studies can also be criticised as they have only been published in specialist paranormal journals, and not peer reviewed by mainstream scientific journals. The serious EVP researchers claim to be using scientific techniques and controlled conditions for their experiments, however it is difficult to avoid the possibility of a bias towards a paranormal explanation for the presence of anomalous voices. There is also little that can be done to try and either prove or disprove the existence of an afterlife, although a robust examination of the apparent voices that these researchers claim as proof may aid in this task.

1.8 Psychological and Neuropsychological Accounts of EVP

It is difficult, or impossible, to prove or disprove the existence of an afterlife and communication with the dead. However there has been considerable research into how individuals may misinterpret events as anomalous, particularly how those with an *a priori* belief are more likely to misinterpret events (Irwin, 1993; 2009). Irwin (2003, 2009) describes a ‘top-down’ cognitive process whereby people maintain their paranormal belief by utilising deficient reality testing processes, in which they attribute a paranormal explanation to an unusual event without testing whether such

an explanation is logically plausible or not. Thus, each apparently paranormal experience reinforces their *a priori* belief which in turn reinforces their paranormal interpretation of subsequent events. According to this model, believers would be more likely to report hearing EVPs, particularly if they report having already experienced hearing them previously (for example during ghost hunts).

Wiseman and Watt (2006) describe the factors that may cause misattribution of events to a paranormal cause in paranormal believers, the misattribution hypothesis. The factors they describe are poor cognitive abilities, probability misjudgement, an increased tendency to find connections between experiences and events, and increased fantasy proneness in believers when compared to non-believers. Gray and Gallo (2016) found that paranormal believers scored in a consistently inferior manner than sceptics on four different measures of analytical thinking. The measures used were the Shipley institute of living scale (a screening measure for intelligence), a remote associations test (participants were given three words that were related to a fourth word, and asked to identify the fourth word), an argument evaluation task (examining critical thinking) and a conspiracy questionnaire. They describe this as an independent cognitive difference unrelated to other measures such as memory (which did not appear to show any group differences). This suggests that only specific cognitive abilities are relevant when assessing the reasons influencing misattribution in paranormal believers.

Comparable "top-down" processes have been shown to occur in human auditory perception. Hines (1999) demonstrated how participants rated ambiguous speech as much clearer when they were given a transcript to follow whilst listening. This mimics the techniques used by EVP researchers such as Raudive (1971) whereby listeners are prompted as to what they *should* be hearing. Blackmore and Moore (1994) showed that paranormal believers were more willing to report seeing forms in a noisy visual image and they suggest that this may apply to auditory tasks as well as visual ones. Brugger, Landis and Regard (1990; cited in French & Wilson, 2007) found believers are more likely to report the presence of 'meaningful' information in randomly presented dot patterns, and although believers are more prone to make these Type 1 errors, this cognitive style is also associated with higher creativity (Brugger, 2001). Believers have also been shown to produce more original responses than non-believers on word association tasks, again suggesting higher creativity in believers (Gianotti, Mohr,

Pizzagalli, Lehman & Brugger, 2001). Gianotti *et al* (2001) developed their own test, based on the Remote Association Test, which considers all associations made by participants and allows for comparison of each individual against the subject group, and therefore facilitates measuring the originality of responses. Shermer (2012) calls this tendency "patternicity", the tendency to find meaningful patterns in meaningless noise and he suggests that we display this behaviour as it can have survival advantages, and where it is not an advantage, it is not a disadvantage for survival.

Davis, Johnsrude, Hervaise-Adelman, Taylor, and McGettigan (2005) describe how listeners who have been trained in interpreting time-compressed speech show a form of perceptual learning that allows them to still perform better in these listening tasks on retesting a year later. This would mimic the model described in EVP where people can become "trained listeners" (Jürgensen, 2004). When people are played *sine-wave speech*† but not told that it is based on speech, most listeners will not recognise that it is based on speech, but rather interpret it as a sequence of computer beeps, warbles and whistles. However, if these people are told that the sounds are manipulations of natural speech, they will immediately interpret the sounds as words, and provide quite accurate transcriptions of the speech (Barker & Cooke, 1999). This shows just how strong the ability to interpret sounds in a linguistic framework can be. MacRae (2004) sent copies of his audio files to a number of participants, along with a list of five possible interpretations for each one, participants having to choose which interpretation they thought was the correct one. MacRae's (2005) samples were post-processed in a number of ways, firstly the noise on the files was reduced using computer software. Next, digital filtering was used to accentuate higher frequencies to compensate for a deficiency in the higher portion of speech bandwidth that is described by MacRae as missing in EVP. Following this the sound files were normalised so that quiet sounds were heard at the same level as louder sounds, and the clips were cleaned again to remove more background noise. The samples were finally slowed down, as MacRae suggests that EVP voices speak too quickly. As MacRae's samples are both similar to sine-wave speech and post-processed in a number of ways (as described above), if the participants are given interpretations to choose from as well it

†*Underlined and italicised words are defined in the glossary (Appendix B)*

would seem likely that an incorrect conclusion may be that a number of apparently genuine EVPs exist on the recordings.

1.9 EVP Methodology

Both the techniques used to obtain EVPs and the voices described as a result vary between experimenters. However in general EVP proponents can be described in two groups. The first group consist of experimenters who carry out regular attempted communications. For these experimenters, the specific location used when obtaining these communications is not a fundamental requirement for obtaining the recordings. The messages will be produced regardless of the location used, and the locations used for recordings are usually laboratories or offices (Raudive, 1971; Cardoso, 2010). The messages that are obtained are used to provide both proof of survival after death, and to describe the world that exists after death (Raudive, 1971). The originators of the voices themselves are described as being from a multitude of sources: Raudive (1971) describes analysing over 25,000 voices, including personal contacts (messages from deceased family, friends and acquaintances), writers and poets, political figures (including Churchill, Stalin, and Hitler) and more general voices. The voices appear to know who the experimenters are, often addressing them by name and passing comments that appear to show that they are present in the room with the experimenters, making comments such as "….he has a red pullover on his back" (Raudive, 1971, p.113) and "…chase the old man away, Konstantin!" (in response to a sceptic being present [Raudive, 1971, p.112]). The utterances tend to be fairly short phrases or sentences, and can be interpreted as containing a number of languages within one phrase, for example "Guten Abend med dej! I wishy your bebi Wein." (Raudive, 1971, p.138) is translated as "A good evening to you! I wish to drink your wine" and is described as being composed of German, Swedish, English and Spanish. The voices also describe something of the world after death, and an attempt to build a bridge between worlds, a theme that is carried on by contemporary EVP researchers (for example Cardoso, 2010).

In contrast to this, ghost hunters using EVP techniques tend to report very short utterances in response to questioning. These utterances typically consist of words or short phrases such as "help me" and "run" (Gesner, 2020). They are also typically reported as being one language, although experimenters can report that they

need to manipulate the sound file in some way to discern the voices (for example playing the clip backwards or altering the speed the clip is played at [O'Toole, 2006]). Ghost hunters generally try to obtain EVP voices in supposedly haunted locations, and rather than attempting to discover information about life after death, they instead simply want to contact any spirit that might be present in the location as a means of proof that the paranormal exists.

The focus of the current study is to investigate more deeply the most commonly reported phenomenon across both groups, although more common in the ghosthunting community, which is obtaining short voice utterances in the presence of a noisy background, for example white noise. Concentrating on one common type of report will allow investigation of the specific factors that might be causing the perception of the alleged voices under these specific conditions.

2 Individual Differences

2.1 Individual Differences: Paranormal Belief

If EVP proves to be nothing more than misperception, than it may be supposed that there must be a psychological reason for the individual to be interpreting and believing that they are hearing the voices of the dead. There has been a considerable body of work looking at the reasons why people may assign a paranormal explanation to events, and most of the work has included some form of measurement of paranormal belief. This measure of paranormal belief is not quite as straightforward as might be supposed, there have been numerous scales developed over the years, yet each has prompted much discussion about the validity of the measurements, and as yet there has been no universally accepted definitive scale (Irwin, 2009).

The most commonly used scales in previous studies include the Australian Sheep Goat Scale (Thalbourne & Delin, 1993), The Paranormal Belief Scale (Tobacyk & Milford, 1983) and the subsequent Revised Paranormal Belief Scale (Tobacyk, 2004), and the Anomalous Experiences Inventory (Gallagher, Kumar & Pekala, 1994). The Australian Sheep Goat Scale was originally designed to measure sheep-goat effects – the apparent tendency for people who believe that success is possible in Extra-Sensory Perception tests (sheep) to score differently than people who do not believe it is possible (goats) (Thalbourne & Haraldsson, 1980). The scale has been refined over the

years and is now an 18 item questionnaire that measures belief in Extra-Sensory Perception, Psychokinesis, and two questions concerning belief in an afterlife (Wiseman & Watt, 2006). The Revised Paranormal Belief Scale was originally described as having seven discrete factors, these being Traditional Religious Belief; Psi; Witchcraft; Superstition; Spiritualism; Extraordinary Life Forms; and Precognition (Lange, Irwin, & Houran, 2000). However there has been much debate over the validity of the seven factor model (Lawrence, 1995; Tobacyk & Thomas, 1997), and a modification such that two clusters, New Age Philosophy and Traditional Paranormal Beliefs, are now described (Lange, Irwin, & Houran, 2000). This new modification has been used by a number of researchers (for example, Irwin, 2003). The Anomalous Experiences Inventory has five subscales, which measure Anomalous/Paranormal Experience; Anomalous/Paranormal Belief; Anomalous/Paranormal Ability; Fear of the Anomalous/Paranormal; and Drug Use (Gallagher et al, 1994). This scale is useful because it considers experience and ability as well as belief, so when measuring practical applications of paranormal experience/ability such as EVP experience, it allows a measurement of whether people actually experience what they think of as paranormal events, rather than just believing that these events exist.

Irwin (2009) undertakes a critical anaysis of various paranormal belief scales, and concludes that paranormal belief cannot be considered to be a global construct, but rather that it has multiple dimensions. Regrettably there has not yet been a definitive scale produced that defines the dimensions that make up paranormal belief. Despite this, all three scales, or variants of them, are commonly used in studies where a measure of paranormal belief and/or ability is required.

2.2 Individual Differences: Afterdeath Beliefs

As proponents of EVP describe apparent communication with the deceased, both known to them personally and historic figures, it may be supposed that this would predict some form of afterlife belief that encompasses the continuation of the personality post mortem. Burris and Bailey (2009) describe four types of afterdeath beliefs:

- Disembodied Spirit – consciousness continues after death, but the physical body and individual identity do not

- Spiritual Embodiment – consciousness and identity continue but the physical body does not
- Reincarnation – consciousness continues, but is manifested in a new physical body without its previous identity or memories
- Bodily Resurrection – consciousness and identity remain in a restored physical body

All four beliefs depend on the concept of consciousness surviving death, but Burris & Bailey (2009) also describe one belief where consciousness does not survive death, and this is Annihilation. Following this model, this should only allow for EVP experiencers to believe in a Spiritual Embodiment model of afterdeath belief, where consciousness and identity survive the death of the physical body. None of the other beliefs would allow for post mortem communication with recognisable people, whether known to the experiencer or a famous figure.

2.3 Individual Differences: Big 5 Personality Traits

It has been suggested that individual personality differences can be described in a number of different traits. The most widely used today is a five factor model which describes the traits as being Extraversion; Agreeableness; Conscientiousness; Emotional Stability; and Openness (or Intellect) (Goldberg, 1992). MacDonald (2000) found an association between the Paranormal Belief scale of the Expressions of Spirituality Inventory with the Big 5 Openness factor. Mikloušić, Mlačić and Milas (2012) generated three paranormal belief dimensions from the Revised Paranormal Belief Scale, and found that the General Paranormal Belief dimension correlated positively with the Big 5 Openness factor. Smith, Johnson and Hathaway (2009) found that both Openness to Experience and Sensation Seeking partially predict belief in the paranormal, with Openness to Experience being the more important factor. Within the Openness to Experience trait, openness to Fantasy predicted paranormal beliefs the most, followed by Feelings and Values, then Actions. Despite this, a large proportion (73%) if the variance was still unaccounted for which suggests that there may be other factors influencing personality in relation to paranormal beliefs.

2.4 Individual Differences: Schizotypy

Schizotypal Personality Disorder is described as a form of schizophrenia, with diagnostic criteria including magical ideation and unusual perceptual experiences (Dinn, Harris, Aycicegi, Greene & Andover, 2001). Three or four factors have been described when accounting for the dimensions reported within schizotypy and schizophrenia, but both models include positive and negative dimensions (Fisher, Mohanty, Herrington, Koven, Miller & Heller, 2004). Positive schizotypy is characterised by unusual perceptual experiences (which in clinical schizophrenia can take the form of delusions and hallucinations), and odd beliefs, whilst negative schizotypy is characterised by decreased cognitive functioning and anhedonia (Barrantes-Vidal, Ros-Morente & Kwapil, 2009). Positive schizotypes score highly on the Unusual Experiences (UE) factor described by the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) scale (Mason & Claridge, 2006), and a correlation has been found between UE, paranormal experiences and subjective health (Goulding, 2004).

Holt, Simmonds-More and Moore (2008) describe how mental health appears better if there are no schizotypal traits present, however when investigating participants who report schizotypal factors, the highest well-being is reported in positive schizotypes, which supports the idea of a Happy Schizotype. They describe how these Happy Schizotypes incorporate paranormal belief and paranormal experiences with a high level of well-being. It is reasonable to suggest that people who use EVP techniques and report hearing spirit voices would display this positive, happy schizotype, as they not only display belief in the paranormal but also report paranormal experiences.

Irwin, Dagnall and Drinkwater (2013) suggest that schizotypy predicts both proneness to anomalous experiences, and proneness to paranormal attributions, and report that whilst both are found in positive schizotypy, they utilise different neurophysiological processes. They report finding a positive relationship between proneness to paranormal attributions and suspension of reality testing.

Apophenia has been reported as having a link to positive schizotypy – apophenia has been described as seeing connections where there are none and creating meaning from these created connections (Mohr & Ettinger, 2014). Mohr and Ettinger (2014) describe this effect as explaining how patterns can be created in

random noise, and also report how apophenia and positive schizotypy are not only linked, but are modulated by dopamine. They also describe how apophenia has been predicted by the Big 5 factor of Openness, and from this they describe apophenia as "… openness to implausible patterns" (p.184). A number of personality traits have been associated with the positive schizotypy trait, notably high neuroticism, openness to experience and low agreeableness, but the trait has also been associated with creativity (Fisher, Mohanty, Herrington, Koven, Miller & Heller, 2004).

Barkus, Stirling, Hopkins, McKie, and Lewis (2007) showed that high (non-clinical) schizotypes were more likely to report hearing a signal when none was present when taking part in an ambiguous auditory test. However, it was only a small number of the positive schizotypes that reported most of these false alarm results. They interpreted this as suggesting that there were other factors that were influencing these participants to report a high number of false alarms. This finding was also suggested by Li, Yang, Chen, Chen and Liu (2003), who found that in an auditory signal detection task, participants with higher Schizotypal Personality scores performed worse in an auditory discrimination task than participants showing lower scores. There was no difference between participants in response bias (the tendency of the participants to say yes or no to hearing a signal in the noise) in the tasks. They suggest that factors such as anxiety should also be taken into account.

Brugger (2001) describes evidence for associative-semantic processing as being not only found in schizophrenics, but also as a function of belief in the paranormal. Additionally, Brugger (2001) describes how enhanced mediated semantic priming is associated with paranormal belief. In standard sematic priming tasks, participants respond more quickly when presented with a word if the word has been primed first with a semantically related word.

Mediated semantic priming uses two stimuli that are related by a common association, for example the words 'lion' and 'stripes' are both associated to the mediating word 'tiger' (Brugger, 2001). It might be that these effects can also influence the mistaken creation of words and phrases in EVP recordings, as the listener uses the priming effect of the questions they ask of the "spirits" in combination with the

apparent speech *phonemes*† present on the recordings to manufacture an apparent voiced response.

2.5 Individual Differences: Reality Testing

Irwin (2004) quotes Reber's description of reality testing as comprising "a set of perceptual, cognitive and sensorimotor acts that enables one to determine one's relationship with the external physical and social environments" (p.142). Irwin further defines the reality testing process as one whereby the outcome of applying reality testing to a situation results in "a generalised belief about the nature of the physical and social worlds" (p.144). Further, this belief is amended and revised according to new information that is processed, however the explanation proposed by the person undergoing the experience is not subjected to internal critical testing (Irwin, 2004). Irwin (2004) describes how this process could affect an individual who experiences an apparently anomalous experience, by causing them to assign a paranormal explanation without testing the plausibility of that explanation.

A number of studies have shown that hallucinators are deficient in reality testing ability, and also that a failure to discriminate between internal and external events may account for subvocalisation being responsible for auditory hallucinations (Bentall, 1990; Bentall & Slade, 1985). Subvocalisation is a process that occurs mainly when people are reading but can occur in any circumstance where language is at the front of a mental process. The larynx and vocal cords can move as if the person is actually speaking, and this can also be accompanied by auditory hallucinations (Blom, 2010). Mintz and Alpert (1972) found that clinical patients who display vivid auditory imagery and impaired reality testing are more likely to experience auditory hallucinations. There is also a link between paranormal belief and reality testing - (Irwin, 2004) found that deficits in reality testing could predict paranormal belief, which may suggest that deficient reality testing may account in part for formation and maintenance of paranormal beliefs. If reality testing deficits can account in part for both hallucinatory experiences and the formation and maintenance of paranormal beliefs, it would be expected that people with high paranormal beliefs who experience auditory EVPs would also display these reality testing deficits.

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†*Underlined and italicised words are defined in the glossary (Appendix B)*

Ford and Mathalon (2005) have shown that in schizophrenic patients, there may be a dysfunction in the brain's corollary discharge mechanism which underlies a reality testing deficit. They describe a model whereby any motor action is accompanied by an internal copy of that action, this internal copy sends a copy of the command that is being sent to the muscles (a corollary discharge), and this corollary discharge informs the brain that the action is a self-generated one. This allows the individual to distinguish between internal and external events. In schizophrenic patients, this mechanism fails, which results in the patient being unable to distinguish between externally generated voices and internally generated thoughts, and thereby producing the experience of an auditory hallucination (Ford & Mathalon, 2005). Whilst this is in a clinical population, this mechanism may still affect a non-clinical population who are predisposed to unusual experiences, particularly if they also display positive schizotypy (see section 2.4).

2.6 Individual Differences: Dissociation

Spiegel and Cardena (1991) describe dissociation as "a structured separation of mental processes e.g., thoughts, emotions, *conation* †,memory, and identity, that are ordinarily integrated" (p.367). Whilst this is in a clinical context, there is evidence of a correlation between certain apparently paranormal experiences and dissociation within non-clinical populations. For example, Richards (1991) found correlations particularly with waking clairvoyance, precognition, apparitions, psychokinesis and volitional telepathy. As a number of these experiences do not appear to have a dissociative component associated with them, Richards suggests that displaying the dissociation trait may display a wider capacity for shifting conscious focus. Although there is no immediately obvious component of a dissociated state reported during EVP, it may be that a tendency for dissociation may aid the interpretation of the sound recordings. Longden *et al,* (2012) describe the hearing of voices as a dissociative disorder, being part of a continuum with inner speech at one end, and full hallucinatory voices at the other, so there may be reason to suppose that a tendency to construct and interpret paranormal voices such as with EVP may lie on this continuum.

†*Underlined and italicised words are defined in the glossary (Appendix B)*

2.7 Individual Differences: Fantasy Proneness

Fantasy prone individuals display a number of traits, including the tendency to fantasise a considerable amount of the time, an ability to hallucinate objects and experience what they fantasise, and they also can have difficulty distinguishing between real and fantasised events (Rhue & Lynn, 1987). They also report vivid childhood memories and report apparent paranormal experiences such as out-of-body experiences (Merckelbach, Horselenberg & Muris, 2001). Smith, Johnson, and Hathaway (2009) found that fantasy proneness is a predictor of paranormal belief. Merckelbach, Muris, Horselenberg, and Stougie (2000) describe how people showing a high level of dissociation also demonstrate a positive response bias in a memory task, which is mediated by fantasy proneness. Although this task was a memory task, it may prove that this also applies to other tasks, such as auditory tasks.

Merckelbach and van de Ven (2001) report that participants in an auditory listening task who were required to report if they heard a certain song in a white noise clip, were more likely to report hearing the song if they also scored more highly on fantasy proneness and hallucination scales. They also found that fantasy proneness contributed more to this result than the tendency to hallucinate. They interpreted this as possibly indicating that fantasy prone individuals have a greater tendency to endorse odd items. Merckelbach and van de Ven (2001) also suggest that there are two possible explanations for this tendency, either hallucinatory reports have their basis in fantasy or alternatively they are due to impaired reality testing in the individual. As there is a correlation between dissociative tendencies and a number of paranormal experiences, it may prove that paranormal believers (and thereby EVP experiencers) display dissociative tendencies and positive response biases that are mediated by fantasy proneness.

2.8 Individual Differences: Hallucinations

Hunter and Woodruff (2004) describe how, in clinical schizophrenia, patients may experience functional hallucinations, which are hallucinations that occur when the patient perceives a real stimulus. They give the example of a patient who hallucinated voices whenever he heard real auditory stimuli, such as the sound of an engine or even superimposed over a real voice on the television. The hallucinated voices took on the characteristics of the underlying sound, so for example when the

hallucination was heard when an engine sound was present, the voice had the characteristics of the engine sound, and did not show characteristics such as gender or accent. If this phenomenon occurs in clinical schizophrenia, then perhaps in non-clinical patients the effect is present but in a diluted form, so for example a voice may be constructed from the mechanical sound of the tape recorder, but still retains some characteristics of the human voice. As yet there have been no studies attempting to replicate this, but this would be a worthwhile area for further study.

Asai, Suginmore and Tanno (2011) suggest that in schizophrenic patients, auditory hallucinations occur in the right brain hemisphere. They suggest that this right brain hemisphere produces inner speech which is misattributed to external speech. They also suggested that these patients may have disorders in both right and left hemisphere, displaying a speech perception deficit in their left hemisphere and speech processing deficits in their right hemisphere. Broca's area in the brain is involved in production of speech and has been associated with auditory hallucinations where patients mistake internally generated speech as being spoken by others (Ćurčić-Blake *et al*, 2017). There have also been suggestions that schizophrenic patients may display a second language area in their right hemisphere (Asai, Suginmori & Tanno, 2011).. Whilst these findings have been reported in clinical populations, as paranormal believers have been shown to display a form of positive, happy schizotypy, it may be that they (and by extension EVPers) also display these traits to some extent. Schizotypal traits are more common in mixed-handed non-clinical participants than in left or right-handed participants (Tsuang, Chen, Kuo & Hsiao, 2013).

Patients with clinical schizophrenia who report hallucinations tend to report them as distressing, whereas non-clinical individuals, who may be also be displaying positive, happy schizotypy, report their hallucinated voices as being positive (Badcock & Chhabra, 2013).

2.9 Individual Differences: Illusions

Of perhaps more interest when discussing EVP are auditory illusions. Hallucinations are the perception of a stimulus where there is none present, whereas illusions are misperceptions of an external stimulus (Norton & Corbett, 2000). As the EVP practitioner is listening to noise and confabulating speech within it, it might be

more correct to consider illusions rather than hallucinations, however, as they appear to be creating speech where there is no speech present, perhaps this may also fall under the heading of hallucinations.

There is a surprising lack of psychological studies concerning auditory illusions. Most are concerned with the interaction between auditory and visual modalities (for example Mishra, Martinez, Sejnowski & Hillyard, 2007) or with auditory restoration where the brain fills in gaps in speech under noisy conditions (Micheyl, Carlyon, Shtyrov, Hauk, Dodson & Pullvermüller, 2003). Most of the relevant information that can be applied to EVP can be found in the field of speech perception – see Section 3.2.

2.10 Individual Differences: Death Anxiety

Death anxiety describes a number of negative emotional attitudes regarding death, such as fear, accompanied by a diffuse fear of the general concept of death (Neimeyer, Moser & Wittkowski, 2003). Religious believers tend to display lower death anxiety scores than non-religious participants, however there is some debate as to whether this is because they actually have a lower death anxiety, or whether they are more likely to present themselves as less afraid of death (Lundh & Radon, 1998). If EVP experiencers believe that they are communicating with the deceased, this may cause them to have less fear of death, as they have apparent proof that there is a continuation of spirit after death. There is also some suggestion that people who display death fascination display a positive attitude in relation to death, due to them having an interest in the positive images of death (Lee, Piotrowski, Rózycka & Zemojtel-Piotrowska, 2013), of which belief in an afterlife could be part. It would seem logical that this belief in an afterlife might reduce death anxiety, as apparent proof of an afterlife would be expected to provide comfort that ‘death is not the end’. Contrary to this assertion Houran (1997) found that neither Paranormal Belief nor Experience of the Paranormal had a correlation with scores on a Death Anxiety Scale. Instead, he found that gender was more of a predictor (Houran, 1997). It would prove interesting to see if people who believe that they are actually talking to spirit might show a different result.

2.11 Individual Differences: Narcissism

Roe and Morgan (2002) found that narcissism correlated significantly with certain subscales of the Australian Sheep-Goat measure, specifically the extrasensory perception (ESP) and psychokinesis (PK) scales. Participants did not display a correlation between narcissism and life after death, the afterdeath belief which might be expected in EVPers, as the process of communicating with the dead would necessitate a belief in life after death. However, Roe and Morgan (2002) also suggest that high scorers on the narcissism scale tend to have more power and success fantasies, and these may be being displayed by them claiming to have psychic abilities such as ESP and PK. This trait may also direct some individuals to believe that they are communicating with the dead via EVP, particularly if they can act as an apparent channel for communication for others. Whilst general paranormal believers who claim to practice ESP and PK show an increased narcissism trait, it might be that for EVPers, a specific group of paranormal believers, narcissism is also correlated with life after death.

2.12 Gender Differences

There is some evidence that females report higher paranormal beliefs than males, specifically regarding ESP, superstition and traditional religious beliefs, while males report higher belief in extraordinary life forms (Irwin, 1999). This would suggest that females are more likely to report EVP experiences than males, given the assumption that a belief in the paranormal is necessary to support a belief in EVP.

As paranormal believers display higher levels of positive schizotypy (Hergovich, Schott & Arendasy, 2008), it would be expected that due to their higher level of paranormal belief, females would display higher levels of positive schizotypy than males. This has been described as being true, for example Raine (1992) described how females score more highly on positive schizotypal features, and males score more highly on negative features in a non-clinical population.

There has been suggestion in the past that females may be more prone to displaying features of dissociation than males, however Spitzer, Klauer, Grabe, Lucht, Stieglitz, Schneider and Freyberger (2003) suggest that there are no differences between males and females, and previous studies have suffered from selecting specific

patient groups. Therefore, there are not expected to be any differences between males and females in the current studies.

Death anxiety shows a more complicated picture between males and females – Russac, Gatliff, Reece and Spottswood (2007) report that not only do females display a higher level of death anxiety than males, but that this anxiety peaks during their 20's for both genders, then females display another, smaller peak in the their 50's which males do not. Therefore, the picture is more complicated than simply looking at death anxiety and EVPness, as age of participants and gender also have an effect. Grijalva et al (2015) report that there is a demonstrable gender difference when examining narcissism, with males scoring higher than females primarily on the Exploitative/Entitlement facet

When looking at the Big 5 personality factors, it has been shown than females display higher scores on Neuroticism and Agreeableness (Weisberg, DeYoung & Hirsh, 2011). They describe how Conscientiousness has shown no significant difference between sexes at the Big 5 level, nor has Extraversion, although Extraversion is complicated by the differing traits making up the domain, with some favouring female higher scores and some favouring male higher scores. The same is true of the Openness/Intellect trait.

2.13 Handedness

There are a number of differences apparent between right and left or mixed handed individuals when considering brain lateralisation. Left-handers display the same left brain hemisphere speech specialisation as right-handers, however it is less marked in left-handers (Khalfa, Veuillet & Collet, 1998). For right handers, the medial efferent system of the ear is more effective in the right ear than the left ear, whereas in left handers the system is more symmetrical (Khalfa, Veuillet & Collet, 1998). This system enhances signal detection in less than optimal listening environments (Bidelman & Bhagat, 2015), so one would expect that right handers would have clearer speech recognition in the right ear and left or mixed handers would not show this bias. In dichotic listening tasks, right-handers display a right ear advantage and left-handers display a left ear advantage (Khalfa, Veuillet & Collet, 1998). Khalfa *et al* (1998) further suggest that as the medial efferent system also plays an antimasking role in speech perception within noisy environments, the lateralisation of this system may favour

language treatment by the right ear. They do however show that the reverse asymmetry shown in left handed participants appears to be displayed in males, possibly due to the fact that females show greater brain symmetry (McGlone, 1980). Mixed-handed people (who show no definite preference for one hand over the other), have been shown to display higher schizotypy scores than left or right handers (Tsuang, Chen, Kuo & Hsiao, 2016). There is some evidence that magical ideation is also correlated with handedness, with mixed-handers showing higher levels than others, however there is some debate over whether this is shown only in questionnaire tasks, and not in behavioural tasks (Grimshaw, Yelle, Schoger & Bright, 2008). These findings would suggest that right handed participants would display a right ear advantage when undertaking listening tasks and left handed males would display a left ear advantage.

3 Auditory Perception

3.1 Nature and Neuropsychology of 'pure' white noise

White noise is noise that consists of every frequency in the audio bandwidth, at equal energy levels (Kefauver, 2001). It is perceived by the human ear as a hiss, because each octave contains twice as many discrete frequencies as the one below it and therefore seems louder – the lower octaves are masked by the higher ones thereby causing the perception of a hiss.

A standard method of recording EVPs is to play white noise and ask questions of the spirit world whilst recording both the white noise and questions on a tape recorder. When played back, responses to questions may be heard in the hiss of the white noise. These responses may be indistinct or clear, and interpretation of the responses may vary. Even in the absence of questioning and recording, apparent voices and music may be heard in white noise. An example is a woman who describes hearing both music and voices when she is in the presence of running water or air conditioning (Sacks, 2012). She describes hearing music with lyrics, but not being able to distinguish the words, and only hears these anomalous sounds in the presence of white noise.

Although most experimenters discuss the use of white noise, white noise is artificially created by combining every frequency within the human hearing range in

equal amounts and does not commonly exist in the outside environment (Mehta, Zhu & Cheema, 2012). Pink noise is white noise that has been altered to make the sound pressure level of each frequency band constant (Kawada & Suzuki, 1993). It decreases in intensity by three decibels per octave, which mimics natural sounds heard by the human ear (Berg, 2018). Pink noise has been used in a number of auditory cognition tests and is therefore more suitable for using in experimentation.

3.2 Perception of Ambiguous Audio Stimuli

3.2.1 Auditory and Speech Perception

It has been suggested that the words that make up speech can be broken down into smaller units called *phonemes*†, however this is not universally accepted as words can be distinguished even during speech that is so rapid that it is impossible to distinguish individual phonemes (Moore, 2008). It may be that it is patterns of sound that are recognised rather than individual phonemes, in which case if the sound is ambiguous it may be misinterpreted if it resembles a particular sound pattern (Moore, 2008). We rarely produce distinct vowels in normal speech, the exact pronunciation varies according to the consonants preceding and following the vowel (Lacabex, Lecumberri, & Cooke, 2007), which again could cause misinterpretation if a vowel-like sound is heard, depending on the expectation of the listener.

When sounds are perceived as being from a single source, a number of criteria must be met for the perception to occur. In a mixture of sounds, elements are more likely to be attributed to one source if they are close in frequency (Remez, Rubin, Berns, Pardo, & Lang, 1994). If competing voices have a different *fundamental frequency*† then the first *formant*† frequencies will be more defined to the listener, thereby allowing the listener to separate the two voices (Darwin, 2008). This may impact on EVP perception if sounds are heard that are close in frequency, as they may be perceived to be from the same source even if they are not (for example, there may be almost simultaneous sounds from two different sources recorded on tape, which are then assigned to the same source on playing back the tape, and from this a single sound comprising the two separate ones may be perceived). The direction of sounds is

†*Underlined and italicised words are defined in the glossary (Appendix B)*

important when distinguishing whether they are from a single source or not, however this can be impossible to tell unless sophisticated stereo recording equipment is used.

Speech perception is robust to distortions in the sound being perceived, as has been demonstrated by numerous experiments where speech has been filtered, clipped and changed to simple ***sine waves***†, yet still remains intelligible (Darwin, 2008). Kashino (2006) describes the phenomenon of phonemic restoration – in certain circumstances the brain can create missing portions of speech, so it appears to the listener that the missing portions are actually present. This appears to be a method employed by the brain to allow for speech perception in less than optimal conditions and appears particularly successful in creating the illusion of continuous speech when gaps in the speech are filled by white noise (Kashino, 2006). If there are elements in EVP recordings that mimic speech sounds, it may be possible that this phonemic restoration effect causes listeners to create apparent words out of the noise. If there is no actual speech present, this may explain why EVP recordings are described as being in multiple languages – if the EVP listener is multilingual then as the brain is trying to create sense out of random noise it may interpret certain sounds as being spoken in a familiar foreign language, in addition to explaining the simpler creation of speech in one language. Kashino (2006) describes how ***broadband noise***† that is used to fill gaps in speech must be louder than the speech sounds for speech perception to optimally occur. Again, this appears to replicate the effect in EVP sound clips, where the apparent voices can be quite faint compared to the white noise, necessitating multiple attempts at listening before sense can be made. Cardoso (2012) says that results from her experiments show that the apparently anomalous voices are clearer and louder in the presence of background noise, with some correlation between the level of background noise and the amplitude of the apparent voices. This would appear to add evidence to the suggestion that EVPs are simply misperceptions of the brain, although Cardoso does not suggest this possibility, preferring to describe the voices as apparently paranormal.

The brain utilises various techniques when filling in these speech gaps. Kashino (2006) describes how coarticulation of all the physical elements used to produce speech (lips, tongue etc.) means that phonetic information can overlap with the

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†Underlined and italicised words are defined in the glossary (Appendix B)

following speech segment, meaning there is some speech signal redundancy which contributes to the brain's ability to fill in gaps. He also describes the semantic context within sentences, something that is utilised in EVP clips by the EVP practitioner relating the sentence (or part sentence) to a prior expectation (Simpson, 1981).

In normal human speech, strong syllables which contain a full vowel are usually found as the initial syllables of lexical words (ones which supply the meaning to a sentence) (Carter & Cutler, 1987). By contrast, grammatical words (which relate lexical words to each other) are defined by having a weak syllable as their initial syllable. Weak syllables are also found in non-initial positions. Cutler and Butterfield (1992) suggest that when speech is ambiguous, participants will insert a speech boundary before a strong syllable and delete boundaries before a weak syllable (for example Carter and Cutler (1987) give the example of interpreting "transcendental meditation" as "transcend dental medication" when inserting a boundary before a strong syllable). This effect may have some relevance to EVP clips if sounds are misperceived, as this may cause the creation of an apparent word or sentence, depending on whether the listener has perceived a sound similar to a strong syllable or a weak syllable.

3.2.2 Pronunciation of Words

Pronunciation of words within speech can vary according to a number of factors. One of these is speech formality - some words are not pronounced in the same way during casual speech as they are in formal speech, Hanique, Emestus, and Schuppler (2013) give the example of the words "this shop" being pronounced with blending of the words giving a long "s" sound. Vowel reduction in phonology is the process by which a vowel in an unstressed syllable may be reduced to the schwa sound (a mid-central vowel sound) (Lacabex, Lecumberri & Cooke, 2007). This process is a categorical one, where vowel sounds are either the full vowel sound or the reduced vowel sound, but not in between (Padgett & Tabain, 2005), and does not depend on rate of speech. However, Hanique, Emestus & Schuppler (2013) describe how this schwa sound may be reduced or absent in a number of situations such as faster speech, so a vowel sound can be transformed to a schwa sound, but this schwa sound itself may be reduced or absent in certain speech. Phonetic vowel reduction is a gradient process whereby the vowel becomes weaker or shorter – this effect varies between languages, for example in Spanish the reduced vowels still maintain their

basic qualities, however in English reduced vowels can be so distinctive as to become phonemes in their own right (Lacabex, Lecumberri, & Cooke, 2007). This variability in pronunciation not only within but between languages may affect what EVP experiencers report when faced with ambiguous signals.

Languages differ in their expression of a number of linguistic categories – for example whilst the schwa vowel sound is common in the English language, it has no corresponding sound in Spanish (Lacabex *et al*, 2007). For multilingual speakers, this may be a further factor that confounds the perception of apparent speech within noise – for example the listener may perceive the voice as speaking in Spanish, but then perceives a word that contains a schwa, as this is not typical of a Spanish word the listener may then perceive a switch of language to one that does contain this sound, for example English.

The organs of the human auditory system work by analysing the sound that enters the ears, then transmitting this analysed information to the brain. Each part of the auditory system is important in analysing these sounds, for example the external part of the ear reflects sounds towards the ear canal, and middle ear bones increase sound pressure to ensure that enough of a signal can reach the fluid filled inner ear. The ear creates a one dimensional representation of the sound frequencies that it has been subject to, and this is then passed to the brain. The brain then reconstructs the original sound map from this information (Richardson, 1995).

The inner ear contains around 20,000 sensory cells, compared with the sensory photoreceptors in the eye, which number around 1 million. This means that the inner ear is far more affected by damage to the sensory cells than the eye would be (Brownell, 1997). The cochlea of the human ear also produces sound itself, described as otoacoustic emissions (OAEs) (Kemp, 2002). These are generated as a side-effect of the outer hair cells of the cochlea amplifying auditory inputs (Kemp, 2002). Spontaneous OAEs can sometimes (although rarely and usually in children) be loud enough to be heard by other people (Richardson, 1995). Although rare, if these OAEs are of sufficient amplitude they can occasionally be perceived and may therefore interfere with auditory perception (Yongbing & Martin, 2006).

According to Marian, Lam, Hayakawa and Dhar (2018), people who display higher cognitive control (using better inhibition, mental flexibility and processing speed as measures) have been shown to have greater suppression of spontaneous

OAEs, possibly because background noise is “turned down”, and this allows more efficient speech perception. This also applies to people with reduced working memory, possibly because filtering sound at an earlier stage (for example in the cochlea), means that less manipulation is required in working memory (Marian, Lam, Hayakawa & Dhar, 2018).

It has been suggested that cognitive abilities may be enhanced in bilingual people, one suggested mechanism for this is due to the processing of language – words from both languages can be accessed by the person listening, even if only one of those languages is relevant at the time (Marian, Lam, Hayakawa & Dhar, 2018). This means that the language that is not relevant at the time needs to be suppressed, leading eventually to an enhanced level of cognitive control. If the person is listening under noisy conditions, this can cause interference between the two languages which will lead to problems processing speech, potentially mimicking the multilingual interpretation of EVPs. Spontaneous OAEs have been shown to be suppressed in bilingual people, possibly in a similar way to people with reduced working memory, that this is used as a mechanism for compensating for the greater demands on cognition (Marian *et al,* 2018). However recent studies have shown that the reported cognitive benefits may actually be due to previous methodological issues (von Bastian & Souza, 2015).

3.2.3 Listening Training

Another factor that is stressed in much EVP research is the importance of listening training – the more EVPs listened to, the easier it becomes to pick out the apparent words (Raudive, 1971). This however also holds true for non-paranormal contexts, Benard and Baskent (2013) describe how speech intelligibility in listening tasks utilising interrupted speech improves with training. A variety of top-down mechanisms are also employed when attempting to make sense of degraded speech, including prior knowledge and expectations (Benard & Baskent, 2013) and certainly this may account for the interpretations that people put on ambiguous EVP clips.

It has been suggested (Benard, Mensink & Baskent, 2014) that linguistic skills are important in being able to restore degraded speech, however practical experiments measure performance against a set of known stimuli, where a response can be considered correct or incorrect. For EVP there is no knowing what might be a

"correct" answer, so it may be assumed that linguistic skills have no immediate bearing on whether individuals report hearing apparent voices, although it may be that this does have a bearing where voices are interpreted in a multitude of languages for example, where superior linguistic skills are required.

The combination of listening training, pronunciation of words, and general factors of speech generation and perception all combine to demonstrate that hearing is a complicated process that utilises both top down and bottom up processing and can vary according to the environment.

3.3 Auditory Perception Tasks

To ascertain whether EVP experiencers are more likely to report hearing voices in sound clips, Signal Detection Theory (SDT) is a useful method as this methodology can extract the effects that decision bias may be having on participants. SDT measures are used when a task needs to discriminate between two different types of stimuli and can be utilised on auditory discrimination tasks where participants are presented with a series of sound clips, half of which contain no signal and are termed noise trials and half of which contain a signal present within the noise and are termed signal trials (Stanislaw & Todorov, 1999).

In the case of investigating EVP the possible responses would be whether the participant reports hearing a voice within noise or not. Each participant is played a number of sound clips, some of which contain noise only, and some of which contain noise plus a signal (in the case of EVP research this is a human voice producing a short speech segment). Each participant's response is dependent on the value a decision variable reaches on a signal intensity scale (Vercammen, deHaan & Aleman, 2007). If the decision variable value reaches the response criterion of the participant, they will respond that they heard the signal (the EVP voice) in the clip. If this decision variable value does not reach the response criterion, the participant will respond that they did not hear an EVP voice in the clip. The four possible responses to the clips (hit, miss, false alarm and correct rejection) allow the calculation of two measures – sensitivity and response bias. Sensitivity is described as the distance between the mean value of the noise, and signal plus noise distributions (Vercammen, deHaan & Alemann 2007) and describes the perceptual accuracy of the participant (their ability to actually hear the voice). There would not be any expected differences between EVP believers and

sceptics in sensitivity. The response bias describes the participant's individual criterion for making the decision concerning whether they did hear a voice in the clip or not. A lower criterion value indicates that the participant is more likely to decide and report that they have heard a voice in the clip, and as a consequence this will increase the number of false alarms (reporting an EVP voice in the clip when there is not one present). This has been described as being advantageous, as attentional processes may enhance perception and allow a greater recognition of weak signals (Vercammen, deHaan & Alemann, 2007). The decision making process depends on the consequence of the response – for EVP sound clips it might be expected that paranormal sceptics would be more likely to display a higher criterion value as they would be averse to report hearing a potentially paranormal voice. It might also be expected that where the signal is at the hearing threshold they would also be less likely to report hearing a voice, as the consequences of reporting a voice in a paranormal context would be negative for a sceptical participant. Conversely, it might be that for a paranormal believer/EVPer they would be more likely to report hearing a voice when the sound clips are ambiguous, as this would support their belief that voices may be present in the sound clips.

To ascertain if there are differences in both sensitivity and response bias between groups of participants dependent on their EVP status (believer or non-believer), it is necessary to calculate the number of hits (reporting a voice in noise when a voice is present) and false alarms (reporting a voice when no voice is present). The hit rate is calculated by dividing the number of correct hits by the total number of signal trials, and the false alarm rate is calculated by dividing the number of false alarms by the total number of noise trials (Stanislaw & Todorov, 1999). These values can then be used to calculate the d' value for participants (using z scores for hit rate and false alarm rate), which represents the ability of participants to be able to distinguish signal from noise, which for the current study is whether there is a voice present in the sound clip or not. To measure a bias towards reporting or not reporting a voice within the noise, a criterion value can be calculated – the lower the value of this criterion value for a participant, the more likely they are to report hearing a voice. It might be expected that EVP believers would show a lower criterion score, as they would be more likely to report hearing a voice in noise than sceptics. There may be a number of factors that affect how participants respond when listening to sound clips,

which could include their level of paranormal belief overall, their belief in EVP, and any task instructions given to them regarding whether the task potentially contains paranormal voices or not. Using signal detection methodology should allow for assessment of the influence of these factors on the responses of participants.

Bentall and Slade (1985) found that hallucinators and non-hallucinators both displayed the same sensitivity during an auditory task, however the hallucinators were more likely to report a signal being present. In an unpublished study (Winsper, 2010) participants were paranormal believers and non-believers rather than clinical hallucinators and non-hallucinators, and this study showed that whilst paranormal believers were more likely to report a signal being present, they were also more sensitive to signals. Vercammen, de Haan, and Aleman (2008) also found that hallucinating patients showed a positive response bias in an auditory SDT task, whereas controls and non-hallucinating patients did not display this bias. Although EVP experiencers and paranormal believers are generally not found to be clinical hallucinators, the fact that paranormal believers have been shown to have a positive response bias and also that they are more likely to display positive schizotypy, coupled with the fact that it may be supposed that EVP experiencers would be expected to display paranormal belief, means that it may be predicted that EVP experiencers will also display a positive response bias in an auditory signal detection task. This would suggest that they would be more likely to report hearing voices within noise than non-EVP experiencers.

3.4 The Role of Suggestion and Priming

The role of suggestion in EVP is two-fold – firstly suggestion can be classed alongside expectation when people are listening for EVP voices – both the expectation and suggestion that apparently paranormal voices may be present on a recording may be enough to cause a paranormal believer to report hearing voices, even when none are present. Secondly, Keil (1980) described how anyone who is told what they should be expecting to hear before listening to sound clips, is likely to interpret ambiguous clips in the manner in which they have previously been prompted. This effect was also described by Grings (1942) when documenting research using the verbal summator technique – he found that in a psychiatric patient population, a number of factors affected the patient interpretation of vowel patterns. These included not just the

nature of the actual stimulus, but also the expectations of the patient according to the instructions they were given and their first impressions of the test situation.

Wiseman, Greening, and Smith (2003) found that under séance room conditions, paranormal believers are more suggestible than non-believers, but only when the suggestion is consistent with the existence of paranormal phenomena. This does not hold true where suggestions are inconsistent with the existence of paranormal phenomena. This may suggest that believers would be more likely to report the hearing of voices if a task is described in paranormal terms (for example as an EVP task) than if it is introduced purely as a listening task.

Tamatea and Evans (2002) describe an auditory task wherein participants were subject to either suggestion (told the sound clips might contain words or phrases) or one of two primed conditions (either told that the clip might contain a specific phrase or told the clip might contain a phonetically similar phrase). They found that the more information provided to participants, the more likely the participants were to report hearing something. Priming caused the most responses, suggestion caused fewer responses, and a control group reported no responses at all. This suggests that if participants were exposed to apparent EVP clips, it might be expected that the same results would be found, so suggestion and priming would produce more reports of apparent voices, with priming causing the largest effect.

Rogers, Jacoby and Sommers (2012) describe perception of speech in terms of sensation and context. Sensation corresponds with bottom up processes, as it relates to the processing of the characteristics of the word by the peripheral auditory system. Context corresponds to top-down processing and describes the mental and environmental circumstances under which the perception of the speech is heard. The sensory information described by Rogers *et al* (2012) includes the previously described features of speech – formant frequencies, voice-onset, and phonetic information. They describe the context as being the information in the sentence prior to the target word, however this model of integrating bottom-up and top-down processing can also apply to EVP, where instead of knowing the context of the sentence surrounding an anomalous word or phrase, the EVP experiencer is mentally creating the context by the expectation of hearing a ghostly voice in the recording. Whilst the words and phrases reported by EVP experiencers may seem unusual to non-EVPers, they may

make perfect sense in the context of ghost hunting or trying to contact the spirit world.

4 Summary

Evidence from existing studies has shown that paranormal believers display certain characteristics. Paranormal believers are more likely to be positive schizotypes who may hear voices, particularly in a dissociative state, and non-clinical high schizotypes are more likely to record false alarms in ambiguous auditory tests (Barkus *et al*, 2007). There is a correlation between some apparent paranormal experiences and a dissociative state in non-clinical populations (Richards, 1991), so believers may have experiences that include the hearing of voices if they display dissociative tendencies. A high level of dissociation can cause participants to demonstrate a positive response bias in memory tasks, mediated by fantasy proneness (Merckelbach *et al*, 2000). Both fantasy proneness and deficits in reality testing can predict paranormal belief, also openness to experience and sensation seeking partially predict paranormal belief (Smith *et al*, 2004; Smith *et al* 2009). Narcissism is significantly correlated with some paranormal belief subscales, possibly indicating a need for control (Roe & Morgan, 2002).

From these previous studies, we can predict that EVP experiencers should show positive schizotpy and dissociative tendencies (possibly mediated by fantasy proneness). Assuming they show high levels of paranormal belief, they should also display fantasy proneness, openness to experience and sensation seeking. They may also show some level of narcissism, particularly if they use EVP as a method of passing information onto others.

The concept of death anxiety describes negative emotional attitudes regarding death, including a fear of death. As EVPers are reportedly communicating with the dead, in many cases on a regular basis, it was hypothesised that high EVPers would display a low level of death anxiety, as it is unlikely that they would carry on attempting to obtain EVPs if they were afraid of death, and also due to the fact that EVPers frequently describe life after death as a positive state. Deficits in reality testing can predict paranormal belief, so it was predicted that EVPers would also display this deficit in reality testing.

5 Study 1 – Exploring Paranormal Belief in Relation to belief in Electronic Voice Phenomena

5.1 Abstract

Paranormal beliefs have been shown to correlate with a number of personality variables, however previous research has concentrated on a generalised aspect of the paranormal. It might be supposed that as paranormal belief increases, so does belief in specific phenomena. Previous studies have concentrated on more generalised features of paranormal belief, and personality correlates to this belief. This study concentrated on participants who professed belief in, or experience of, a specific area of the paranormal -Electronic Voice Phenomena (EVP) – a technique for apparently communicating with the spirit world using electronic devices. 61 participants were given a questionnaire pack measuring paranormal belief and ability, afterdeath beliefs, Big 5 personality factors, and a Paranormal Investigation Experiences Questionnaire (PIEQ) (designed for the current study). Results showed that the PIEQ could distinguish between non- and low/ high-EVP participants as a measure of "EVPness". All measures showed significant differences between non-EVPers and low/high EVPers. There were no differences between low- and high-EVPers apart from low-EVPers displaying a higher level of superstition, and high-EVPers displaying a higher level of Anomalous/Paranormal Experiences. Afterdeath beliefs in EVP believers are not consistent, indicating that participants who believe they have heard spirit voices may not be interpreting the origin of the voices in a consistent fashion. Males were no more likely to believe or disbelieve in the paranormal than females but were more likely to report that death is final, and there is no afterlife.

5.2 Introduction

Paranormal belief has been studied as a belief factor that may predict a number of individual differences observed in individuals (for example Irwin, 2009). The definition of paranormal belief itself varies depending on which elements are being studied, with a number of different tools being utilised to try and measure the concept. The focus on studies appears to be split between two opposite approaches; using laboratory studies to discern if an anomalous effect can be detected and measured; and examining personality correlates to explain the reasons for belief in

paranormal concepts. When attempting to discern whether a replicable effect is present or not, certain aspects of the paranormal are concentrated on, generally termed psi phenomena, for example telepathy (direct mind-to-mind communication), clairvoyance (awareness of events that cannot be perceived by the senses), psychokinesis (the ability to influence physical or biological systems by thought), and precognition and retrocognition (extrasensory awareness of future or past events) (Irwin, 2009). The approach of examining personality correlates makes no attempt to ascertain if an apparent paranormal effect is present, but rather seeks to explain why individuals may believe in effects for which there may be little or no scientific evidence or explanation.

In the present study, a specific area of the paranormal was investigated, specifically Electronic Voice Phenomena (EVP) – a technique for apparently communicating with the spirit world via electronic devices (Raudive, 1971). This is an area that has not been researched to the extent of other aspects of the paranormal, and due to the specific reports of practitioners being able to discern voices within noise it was felt that this is a highly specialised aspect of the paranormal that required investigation.

When taking the approach of examining correlates of belief, there are a number of scales available which claim to measure paranormal belief. However, there is debate surrounding the validity of these measures, and even the factors described as being present within the scales are debated as to their number and validity. The most commonly used scale is the Revised Paranormal Belief Scale (RPBS) (Tobacyk, 2004). Tobacyk describes seven factors, Traditional Religious Beliefs, Psi, Witchcraft, Superstition, Spiritualism, Extraordinary Life Forms, and Precognition. Lange, Irwin and Houran (2000) described a two cluster model, composing New Age Philosophy and Traditional Paranormal Beliefs, and they suggest that until age and gender biases are controlled for, the correct number of factors will remain impossible to ascertain. Tobacyk (2004) made efforts to amend some of the questions present in the original Paranormal Belief Scale when he published the Revised version, particularly to attempt to improve the cross-cultural validity. Studies undertaken in countries with belief systems that are potentially different from the American culture used in the original RPBS have still however produced different factors. For example, Utinans *et al* (2015) report a six factor model from a sample of Latvian respondents, comprising Magical

Abilities, Psychokinesis, Traditional Religious Belief, Superstition, Spirit Travel and Extraordinary Life Forms.

Paranormal belief cannot be measured in isolation when attempting to measure practical manifestations of this belief, as people do not only believe in the paranormal, but some take this further and carry out activities specifically to experience apparent anomalous experiences. One such example of this is Electronic Voice Phenomena (EVP), where it is claimed that communication with the spirit world is possible via electronic recording devices (Raudive, 1971). This extends the idea of paranormal belief into the realm of practical application, where believers try to produce anomalous voices in response to questions (Edwards, 2012). It may be that these people who actively seek out and try to produce these anomalous recordings can be described as a separate group of paranormal believers, who take their belief and not only practically act on it, but also report positive results.

Irwin and Wilson (2013) describe a two-stage process with people who report anomalous events, the first stage is having the anomalous experience, and the second is interpreting it as a paranormal experience. They give the example of participants taken round a house with a reputation for being haunted – participants not only vary in the degree to which they experience physical effects such as changes in temperature, they also vary in their propensity to interpret these effects as paranormal. It may be assumed that interpretation of events as paranormal varies on a continuum, from disbelief in the paranormal at one end, through belief in the paranormal, to seeking out and experiencing paranormal events at the other end.

If people are experiencing a phenomenon that they are interpreting as communication with the spirit world, it must be assumed that they believe in life after death, particularly as they report communication with spirits with unique identities. These spirits can be people they knew in life, people associated with a particular place, or famous people that they had no contact with until after the death of the famous person (for example, Jürgenson, 2004).

There are a number of afterdeath beliefs that have been described, and the Afterdeath Belief Scale measures five factors of this belief (Burris & Bailey, 2009). These five factors are not compatible with each other when looking at belief in an individual, as they describe different ideas of what happens after death, so one would expect that an individual would only believe in one factor from this model. However,

Singleton (2016) describes how in a sample of people, after death beliefs appeared to fall into loose rather than strict categories, and some participants reported belief in multiple categories (for example the belief that we go to heaven after we die, but when heaven becomes boring we can be reincarnated). If people are creating their own ideas of life after death, and these ideas can be fluid, it may be that rather than having a strict belief and applying this belief to anomalous events, people are revising their beliefs according to the anomalous events they are experiencing.

There have been a number of studies that attempted to correlate factors of the Big Five personality factors and religion. A meta-analysis by Saroglou (2002) found correlations between religiosity and the factors of Agreeableness and Conscientiousness. The meta-analysis also found a weak correlation between religiosity and Extraversion, and a small but significant negative effect of Openness. However, Saroglou describes paranormal beliefs as a construct that is independent from religion. Despite this, it has been reported that paranormal beliefs do appear to have an association with religion. Aarnio and Lindeman (2007) report finding four groups of believers; sceptics; the religious (the higher their religious belief, the lower their paranormal belief); paranormal believers (the higher their paranormal belief, the higher their religious belief); and double believers (these people were more attracted to both the paranormal and religion, but there was no relation between these beliefs). This suggests that there may be a relationship between religion and paranormal belief, and therefore between Big 5 personality factors and paranormal belief.

A number of studies have historically been conducted to attempt to discover the individual differences apparent in individuals claiming paranormal beliefs and abilities (for example Irwin, 2009). There has not yet been a systematic attempt to apply these various measures to individuals who claim to obtain apparent paranormal voices on recording devices (Electronic Voice Phenomena, or EVP). It might be supposed that these EVP experiencers will display high levels of paranormal belief, as a belief in paranormal phenomena would be required to believe that one has obtained the voices of deceased beings on recording devices. The purpose of this first study was to explore a series of individual difference measures in EVP believers, paranormal believers without EVP experiences, and non-believers, in an attempt to define differences between the groups that may be used as a measure of “EVPness”.

It was predicted that high paranormal believers would believe in and experience EVP (see also section 2.1 – Paranormal Belief). In contrast to this, it was predicted that paranormal sceptics would assign anomalous voices a non-paranormal explanation (see also section 2.1 – Paranormal Belief).

As the concept of EVP presupposes a belief in life after death, it was proposed that high EVP believers would display a high level of belief in life after death (see also section 2.2 – Afterdeath Beliefs). As it has not been clear from previous studies what form this belief might take, no prediction was made as to the specific afterdeath beliefs that might be reported by participants.

The picture concerning the Big 5 personality factors is not as clear – both MacDonald (2000) and Mikloušić, Mlačić and Milas (2012) found an association between the Big 5 Openness factor and Paranormal Belief, however Saroglou (2002) found a negative correlation between religion and the Openness factor. Aarnio and Lindeman (2007) found that paranormal believers can also be religious, which means for this demographic the results could be ambiguous. Because of this it was predicted that high EVPers would display a higher level of the Big 5 personality factor of Openness, depending on their level of belief in religion (see also section 2.3 – Big 5 Personality Traits).

Females have been described in the past as having higher levels of specific paranormal beliefs than males, interestingly this includes not just paranormal factors such as extrasensory perception and superstition, but also traditional religious beliefs (Irwin [1999] for example). Kennedy (2003) describes how belief in psi is higher in females, and sceptics tend to be males. Given this, it was hypothesised that females would display a higher level of paranormal belief and EVPness than males (see also section 2.12 Gender Differences)

5.3 Method and Materials

The questions in Study 1 were devised to assess participants experience of the paranormal, membership of paranormal groups, frequency and methods of recording EVPs, the paranormal or non-paranormal nature of EVPs, and for participants who had experienced EVPs, questions concerning details of the EVPs they had experienced. Additionally, the study also assessed participants belief in, and experiences of, the paranormal, their afterdeath beliefs, and their Big 5 personality factor scores.

5.3.1 Paranormal Investigation Experience Questionnaire (PIEQ) (See Appendix E)

A 43 item questionnaire (the Paranormal Investigation Experience Questionnaire – the PIEQ) was constructed to explore respondent's experiences of EVP, and to devise a measure of "EVPness" – the tendency to use and believe in EVP. This consisted of 21 initial questions to be answered by all participants.

- Experience of the paranormal and membership of paranormal groups (six questions). Sample question "Are you currently a member of a paranormal investigation group". For the purposes of this study, a "paranormal investigation group" was defined as "any group that investigates apparently paranormal phenomena, including parapsychological research and investigation". Hines (1988, p.7) describes the paranormal as having "… a reliance on explanations for alleged phenomena that are well outside the bounds of established science." Northcote (2007, p.14) uses a similar definition, and uses the term "paranormal" to refer to "….. all types of reported phenomena considered to be outside the realm of mainstream science". Irwin, Dagnall and Drinkwater (2013) describe how people may experience an anomalous encounter yet not assign it a paranormal explanation. To combine these two concepts, firstly that a paranormal event cannot be explained by established science, and also that the event is not assigned a normal explanation, the term "paranormal" was defined as referring to "events that are currently outside the range of normal experience or scientific explanation".
- Frequency and methods of recording EVPs (9 questions). Sample question "How many times have you experienced EVP that you consider evidence of communication with the dead?".
- Two free response questions to describe why participants record EVPs
- Four questions concerning the paranormal or non-paranormal nature of EVPs. Sample question "To what extent do you think EVP is a paranormal phenomenon". This was measured using a 7 point scale ranging from "strongly disagree" to "strongly agree".
- The remaining 22 questions were to be answered only by participants who had experienced EVP and concerned details of the EVPs they had experienced. Sample questions included "How many times have you experienced EVP that

are personal to you (e.g. from a relative or friend"), and "My EVP experiences have generally been positive and/or pleasant".

5.3.2 The Revised Paranormal Belief Scale (RPBS)

Seven subscales of this questionnaire were used, as described by Tobacyk (2004).

- *Traditional Religious Belief* (TRB - 4 items). Sample item "The soul continues to exist though the body may die".
- *Psi* (P – 4 items). Sample item "Psychokinesis, the movement of objects through psychic powers, does exist".
- *Witchcraft* (W – 4 items). Sample item "Black magic really exists".
- *Superstition* (SU – 3 items). Sample item "If you break a mirror, you will have bad luck".
- *Spiritualism* (SP – 4 items). Sample item "It is possible to communicate with the dead".
- *Extraordinary Life Forms* (ELF – 3 items). Sample item "The Loch Ness monster of Scotland exists".
- (PR – 4 items). Sample item "Some psychics can accurately predict the future".

The scale was answered using a seven point Likert scale ranging from Strongly Disagree to Strongly Agree. The reliability of the questionnaire (Cronbach's alpha) for each subscale in this sample was TRB (n=53) 0.76, P (n=55) 0.85, W (n=54) 0.88, SU (n=54) 0.84, SP (n=56) .93, ELF (n=56) 0.46, PR (n =56) 0.89.

5.3.3 The Anomalous Experiences Inventory (AEI)

This scale (Gallagher, Kumar & Pekala, 1994) measures paranormal beliefs and experiences, in addition to use of drugs and alcohol. It consists of 70 items and has 5 subscales. The Inventory includes seven questions regarding the use of drugs and alcohol – Houran, Irwin and Lange (2001) have suggested that people who endorse a New Age Philosophy belief (which includes concepts such as paranormal experience and ability) are more likely to display an openness to experience which is demonstrated in a higher tolerance of ambiguity and also by drug use.

- *Anomalous/Paranormal Experience* (APE - 29 items). Sample item "I have attended séances".
- *Anomalous/Paranormal Belief* (APB - 12 items). Sample item "I believe in life after death".
- *Anomalous/Paranormal Ability* (APA - 16 items). Sample item "I am able to communicate with supernatural forces".
- *Fear of the Anomalous/Paranormal* (FAP - 6 items). Sample item "Using a Ouija board frightens me".
- *Use of Drugs and Alcohol* (UDA -7 items). Sample item "I have smoked marijuana".

The scale was answered using true-false responses. The reliability of the questionnaire (Cronbach's alpha) for each subscale in this sample was APE (n=50) 0.88, APB (n=46) 0.85, APA (n=49) 0.82, FAP (n=55) 0.56 UDA (n=55) 0.53.

5.3.4 The Afterdeath Belief Scale

This scale measures participant's views on life after death. The scale consists of 24 items and measures five factors of afterdeath belief plus a measure of belief and behaviours affecting perceived afterdeath outcomes (Burris & Bailey, 2009).

- *Disembodied Spirit* (DS) - consciousness continues after death but identity and body do not survive (4 items). Sample item "What is "me" will cease to exist, yet "I" will live on as part of a larger whole".
- *Spiritual Embodiment* (SE) - identity and consciousness survive death but the body does not (4 items). Sample item "My soul – the spiritual essence that makes me a unique individual – will live on forever".
- *Reincarnation* (RE) - consciousness survives and returns in a new body, identity is lost (4 items). Sample item "I will, at some point, return to the physical world to be born as a different person".
- *Bodily Resurrection* (BR)- consciousness, identity and body all survive death (4 items). Sample item "My physical body will eventually be fully restored and perfected, and I will live in it again".

- *Annihilation* (AN) - consciousness, identity and body all do not survive death (4 items). Sample item “My personality, consciousness – all that I am – will cease to exist”.
- *Belief/Behaviour Efficacy* (BBE) - how much participants believe that their actions and beliefs affect what happens to them after death (4 items). Sample item “What happens to me afterward is affected by how I live now”.

The scale was answered using a seven point Likert scale ranging from strongly disagree to strongly agree, with scores on each scale potentially ranging from 4 to 28, with a higher score indicating higher belief in that factor. The reliability of the questionnaire for each subscale for this sample were DS (n=58) 0.89, SE (n=57) 0.94, RE (n=60) 0.96, BR (n= 61) 0.71, AN (n=61) 0.91, BBE (n=59) 0.76.

5.3.5 Personality

The 50 item IPIP representation of the Goldberg (1992) markers for the big five factor structure was used (Big-Five Factor Markers, n.d.). This contains five subscales:

- *Extraversion* (E - 10 items). Sample item “I am the life of the party”.
- *Agreeableness* (A - 10 items). Sample item “I am not interested in other people’s problems” (reverse scored).
- *Conscientiousness* (C - 10 items). Sample item “I pay attention to details”.
- *Emotional Stability* (ES - 10 items). Sample item “I seldom feel blue”.
- *Intellect/Imagination* (II - 10 items). Sample item “I have excellent ideas”.

The scale was answered using a five point Likert scale ranging from Very Inaccurate to Very Accurate. The reliability of the questionnaire (Cronbach’s alpha) for each subscale in this sample was E (n=52) 0.88, A (n=53) 0.72, C (n=51) 0.83, ES (n=52) 0.82, II (n=53) 0.72.

5.3.6 Demographics

A set of demographic questions was also included assessing participant’s gender, age, ethnicity, occupational status and educational attainment.

5.3.7 Participants

Participants were recruited through paranormal groups and sceptic societies. A total of 61 questionnaires were returned. Respondents (30 male and 31 female) ranged in age from 24 to 79 years, with a mean age of 44.84 years (SD = 13.014 years).

5.4 Procedure

Questionnaires were distributed to members of paranormal groups and sceptical groups at group meetings and conferences. Respondents were asked to either complete the questionnaire at the time, take one home to complete and return, or they could have the questionnaire emailed to them to fill in. The order of presentation of the questionnaires within the questionnaire pack was randomised to account for any possible biasing factors due to order of presentation, and the pack that participants were sent was randomly selected.

Ethical approval was received from the University of Central Lancashire Ethics Committee. Additionally, consideration was given to participant's perception of the personality variables being assessed in relation to their paranormal belief. Care was taken to ensure that the study was presented in a neutral manner, and debriefing information was careful to contain information stating that paranormal believers/EVPers might be more likely to find patterns in white noise, but also that this may show that they are more accurate at perceiving patterns in noise. There can be a suspicion of academic studies regarding paranormal phenomena within the believer population, as there is a suspicion that academia may be pathologising paranormal experiences (Steffen, Wilde & Cooper, 2018). Participants were also given ample opportunity to discuss any concerns in an informal setting both before taking part and during the debrief.

5.5 Results

5.5.1 PIEQ

To identify any differences between EVPers and non-EVPers, five questions were identified from the PIEQ questionnaire that related directly to participant's belief

in EVP as a paranormal phenomenon that facilitated communication with the spirit world. These questions were:

- How many times have you experienced EVP that you consider evidence of communication with the dead?
- To what extent to you think EVP is a paranormal phenomenon?
- To what extent do you think EVPs are misperceptions of normal (i.e. non-paranormal) sounds (reverse scored)
- To what extent do you think EVPs provide evidence that some aspect of personality survives bodily/physical death?
- To what extent do you consider EVP to be a scientific technique?

Twelve questions were also identified from part 2 of the PIEQ, that related to the type of experience participants had reported of EVP. Sample questions are:

- How many times have you experienced EVP that are personal to you (e.g. from a relative or friend)?
- How many times have the EVP voices responded directly to your questions?

The four questions identified as being indicative of participant's belief in EVP as a paranormal phenomenon that facilitated communication with the spirit world were scored on a 7 point scale, ranging from Strongly Disagree through to Strongly Agree. For scoring purposes, responses were coded from zero (Strongly Disagree) to 7 (Strongly Agree). EVP sceptics were assigned as participants who scored a total of zero across all four questions, indicating no belief in EVP as a paranormal phenomenon. This was considered to be the optimum way for the current study to separate out the EVP sceptics, as they reported strongly disagreeing with the statements regarding EVP being a paranormal phenomenon, and additionally using this strict criterion would exclude participants who could potentially hold more complicated and less definite views (for instance there may be participants who believe that EVP is a paranormal phenomenon, have not experienced EVP, and do not consider it to be a scientific technique, but who still believe that they provide evidence that some aspect of personality survives bodily/physical death). This group additionally reported having had no actual experiences of EVP, indicating that they both did not believe in the

phenomenon and had not experienced it either. These participants were designated as non-EVPers.

The second half of the questionnaire was only completed by participants who had experienced what they considered to be a genuine EVP voice. This group also reported a high level of belief in EVP as a paranormal phenomenon when responding to the selected PIEQ questions, and therefore displayed a high level of both belief and experience in the phenomenon. These participants were designated as high EVPers.

The remaining participants displayed a high level of belief in the phenomenon, however they did not report practical experience, and were therefore classed as low-EVPers.

In summary, this classification produced three groups of participants:

- Non-EVPers (low belief and low experience)
- Low-EVPers (high belief and low experience)
- High-EVPers (high belief and high experience).

A reliability analysis was carried out on the 17 items selected. Cronbach's alpha showed that the questions reached acceptable reliability, $\alpha = 0.879$. All of the items appeared to be worth using, resulting in a decreased alpha if they were removed, except for the reverse scored item, which would increase the alpha if removed to $\alpha = 0.909$. When examining the participant responses, it was noted that a number of participants appeared to have mis-read the question. For example, they had stated that they thought EVP was a paranormal phenomenon, they had experienced EVP that they considered communication with the dead a number of times, and they thought that EVP provided evidence that some aspect of personality survives bodily death, however on the reverse scored item they selected that they also thought that EVPs are misperceptions of normal (i.e. non-paranormal) sounds. Because of this, the reverse scored item was removed from the questions used to split the participants into groups.

The PIEQ questionnaire was designed in two sections, one to be answered by all participants concerning paranormal experience and belief in EVP, and the second half was only to be answered by participants who have actively recorded EVPs. Because of this, participants naturally fell into three groups rather than two – the first being non-EVPers who had no belief/experience and had been recruited from paranormal sceptic groups, so were actively sceptical as opposed to agnostic, the second being low-EVPers

who believed in the paranormal and the concept of EVP but who had not actively practiced EVP, and the third group was high-EVPers, who believe in the paranormal and regularly practice EVP techniques. The four questions from the first part of the PIEQ were answered on a 7 point scale, from Strongly Disagree through to Strongly Agree, with 12 questions from the second part also answered on a 7 point Likert scale, but with answers ranging from "never" to "51+ times". The participants were split according to their scores on the scale, with participants who scored zero being assigned as non-EVPers, participants who had responded to the second part of the PIEQ (regarding actual experience of EVP) being assigned as high-EVPers, and the remainder of the participants being assigned as low-EVPers (as they displayed belief in EVP but had no actual experience of the technique).

A one-way between groups analysis of variance was conducted to explore any differences between these three EVP groups. The group sizes were 11 non-EVP, 26 low-EVP and 21 high-EVP), and when the Levene test for homogeneity of variances was calculated, a number of subscales showed a significant result, indicating a violation of homogeneity of variances.

Skewness and kurtosis values were calculated, which suggested that the normality was acceptable to proceed with.

Results can be seen in Table 1.

5.5.2 Paranormal Belief Scale

There was a significant difference in the scores between the three groups in Traditional Religious Belief (F (2,55) = 7.87, MSE = 25.12, p =0.001, η_p^2 = 0.223); Psi (F (2,55) = 14.89, MSE=31.35, p =0.000, η_p^2 =0.35), Witchcraft (F (2,55) = 4.73, MSE = 14.84, p=0.147, η_p^2 = 0.30), Superstition (F (2,54) = 4.26, MSE = 3.86, p = 0.019, η_p^2 = 0.136, Spiritualism (F (2,55) = 17.28, MSE = 46.97, p =0.000, η_p^2 =0.386), Extraordinary Life Forms (F (2,55) = 5.58, MSE = 6.37, p=0.006, η_p^2 =0.169) and Precognition (F (2, 55) = 13.41, MSE = 26.30, p =0.000, η_p^2 =0.328) .

Post hoc Tukey tests were conducted on pairwise contrasts to investigate the significant results. As a further check due to the question of the normality of the data, post hoc Games-Howell tests were also performed on the data, the results of which matched the results of the parametric post hoc tests.

Table 1:Mean Belief Ratings across non-EVPer vs low-EVPer vs high-EVPer Group Type

			Non-EVPer		Low-EVPer		High EVPer		Significant mean differences		
			M	(SD)	M	(SD)	M	(SD)	Non vs low-EVP	Low vs high EVP	Non vs high EVP
RPBS											
	Trad. Religious Beliefs		1.48	(1.03)	3.87	(2.06)	3.83	(1.71)	***		**
	Psi		1.88	(1.42)	4.66	(1.53)	4.32	(1.36)	***		***
	Witchcraft		2.27	(1.77)	4.03	(1.87)	4.17	(1.65)	**		**
	Superstition		1.00	(0.00)	1.93	(1.13)	1.37	(0.96)	*		
	Spiritualism		1.39	(0.90)	4.56	(1.88)	4.71	(1.62)	***		***
	Extraordinary Life Forms		2.42	(0.84)	3.38	(1.04)	3.74	(1.19)	*		**
	Precognition		1.27	(0.55)	3.84	(1.64)	3.44	(1.38)	***		***
AEI											
	Anomalous Experience		3.82	(4.07)	9.32	(6.90)	11.10	(4.66)	**		**
	Anomalous Belief		2.30	(2.06)	7.53	(3.34)	7.53	(2.59)	***		***
	Anomalous Ability		1.36	(1.12)	3.65	(3.50)	4.78	(3.64)			*
	Fear of the Anomalous		0.45	(0.69)	1.24	(1.61)	0.52	(0.68)			
	Drug and Alcohol Use		2.00	(1.41)	1.96	(1.46)	1.67	(1.15)			
ABS											
	Disembodied Spirit		7.00	(4.64)	16.92	(6.11)	14.57	(6.01)	***		**
	Spiritual Embodiment		7.09	(5.59)	19.33	(5.55)	20.05	(7.13)	***		***
	Reincarnation		5.82	(3.66)	16.84	(6.00)	16.29	(7.53)	***		***
	Bodily Resurrection		4.09	(0.30)	6.65	(3.42)	6.81	(4.32)			
	Annihilation		22.63	(7.21)	14.23	(6.77)	10.43	(6.82)	**		***
	Belief/Behaviour Efficacy		8.09	(3.83)	16.56	(5.55)	16.60	(6.96)	***		***
Big5											
	Extraversion		30.18	(8.45)	29.04	(8.24)	30.15	(7.93)			
	Agreeableness		35.10	(3.51)	38.04	(4.46)	38.81	(5.78)			*
	Conscientiousness		35.00	(7.31)	35.78	(5.36)	38.85	(7.20)			
	Emotional Stability		28.73	(4.86)	34.04	(7.36)	33.00	(6.13)			
	Intellect/ Imagination		38.27	(3.44)	38.96	(4.97)	40.00	(5.36)			
Significant group effect at the * p<.05 ** p<.01 *** p<.001 levels											

Significant mean differences for each subscale of the Revised Paranormal Belief Scale can be seen in Table 1. As predicted, high EVPers showed a significantly higher belief than non-EVPers in all factors of the Revised Paranormal Belief Scale (Traditional

Religious Beliefs p=0.002, Psi p=0.000, Witchcraft p=0.013, Spiritualism p=0.000, Extraordinary Life Forms p=0.01 and Precognition p=0.00) , except for Superstition. Low-EVPers scored significantly higher levels in all scales when compared with non-EVPers (Traditional Religious Beliefs p=0.001, Psi p=0.000, Witchcraft p=0.018, Superstition p=0.032, Spiritualism p=0.000, Extraordinary Life Forms p=0.026 and Precognition p=0.00). Therefore, the only difference between low- and high-EVPers was in the Superstition scale, where low-EVPers scored significantly higher than non-EVPers, but high-EVPers were not significantly different to either low- or non-EVPers.

5.5.3 Anomalous Experiences Inventory

As above, the group sizes were different (11 non-EVP, 26 low-EVP and 21 high-EVP), and when the Levene test for homogeneity of variances was calculated, this showed significant results, indicating a violation of homogeneity of variances.
As previously described, both parametric and non-parametric analysis showed the same outcomes, so the parametric results have been reported here.
There was a significant difference in the scores between the three groups in *Anomalous/Paranormal Experiences* (F (2,47) = 6.28, MSE = 191.92, p=0.004, η_p^2=0.211); *Anomalous/Paranormal Beliefs* (F (2,45) = 13.53, MSE = 108.12, p=0.000, η_p^2=0.376); and *Anomalous/Paranormal Ability* (F (2,46) = 3.91, MSE = 39.96, p=0.027, η_p^2=0.145).
There was no significant difference between the three groups in either Fear of the Paranormal or Drug and Alcohol use.

Post hoc Tukey tests were conducted on pairwise contrasts to investigate the significant results. As a further check due to the question of the normality of the data, post hoc Games-Howell tests were also performed on the data, the results of which matched the results of the parametric post hoc tests.

Significant mean differences for each subscale of the Anomalous Experiences Inventory can be seen in Table 1.Results for Anomalous/Paranormal Experience showed that both low-EVPers (p=0.034) and high-EVPers (p=0.002) scored significantly higher than non-EVPers. This was also true for Anomalous/Paranormal Belief showing that both low-EVPers (p=0.000) and high-EVPers (p=0.000) scored significantly higher than non-EVPers. The results for Anomalous/Paranormal Ability showed high-EVPers

to report significantly more Ability than non-EVPers (p=0.012), with low-EVPers showing no significant differences.

5.5.4 Afterdeath Belief Scales

As in the previous tests, the data showed evidence of non-normality, however both parametric and non-parametric tests gave the same results. The parametric results are reported here.

There was a significant difference in the scores between the three EVP groups in Disembodied Spirit (F(2,52) = 10.13, MSE = 349.20, p = 0.000, η_p^2=0.28), Spiritual Embodiment (F=(2,52) = 18.26, MSE = 697.82, p = 0.000, η_p^2=0.41), Reincarnation (F(2,54) = 13.07, MSE = 516.48, p = 0.000, η_p^2=0.326), Annihilation (F(2,55) = 11.42, MSE = 539.02, p = 0.000, η_p^2=0.293) and Belief/Behaviour Efficacy (F(2,53) = 9.34, MSE = 318.34, p = 0.000, η_p^2=0.261). There was no significant difference between groups for Bodily Resurrection, although the results approached significance at p=0.053.

Post hoc Tukey tests were conducted on pairwise contrasts to investigate the significant results. As a further check due to the question of the normality of the data, post hoc Games-Howell tests were also performed on the data, the results of which matched the results of the parametric post hoc tests.

Significant mean differences for each subscale of the After Death Belief Scale can be seen in Table 1. All significant results reported above showed significant differences between non-EVPers as a group, and both low-and high-EVPers. There were no significant differences between low-and high-EVPers. For Disembodied spirit, both low-EVPers (p=0.000) and high-EVPers (p=0.002) scored significantly higher than non-EVPers. For Spiritual Embodiment low-EVPers (p=0.000) and high-EVPers (p=0.000) scored more highly than non-EVPers. The same was true for reincarnation, with low-EVPers (p=0.000) and high-EVPers (p=0.000) scoring significantly higher than non-EVPers. The same pattern was displayed for Belief/Behaviour Efficacy, with low-EVPers (p=0.001) and high-EVPers (p=0.000) scoring significantly higher than non-EVPers. The results for Annihilation showed that non-EVPers scored significantly higher than both low-EVPers (p=0.005) and high-EVPers (p=0.000).

5.5.5 Big 5 Personality Factors

As in the previous tests, the data showed evidence of non-normality, however both parametric and non-parametric tests yielded the same results. The parametric results are reported here.

The only difference between any of the groups for the Big 5 factors was that high-EVPers displayed a higher level of agreeableness than non-EVPers (p=0.044).

5.5.6 Gender Differences

Independent samples t-tests were conducted to ascertain if there were any differences between males and females. No association was found between gender and EVP groups when running a chi square test (X^2(2)>=2.60, p=0.273), indicating that gender had no correlation with EVP status, so the analyses could be reported for gender alone. Significant results were as follows.

Paranormal Belief Scale

There were no significant differences between males and females found in the subscales of the Paranormal Belief Scale, although Females reported a higher level of belief in precognition (M=3.63, SD=1.73) than males (M=2.80, SD=11.56), t(59)=1.96, which approached significance at p=0.054.

Anomalous Experiences Inventory

There was a significant difference in the Anomalous/Paranormal Belief scale, with females (M=7.44, SD=3.00) scoring significantly higher than males (M=5.34, SD=3.62), t(49)=2.036, p=0.046.

Afterdeath Belief Scale

Males showed a higher level of belief in annihilation (M=16.50, SD=7.16) than females (M=12.19, SD=8.20), t(59)=2.182, p=0.033. Belief in Reincarnation for females (M=16.16, SD=7.45) was greater than for males (M=12.52, SD=7.09) at a level approaching significance, t(58)=1.94, p=0.057.

Big 5 Personality Factors

The only significant difference was in the factor Agreeableness, where females (M=39.97, SD=4.44) scored significantly higher than males (M=35.64, SD=4.47), t(55)=3.66, p=0.001.

5.6 Discussion

It might be supposed that as paranormal belief increases, so does belief in EVP, and the same for paranormal experiences, that if a person is more likely to report experiencing paranormal phenomena, they may also be more likely to experience EVP. However previous studies have concentrated on more generalised features of paranormal belief, and personality correlates to that belief (for example Mikloušić, Mlačić & Milas, 2012; Hergovich, Schott & Arendasy, 2008), and so whilst it can be assumed that belief in EVP would be analogous to belief in the paranormal, there have been until now no specific studies to investigate this relationship. As paranormal belief covers a wide range of phenomena, and belief in one aspect does not necessarily predispose to belief in another (Rice, 2003), it is proposed that a more fruitful method of investigating individual difference in paranormal believers is to study individual paranormal factors rather than "the paranormal" as a whole concept. Additionally, there may be certain characteristics of EVP experiencers that are particularly significant when compared to more generalised paranormal believers, for example specific personality factors or after death beliefs.

From the results obtained, the PIEQ appears to be able to consistently distinguish between non- and low/ high-EVPers. It would be worth extending the questionnaire to a wider group of people rather than just sceptics and people recruited from paranormal groups, as this will also enable comparison with a less specialised population. Although it would be expected that extremes of belief in both directions would display greater differences and therefore would be more distinguishable from each other, people from paranormal groups who have low belief may display the same results as the general population – it is not possible from the current study to tell if low-EVPers are just matching the beliefs of the general population at large.

As predicted, EVPers scored more highly on measures of paranormal belief than non-EVPers. For the factors Belief in Psi, Witchcraft, Spiritualism, Extraordinary Life Forms and Precognition, both low- and high-EVPers scored significantly higher than non-EVPers. This was also true for Traditional Religious Beliefs (TRB), which again may be predicted if we assume that a number of factors within TRB have been described as also being paranormal (for example the concepts of angels and miracles [Irwin, 2009]). One of the questions in the Revised Paranormal Belief Scale TRB

subscale is “The soul continues to exist even though the body may die”, and this would be expected to be believed by EVPers if they believe that they are communicating with the souls of the deceased. Aarnio and Lindeman (2007) have suggested that there may be a curvilinear relationship between religion and paranormal belief, with moderate religious belief being able to co-exist with paranormal belief, and only in highly religious people are paranormal beliefs rejected.

Low EVPers scored more highly on the Superstition subscale than non-EVPers, showing a significantly higher level of superstition. Low-EVPers may be displaying this higher Superstition in certain actions – for example it is common in amateur ghost hunting groups for participants to recite prayers of protection before beginning an investigation in case they attract malevolent spirits, which could be thought of as a form of Superstition (Myers, n.d.). High EVPers may have lost the need to do this as they are more familiar with the apparent contact with spirits and have lost the fear.

It could be argued that the RPBS does not measure Superstition as a complete concept, as the only questions relating to Superstition are concerned with bad luck (“Black cats can bring bad luck”; “If you break a mirror you will have bad luck”; and “The number 13 is unlucky”), whereas Superstition also covers positive effects such as the example described by Vyse (2013) of the gambler using the digits of his daughter’s birthday to play the lottery in the belief that they will bring him good luck. The Superstition subscale has also been criticised because the questions are concerned with cognition (whether someone intellectually believes in the concept) rather than behaviour (whether someone carries out the action; Irwin, 2009), and it may be that the results might be different if questions were asked about behaviour. However, it was interesting to find that the level of superstition recorded by low-EVPers exceeded that of both non- and high-EVPers. This could possibly be explained by the results of Lindeman and Aarnio’s (2007) study where they suggest that a number of beliefs that have previously been classified as paranormal/magical/superstitious are not actually superstitions at all, but are unsubstantiated beliefs. The examples they give are graphology and biorhythms, but if we class EVPs under this category of unsubstantiated beliefs then it might explain why high-EVPers did not score significantly higher than the other two groups in the study, as actually the Superstition scale is measuring a different construct.

Anomalous/Paranormal Beliefs and Experiences both showed the expected result, with scores significantly increasing with increasing EVPness. Both high and low EVPers reported significantly more Anomalous/Paranormal Experiences than non-EVPers, as was expected. It might be expected that although low-EVPers believe in the paranormal significantly more than non-EVPers they may not have had many actual paranormal experiences, whereas respondents who report a high level of EVPness and are therefore using EVP are having more experiences as well as having greater belief. This was borne out when looking at the second part of the PIEQ, regarding EVP experiences. A number of low-EVPers turned out to have no actual experience of EVP. Anomalous/Paranormal Ability was reported more in high-EVPers than low-EVPers, again this would be expected as high-EVPers are using and reporting EVP more often than low-EVPers, who may have high belief but not necessarily have had a lot of experience so have nothing to base ability on. High EVPers scored significantly higher in Ability than non-EVPers, again this is as expected, as non-EVPers would not be expected to report Anomalous/Paranormal Abilities to the extent shown by high-EVPers.

After Death beliefs have been examined previously, Thalbourne (1996) described how a higher belief in and experience of the paranormal, correlated with a higher belief in an afterlife, particularly if that afterlife included reincarnation. As EVPers believe that they are talking to the spirits of deceased people, it can be expected that they would hold similar after death beliefs to the less specialised general paranormal believers. However, it may also be that as EVPers describe specific spirits that they communicate with, this may have an effect on the after death beliefs they hold, and therefore separate them from general paranormal believers. In the current study, it was found that both low- and high-EVPers appear to hold a number of Afterdeath beliefs, some of which may not appear to be compatible with each other. The belief in Disembodied Spirit factor was significantly higher in both low- and high-EVPers than non-EVPers. As some form of disembodied spirit is necessarily required for the concept of EVP as communication with spirit, this may be expected, however it was slightly surprising as disembodied spirit is the concept of consciousness continuing after death in the absence of the identity – this finding would suggest that whilst high-EVPers are hearing EVPs they are not necessarily interpreting them as specific identities (for example friends or relations who are still individuals as they were before

death). This may be because whilst they are obtaining more EVPs and distinguishing between them, they cannot assign them to specific people (friends/relatives/spirits associated with a particular place).

Both Spiritual Embodiment and Reincarnation belief were significantly higher in low- and high-EVPers than non-EVPers. The Spiritual Embodiment finding was expected as this is the idea that both the identity and the consciousness of a person survives death, and this belief is required to explain the results of a number of reports from both the earlier EVP researchers who report hearing the voices of relatives/friends/famous people, and recent EVP researchers who report hearing relatives and famous people whom they believe existed historically, such as Jesus Christ (Edwards, 2012). Buckwalter and Phelan (2014) describe how emotional state attribution is unaffected by whether the state is being attributed to an embodied or disembodied person, so even if the witness describes communicating with a ghost or spirit that they have no previous knowledge of, they will still attribute the same emotional states to them as they would another human being. This makes sense in the context of EVP, as the ghost hunters are effectively talking to a recording device with no physical presence or cues to guide them, yet as they have the belief that they are communicating with a spirit, they are assigning the spirit the same thoughts and feelings as they ascribe to a living human being.

The Reincarnation finding was slightly surprising, because the belief that consciousness survives and returns to a new body with a different identity would not seem to make sense in the context of EVP. However, it may be that EVPers can believe in both, it may be that they believe both scenarios may happen, and a voice they pick up via EVP may be of a spirit that at some point will lose its consciousness and return in a new body. One explanation may be found in the results described by Walter and Waterhouse (1999), who investigated the findings that there was a substantial minority of westerners believing in reincarnation. When looking at a group of English reincarnation believers, they found that this group's belief in reincarnation was separate from any other expected influences, such as their religious affiliation, and it appeared that their beliefs were not strongly held and had no effect on their everyday life. Given that the belief in reincarnation found by Walter and Waterhouse appeared to be a belief that people could hold without it affecting their life in any meaningful

way, it is therefore not surprising that it is a belief that can be held by EVPers, even though on the surface it appears to make less sense in the context of EVP.

As expected, non-EVPers showed significantly higher belief in Annihilation than low- and high-EVPers, as the concept of annihilation would not be compatible with the concept of EVP. After death beliefs which include some form of continuation after death are reported by paranormal believers, Kennedy and Kanthamani (1995) describe how paranormal experiences cause an increase in belief in life after death, whilst according to Bibby (2017), survival after death is largely ignored or explained away by academics, who tend to be paranormal sceptics.

Belief/Behaviour Efficacy (BBE), the belief that actions and beliefs affect what happens to someone after death (Burris & Bailey, 2009), was significantly higher in low- and high-EVPers than non-EVPers. Again this could be tied to the increase in Traditional Religious beliefs in the two EVP groups, as a recurring theme in religions is the belief that how you act in life will influence what happens to you after death, although this effect may not be as simple as expected – Shariff and Rhemtulla (2012) describe how a belief in hell (i.e. that one will be punished for bad deeds after death) results in a decrease in the national crime rate, whereas a belief in heaven (i.e. a benevolent and forgiving God) results in a rise in the national crime rate. This may suggest that low-and high-EVPers demonstrate a high belief in the possibility of hell and punishment after death and is something that would be interesting to investigate in a future study. This may also tie in with the low-EVPers relatively high level of superstition, with superstition causing them to carry out actions to prevent harm in this life, and BBE causing them to carry out actions to prevent harm after death.

When looking at the Big 5 Personality factors, there were no significant differences between the three groups except for a significantly higher Agreeableness score for high-EVPers when compared with non-EVPers. The lack of significant differences between groups in the Intellect/Imagination (Openness to Experience) personality factor was unexpected as a number of studies have shown that paranormal belief correlates with Openness (e.g. Mikloušić, Mlačić & Milas, 2012). However Irwin (2009) has described how there is a negative correlation between openness to experience and traditional religious beliefs, and as the current sample of high-EVPers displayed higher levels of traditional religious beliefs, they may be less likely to display openness to experience. In addition, Irwin (2009) states that paranormal believers

appear to be reluctant to change their beliefs, which again would suggest that they would not display higher levels of openness to experience.

MacDonald (2000) identified five dimensions of spirituality. Of interest in the current study are Cognitive Orientation Towards Spirituality (COTS), which describes beliefs around the relevance of spirituality to the sense of identity and daily functioning, and Paranormal Beliefs (related to phenomena such as ESP, precognition and psychokinesis, as well as beliefs in ghosts and apparitions). The COTs factors correlates most with Agreeableness and Conscientiousness. Agreeableness does not correlate with the other four factors of the scale. It was expected that high-EVPers would show a significantly higher level of Agreeableness than non-EVPers, therefore would express a belief in spirituality to enhance their sense of identity and their daily functioning. This was displayed in the current study; however it would be interesting to further follow up the dimensions of spirituality when compared with paranormal experience in a future study.

When looking at gender differences, it had been predicted that females would show higher levels of paranormal belief than males, however this was only true for the Precognition subscale. Females have previously been reported to have greater levels of belief in Precognition, along with Traditional Religious Beliefs (Tobacyk & Milford, 1983), however in the current study only Precognition showed a female higher mean score. This may be as a result of the small sample size present in the current study.

Previous studies have shown varying results regarding gender influences on paranormal beliefs, and Irwin (1999) has reported that Extrasensory Perception is one subscale that has shown higher beliefs in females than males. This subscale can be matched to the Precognition subscale in the RPBS used in the current study, however the results of a chi square analysis showed that for the current sample, gender is not a significant predictor of paranormal belief. This may be due to the fact that the sample could be potentially biased, with more believers (of both genders) than non-believers responding to the survey (the researcher discovered during the study that it was considerably harder to recruit sceptics than believers, due to the sceptic's dismissal of the validity of research into any paranormal topic).

Females did report a higher belief in precognition than males, and also a significantly higher score in the Anomalous/Paranormal Experiences subscale. It would be interesting to investigate the type of anomalous/paranormal experiences that are

reported by the groups, as previously it has been shown that females are more likely to report experiences involving contact with the dead, and males are more likely to report UFO sightings (Dagnall, Drinkwater, Parker & Clough, 2016). Irwin (2009) describes two reasoning styles – analytical-rational (requiring effort, a conscious process and mainly verbal), and intuitive-experiential (subconscious, automatic and non-verbal) and reports how all subscales of the Revised Paranormal Belief Scale correlate with the intuitive-experiential style. As well as being implicated in paranormal belief, Irwin (2009) also suggests that this intuitive-experiential reasoning style might also be a factor in ambiguity intolerance and suggests that people using this reasoning style might be more likely to make impulsive interpretations when presented with ambiguous situations. This could provide a reason why EVPers report hearing voices in noise, as if they are using this reasoning style, they would be more likely to assign meaning to an ambiguous signal.

Males showed a significantly greater belief in the Annihilation factor of the Afterdeath Belief scale, as this would suggest that they do not accept the concept of life after death, however as they show no lesser belief in the paranormal than females, this might suggest that they view the paranormal as something other than survival after death, something that could be explored in the future.

The current research would have benefited from a larger participant pool, however it proved quite difficult to recruit specific self-identified EVPers and sceptics, with sceptical participants being the most problematic to recruit. It was unclear why sceptics were not prepared to take part in the research, it may be that they did not see the point in researching something that they did not believe existed. Even though the possibility existed that the research may not prove favourable towards paranormal believers, believers were still more willing as a group to take part in the research. These findings are interesting and something that would be useful to follow up in the future, as to why people sceptical of a “fringe” subject are not willing to take part in research, even if it strengthens the evidence supporting their point of view, whilst people who believe in the subject are willing to take part even if it might disprove the existence of the phenomenon they believe in.

The results of the current study seem to suggest that there is little in the scales studied that separate EVPers from general paranormal believers, apart from higher superstition in low-EVPers and high Paranormal/Anomalous Ability in high-EVPers. It

may prove to be the case that this could be true for any specific factor of the paranormal, for example participants may show the same results when looking at belief in, and experience of, mediumship, or spirit encounters. The current study concentrated on paranormal and afterdeath beliefs, so future studies should be conducted to examine if further personality factors that have been documented as predicting paranormal belief are associated with belief in and experience of EVP, (for example schizotypy), and also to try to examine how EVPers experience and report anomalous sounds. Given the published research available looking at further personality factors, a next step would be to examine if EVPers follow the pattern of differences reported for general paranormal believers when examining a number of further specific personality factors, including schizotypy, fantasy proneness, reality testing, dissociative experiences and hallucination-proneness. To facilitate this, a second study is planned to investigate a number of personality factors that have been shown to differentiate paranormal believers form non-believers, to ascertain if any of these factors can be used to separate high-EVPers from low-EVPers.

6 Study 2 – Exploring Personality Factors in Relation to Belief in Electronic Voice Phenomena

6.1 Abstract

A number of personality variables have been shown to correlate with belief in and experience of the paranormal. A previous study showed that it is possible to distinguish between participants on the basis of their belief in and experience of Electronic Voice Phenomena. This study investigated a number of variables that have been shown to differ between paranormal believers and non-believers, and addressed whether there were differences between non-EVPers, low-EVPers and high-EVPers. Results showed that both low-and high-EVPers scored significantly higher than non-EVPers in the Unusual Experiences Scale of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE); Reality Testing deficits; Fantasy Proneness; and Auditory Hallucinations. This indicated that although it was possible to distinguish between non-EVPers and low/high-EVPers, it was not possible to distinguish between low and high-EVPers using the scales utilised. However high-EVPers showed the highest significant overall rate of hallucination proneness, and also the significantly highest rate of sleep-related hallucinations. Non-EVPers showed the highest level of the narcissistic personality factor Authority, scoring significantly higher than low-EVPers. Previous studies have shown that females are significantly more likely to report paranormal belief and experiences than males, and also to report higher levels of the personality traits studied. In the current study females scored significantly higher than males in the Unusual Experiences scale of the O-LIFE; Reality Testing deficits; Fantasy Proneness; and Auditory Hallucinations.

The result obtained suggest that the factors used in the study, with the exception of hallucination proneness, cannot be used to distinguish between types of EVPers, and are more likely to be distinguishing on the basis of general paranormal belief.

6.2 Introduction

Study 1 (see section 5) demonstrated that both low- and high-EVP experiencers demonstrated the same paranormal belief profile, and both differed from non-EVPers in the same way, with the exception of low-EVPers showing the highest level of Superstition, and high-EVPers showing the greatest level of Anomalous/Paranormal experiences. Study 1 concentrated mainly on paranormal and afterdeath beliefs, so Study 2 was designed to look at individual differences that have been described in the literature as being indicative of a tendency to believe in and experience apparently paranormal phenomena. EVPers as a group had been shown in Study 1 to display high levels of paranormal belief, therefore it could reasonably be suggested that they might also display a number of individual characteristics in common with high paranormal believers, however there may be some differences due to the specific nature of EVP. It was also hypothesised that there may be differences in some of the individual differences chosen between low- and high-EVPers.

Schizophrenia is a clinically recognised psychiatric disorder that causes a number of symptoms to be displayed. These symptoms can be categorised into positive (hallucinations), negative (apathy) and disorganised (bizarre behaviour) symptoms (Nelson, Seal, Pantelis & Phillips, 2013). Schizotypy is a personality type that has been described as varying along a continuum from normal, through affective disorder, to the upper reach of the scale, where a second continuum of the scale encompasses clinical psychosis and schizophrenia (McCreery & Claridge, 1995). There are either three of four factors contained in the schizotypy construct, depending on different studies, however one, Unusual Experiences, appears in both three and four-factor models and appears to describe anomalous experiences such as hallucinations (McCreery & Claridge, 2002; Goulding, 2005). People who score highly on this Unusual Experiences scale have been termed Positive Schizotypes (Holt, Simmonds-Moore & Moore, 2008). People scoring highly on this Unusual Experiences scale, but also being mentally healthy and showing high levels of well-being, have been described as Happy Schizotypes (Goulding, 2004). These Happy Schizotypes experience anomalous events but have higher levels of mental health and well-being than the other types (Holt, Simmonds-Moore & Moore, 2008).

Irwin, Dagnall and Drinkwater (2013) report that there are two processes involved when someone experiences a paranormal experience – the experiencing of the event itself, and the interpretation of that event as paranormal. Schizotypy is a predictor of both processes, so whilst there would be differences expected between non- and low/high EVPers, it is unlikely that there would be any differences in schizotypy between low and high-EVPers.

Positive schizotypes are more likely to report hallucinatory experiences and unusual cognitive and perceptual experiences than are normal controls (Fisher, Mohanty, Herrington, Koven, Miller & Heller, 2004). Auditory hallucinations are one of the defining features of both schizophrenia and dissociative identity disorder (Dorahy *et al*, 2009), and whilst this is in a clinical population, strong associations have been found between belief in paranormal phenomena and positive schizotypy (Hergovich, Schott & Arendasy, 2008). Irwin (2001) reports that in dissociative states, voices are heard as if from an internal source, whereas with schizotypy, voices are experienced as having an external source. In a review of the literature (Longden, Madill, & Waterman, 2012) found that 41% of people with dissociative conditions describe hearing external voices and 52% of people diagnosed as schizophrenic described exclusively internal voices, so it would appear that people with dissociative conditions and/or schizotypy may hear voices apparently emanating from both internal and external sources.

If people experiencing EVP are constructing voices from random noise, it may be that they show higher propensity to this positive, happy schizotypy as it is associated with both belief in the paranormal and the hearing of voices (but in a non-clinical state). If a person is predisposed to experience unusual experiences and also to hearing voices, this may account for some instances of reported EVP.

Previous studies have appeared to show that clinically diagnosed schizophrenic patients who demonstrate auditory hallucinations are more likely to both misperceive speech stimuli and also to assign meaning to meaningless sounds (Vercammen, de Haan & Aleman, 2008). One of the criticisms of these studies has been that account was not taken of suggestibility factors, however if we are applying the model to EVP experiencers with the assumption that they display non-clinical positive schizotypy, it would seem likely that suggestibility would play a part. Therefore, the results of these previous studies may be more relevant due to the suggestibility factor.

From the previous research it might be predicted that high EVPers (those reporting a high level of EVP experiences) would display higher levels of positive schizotypy than other participants, as this factor has been described in paranormal believers, and is also related to hallucination proneness (see also section 2.4 – Schizotypy). Gender has been shown to affect scores on schizotypy scales, with females scoring higher than males in magical thinking/odd beliefs and males scoring higher in negative symptoms (Bora & Arabaci, 2009). It would be expected that if females are displaying higher levels of positive schizotypy than males, they would also be more likely to report hearing EVP voices, so the group most likely to report EVP voices would be females who believe in the paranormal.

Reality testing can be thought of as the ability to differentiate between representations of the external world from representations of the internal world (Arlow, 2018). Arlow (2018) describes how the feeling of reality may be separated from a perceptual experience as other mental functions need to be called upon to make the distinction between reality and fantasy. Langdon and Coltheart (2000) suggest that there are two factors involved in the formation of delusions; damage to sensory or attentional orientating systems which cause the unusual experience, followed by a failure of belief evaluation, and these two factors combined cause the formation of a delusional belief. They report that individuals give more weight to the evidence of their senses and forming a belief to support this sensory evidence, than they do in trying to fit the experience into more mainstream ideas of the nature of reality (Langdon & Coltheart, 2000). These dual factors involved in the formation of delusions are the factors that combine to also describe the process of reality testing, and deficits present within the reality testing system (Drinkwater, Dagnall & Parker, 2012).

Irwin, Dagnall and Drinkwater (2013) report that there are two processes involved in experiencing an alleged paranormal event; a proneness to anomalous experiences, and a proneness to paranormal attributions. They describe how a suspension of reality testing shows a positive relationship to proneness to paranormal attributions. From this it might be expected that people reporting EVP experiences show a deficit in reality testing, as they are attributing and interpreting sounds in a paranormal fashion.

Bentall and Slade (1985) describe hallucinations being reported in the general population in a non-paranormal context, and report that approximately 5% of participants will report hallucinatory auditory experiences when they are presented with the suggestion that there may be a stimulus present. They discuss how hallucinators are poor at reality testing, so it may be that paranormal believers display a combination of poor reality testing due to them having an auditory hallucination experience, then forming a belief to support this experience, and because of their prior bias towards paranormal belief, this belief to support the experience is manifested as a paranormal explanation for the hallucination.

It was predicted that high-EVPers would display impaired reality testing when compared with non-EVPers, given that reality testing has been shown to be deficient when interpreting apparent paranormal events (see also section 2.5 – Reality Testing). There has been little research looking specifically at reality testing differences in relation to gender, however as females have been reported to display higher levels of paranormal belief than males (Irwin, 1999), and paranormal believers have been shown to display higher reality testing deficits than non-believers (Irwin, Dagnall & Drinkwater, 2013), it was hypothesised that in the current study females would report a higher reality testing deficit than males.

Dissociative disorders are generally recognised in clinical populations, however there is evidence that dissociative experiences are present in the general, non-clinical population as well- examples of this type of experience include auditory hallucinations (Ross, Joshi & Currie, 1990). Ross, Joshi & Currie (1990) describe scores on the Dissociative Experiences Scale above 20 indicating a substantial number of experiences which may suggest pathology.

Females have been found to report more dissociative experiences than men, and higher scores in spiritualism and superstition also appear to predict a higher level of depersonalisation/derealisation (Wolfradt, 1997). Wolfradt (1997) suggests that this is because these types of paranormal belief imply a belief in fate and a lack of control, which would make sense as superstition may be invoked when the individual believes in fate and a lack of personal control (Tobacyk, Nagot & Miller, 1988). Additionally, Irwin posited a potential mechanism whereby paranormal belief can be considered part of a complex coping mechanism which allows an individual to cope with a perception of the uncontrollability of life (Irwin, 1994). Irwin (1994) found that higher

dissociation scores were correlated with spiritualism, psi, precognition and extraordinary life forms. Both Wolfradt (1997) and Irwin (1994) found a correlation between higher dissociation scores and spiritualism, and Irwin suggests that this may be due to the feeling of being not in control of death. It may be that high-EVPers gain some measure of feelings of control by apparently communicating with spirits, and lower EVPers (who are still paranormal believers) may not have this mitigating control and may therefore show higher dissociation.

There have been a number of studies which have suggested that overall dissociation is more common in females than males (for example Maaranen, Tanskanen, Honkalampi, Haatainen, Hintikka & Viinamäki, 2005), however they report that only non-pathological symptoms are reported more in females. In contrast, Spitzer *et al* (2003) suggest that there are no gender differences, and previous studies have suffered from case selection biases.

Given that some auditory hallucinations have been described as being dissociative experiences (Ross, Joshi & Currie, 1991), and this can be correlated to a perception of lack of control, it was hypothesised in the current study that low-EVPers may display the highest level of dissociation, as high-EVPers may be using their practical experience of EVP as a means to manage feelings of lack of control (see also see section 2.6 – Dissociation).

Fantasy proneness is a trait that is used to describe individuals who display a number of related characteristics, including experiencing psychic and out of body experiences, being able to hallucinate objects, and difficulty differentiating between fantasised events and non-fantasised ones (Rhue & Lynn, 1987). The reasons for developing this fantasy prone personality fall outside the scope of the current study, however it is generally accepted that both negative (punishment in childhood and loneliness), and positive (encouragement in participating in fantasy by parents) factors may be involved and correlate to high levels of fantasy proneness (Rhue & Lynn, 1987; Sánchez-Bernardos, Hernández Lloreda, Avia & Bragado-Alvarez, 2015). Fantasy proneness has been described as being a positive cognitive resource, enabling planning and assessing consequences, however it has also been associated with schizotypy and negative moods (Sánchez-Bernardos *et al*, 2015). Fantasy prone individuals report psychic and out-of-body experiences, they can vividly hallucinate objects, and they report being able to fully experience their fantasies to the extent that they can

physically feel fantasised experiences (Rhue & Lynn, 1987). Individuals who display fantasy proneness, regardless of the reasons for developing this trait, show a weak association with the personality traits of Neuroticism and Openness to Experience (Sánchez-Bernardos *et al*, 2015).

Individuals who score highly on measures of fantasy proneness have been shown to also display higher levels of paranormal experiences, alongside dissociation and schizotypy (Merckelbach, Horselenberg & Muris, 2001). It has also been suggested that fantasy proneness might facilitate a belief in the paranormal, and that belief in the paranormal then provides the conditions to create the paranormal experience (Irwin, 1990). It would therefore be expected that high paranormal believers (and high-EVPers) would also display higher levels of fantasy proneness. When listening for clips of the song "White Christmas" in auditory noise, Merckelbach and van de Ven (2001) suggest that rather than hallucination, the fact that fantasy prone participants show a tendency to endorse odd items may be behind their reporting of the tune when it was not in fact present. Given the fact that high-EVPers create spirit voices out of random noise, it would be expected that they would also show a higher degree of fantasy proneness than other participants.

When investigating participants who claimed psychic ability, Parra and Argibay (2012) found that male psychics displayed slightly higher levels of both Dissociation and Fantasy Proneness. As Irwin (1990) described a model whereby fantasy proneness facilitates a belief in the paranormal, and females have been shown to display higher paranormal belief than males (Irwin, 1999) it was hypothesised that high EVPers and females would display higher levels of fantasy proneness (see also section 2.7 – Fantasy proneness).

Another factor that has been implicated in reports of apparent paranormal phenomena is hallucination proneness.

David (2004, p. 110) gives this definition of auditory verbal hallucinations:

> "A sensory experience which occurs in the absence of corresponding external stimulation of the relevant sensory organ, has a sufficient sense of reality to resemble a veridical perception, over which the

subject does not feel s/he has direct and voluntary control, and which occurs in a wake state".

Whilst in clinical individuals (for example schizophrenics) the voices are usually described as speaking directly to the patient, this is also described in EVP literature - for example voices calling ghost hunters by name (Edwards, 2012).

It may be expected that proponents of Electronic Voice Phenomena might be described as displaying hallucination proneness, as the alternative would be to accept that they are recording the voices of deceased spirits. Paranormal believers have previously been shown to be more likely to report a signal within noise, particularly in uncertain conditions such as paranormal investigations (Blackmore & Moore, 1994). However, this could be simplistic, as there is considerable research concerning the perception of ambiguous stimuli which combined with personality factors may suggest that the combination of the human propensity for recognising speech in noisy conditions, hallucination proneness and paranormal belief may all contribute towards the EVP proponent reporting voices where there are none (see also section 3.2: Perception of Ambiguous Audio Stimuli).

For non-clinical individuals, auditory verbal hallucinations cause little interference in their daily life, and this is generally due to the positive content of their hallucinations (Sommer *et al*, 2010). Healthy individuals tend to assign an external source to their hallucinations, and this source is frequently a paranormal one (Daalman *et al*, 2011). Young, Bentall, Slade and Dewey (1986) reported that non-clinical females were more likely to report hallucinations than non-clinical males, however they suggest that this could be due to the fact that females are more likely to report all forms of apparent mental illness, with the exception of schizophrenia. When examining clinical populations, Rector and Seeman (1992) found that, in common with previous studies, females were more likely to display auditory hallucinations than males.

It was therefore hypothesised that high-EVPers would display a higher level of hallucinations than non-EVPers (see also section 2.8 – Hallucinations), and also that females would display a higher level of auditory hallucinations than males.

Death anxiety describes the apprehension felt when considering the awareness of the inevitability of death (Lehto & Stein, 2009). There are many theoretical models

concerning death anxiety, including self-realisation (a self-actualising person has a lower fear of death); purpose in life; death as a threat; illusory immortality, and many different scales to measure specific aspect of death anxiety, measuring concepts such as fear of death; fear of dying; fear of the unknown (Tomer, 2015).

Houran (1997) found that there were no differences between paranormal believers and non-believers, or between paranormal experiencers and non-paranormal experiencers, in relation to death anxiety. It could be expected that a belief in the afterlife via direct paranormal experience might decrease death anxiety, however it might be that if the experience consists of talking to alleged spirits in a haunted house, then the fact that spirits are remaining on earth might not be interpreted as a positive after death experience. Results from Study 1 show that afterdeath beliefs are mixed, and do not appear to be compatible either with other beliefs held, or with the concept of EVP, so whilst it is tempting to think that low-EVPers might have the highest death anxiety, as they are aware of the paranormal but do not have direct experience of it and therefore might have more anxiety about what follows death, it is harder to predict than this simple model. Despite this, Jong, Ross, Philip, Chang, Simons and Halverstadt (2017) suggest that non-religious individuals and highly religious individuals have the lowest death anxiety, and people who are less certain about their views show the highest death anxiety, so it may be that both non- and high-EVPers show the least death anxiety, with low-EVPers showing the highest.

The picture concerning death anxiety and gender is complicated – Assari and Lankarani (2016) found that there was no effect of gender on death anxiety, however age predicted death anxiety amongst women (but not men). In contrast, Duff and Hong (1995) found that in a sample of elderly participants in retirement communities, females displayed lower death anxiety than males. It would appear that reports of death anxiety depend on the circumstances of the participants being asked, particularly when analysing specific communities such as aged communities living in close proximity.

Although Houran (1997) found no differences between low and high paranormal believers in respect to death anxiety, the fact that Jong et al (2017) found that no religion and high religion individuals display the lowest death anxiety, suggests that the current study would find that high-EVPers would display a lower level of death anxiety than low-EVPers (see also section 2.10 – Death Anxiety).

Tobacyk and Mitchell (1987) investigated the relationship between narcissistic personality and paranormal beliefs – they found that amongst people who have had an out-of-body experience (defined by Blanke, Landis, Spinelli & Seeck [2004] as "… an experience in which a person seems to be awake and to see his body and the world from a location outside the physical body"), this experience moderated the relationship between narcissism and paranormal beliefs (specifically Psi, Precognition, Witchcraft and Superstition). They interpreted this as people displaying narcissistic personality traits accepting the out-of-body as an objectively real experience, particularly as it confers on them a special status as having experienced something that most people do not, and this then predisposes them to accepting further paranormal experiences. Roe and Morgan (2002) expanded on this work, finding a correlation with high narcissism scores and higher paranormal belief, however this was only for one paranormal belief scale. They hypothesised that this was because the relevant scale was more "person centred" and therefore highlighted participants who believed in or experienced phenomena that might raise their status. They found that narcissism correlated with two subscales – Extrasensory Perception and Psychokinesis and suggest that this may be due to the participants feeling that they exercise some power by having these apparent abilities. It is possible that this effect may also be displayed in high-EVPers, who are claiming to be able to speak directly with the spirit world.

Carroll (1989) reported finding that males scored higher on all subscales of the Narcissistic Personality Inventory (NPI) than women, androgynous, feminine and undifferentiated participants. They report that this may be regarded as an artefact of gender socialisation, alternatively it might be due to the NPI containing items which are more typical of male narcissistic behaviours than female behaviours.

As it has been shown that some forms of paranormal belief are correlated with narcissism, possibly due to participants experiencing a feeling of power by believing in and experiencing paranormal phenomena (Roe & Morgan, 2002), it was hypothesised that in the current study, high EVPers would display higher levels of narcissism than low-EVPers (see also section 2.11 – Narcissism).

6.3 Method and Materials

The questions in Study 2 were designed to assess participant's scores in a number of individual difference measures. This was done by means of a number of questionnaires, specifically measuring schizotypy, reality testing, dissociation, fantasy proneness, hallucinations, death anxiety and narcissism. These are all factors that have previously been shown to vary according to belief in the paranormal.

6.3.1 Paranormal Investigation Experience Questionnaire (PIEQ)

Participants who had not taken part in Study 1 were asked to complete the Paranormal Investigation Experience Questionnaire (PIEQ) as detailed in section 5.3.1.

6.3.2 The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE)

This is a 104 item self-response scale to measure schizotypal traits (Mason & Claridge, 2006). Participants are asked to respond Yes or No to a series of questions. There are four factors described in the scale;

- Unusual Experiences (UE – 30 items). Sample item "Have you sometimes sensed an evil presence around you, even though you could not see it". This factor includes positive symptoms such as hallucinations and magical thinking (Mason, Claridge & Jackson, 1995) and is correlated with paranormal belief (Holt, Simmonds-Moore & Moore, 2008). It can be described as measuring positive schizotypy (Burch, Hemsley, Corr & Gwyer, 2006).
- Cognitive Disorganisation (CD – 24 items). Sample item "Are you easily confused if too much happens at the same time". This factor considers attention difficulties and difficulties with concentration and decision making (Mason, Claridge & Jackson, 1995) and measures disorganised schizotypy and social anxiety (Burch, Hemsley, Corr & Gwyer, 2006).
- Introvertive Anhedonia (IA – 27 items). Sample item "Do you prefer watching television to going out with people". This factor considers a lack of enjoyment from social and other activity (Mason, Claridge & Jackson, 1995) and measures negative schizotypy (Burch, Hemsley, Corr & Gwyer, 2006).
- Impulsive Nonconformity (IN – 23 items). Sample item "Do you often feel the impulse to spend money which you know you can't afford". This factor considers a range of reckless behaviours, but in a more moderate presentation

describes non-conformity and free living (Mason, Claridge & Jackson, 1995). It measures asocial schizotypy (Burch, Hemsley, Corr & Gwyer, 2006).

The scale has high internal consistency (UE α = 0.89, CD α = 0.87, IA α = 0.82, IN α = 0.77) and test-retest reliability (>0.7). In this study UE α = 0.89, CD α = 0.86, IA α = 0.71, IN α = 0.77).

6.3.3 Inventory of Personality Organisation Reality Testing Subscale (IPO-RT)

This scale measures impairment in reality testing and is a 20 item scale that was answered using a 5 point Likert scale ranging from Never True to Always True. A sample item was "I am not sure whether a voice I have heard, or something that I have seen, is my imagination or not". Scores on the scale potentially ranged from 20 to 100, with a higher score indicating a higher failure of reality testing. Lenzenweger *et al* (2001) report a good test-retest reliability (r=.73) and adequate internal consistency (Cronbach's α = .87). The reliability for this sample (n=35) was α = .88.

6.3.4 Dissociative Experiences Scale II (DES)

This is a 28 item self-report measure which measures the frequency of dissociative experiences. Participants are asked to indicate the percentage of time that they experience certain scenarios, then scores are summed and divided by 28 to give an average score, so scores can range from 0 to 100. A sample item is "Some people have the experience of driving or riding in a car or bus or subway and suddenly realising that they don't remember what has happened during all or part of the trip". Carlson and Putnam (1993) report good test-retest reliability (r>.79, p<.0001) and internal reliability (Cronbach's α = .95). Cronbach's α for this sample was .96.

6.3.5 Creative Experiences Questionnaire (CEQ)

This is a 25 item self-report measure of fantasy proneness. Participants are asked to respond either Yes or No to the statements in the questionnaire. A higher score indicates a higher tendency towards fantasy proneness. A sample item is "I am never bored because I start fantasising when things get boring". Test-retest reliability has been found to be fairly good (r = 0.95) and internal consistency adequate (Cronbach's alpha = 0.72)(Merckelbach, Horselenberg & Muris, 2001). For this sample, Cronbach's alpha = 0.78.

6.3.6 Launay-Slade Hallucinations Scale

A modified version of the Launay-Slade hallucinations Scale was used (Larøi, Marczewski & Van der Linden, 2004) as this version includes items that look at a range of hallucinatory experiences including visual, tactile and olfactory, in addition to items regarding feeling the presence of a deceased person and experiences that occurred immediately prior to falling asleep or awakening. Four factors are described in this scale (Larøi, DeFryt, van Os, Aleman & Van der Linden, 2005):

- *Sleep related* (SR – 7 items). Sample item "Sometimes, immediately prior to falling asleep or upon awakening, I have had a sensation of floating or falling or that I left my body temporarily"
- *Vivid daydreams* (VD – 3 items). Sample item "The sounds that I hear in my daydreams are usually clear and distinct"
- *Intrusive thoughts* (IT – 3 items). Sample item "Sometimes my thoughts seem as real as actual events in my life"
- *Auditory hallucinations* (AH – 3 items). Sample item "In the past I have had the experience of hearing a person's voice and then found that no-one was there".

The scale is a 17 item self-report measure that was answered using a 5 point Likert scale ranging from Certainly does not apply to me, to Certainly applies to me. Larøi *et al* (2004) have reported that internal reliability has been demonstrated with a moderately high Cronbach's alpha ($\alpha = 0.78$) and test-retest reliability is high (r=.77). In this study Cronbach's alpha was 0.89.

6.3.7 Death Anxiety Scale – Extended (DAS-E)

This is a 51 item self-response questionnaire, participants are asked to respond True or False to a series of statements concerning death. A sample item is "I am very much afraid to die". Scores can range from 0 to 51, with a higher score indicating higher anxiety about death. The scale has good internal consistency (Templer *et al*, 2006). In this study Cronbach's alpha = 0.88.

6.3.8 Narcissistic Personality Inventory (NPI)

This is a 40 item scale consisting of pairs of statements, participants select the statement from each pair that they feel is closer to describing themselves. Seven factors have been extracted, these are:

- Authority (A – 8 items). Sample item "I have a natural talent for influencing people / I am not good at influencing people"
- Self-sufficiency (SS – 6 items). Sample item "I always know what I'm doing / Sometimes I am not sure of what I am doing".
- Superiority (S – 5 items). Sample item "I am no better or worse than most people / I think I am a special person".
- Exhibitionism (E – 7 items). Sample item "Modesty doesn't become me / I am essentially a modest person".
- Exploitativeness (EX – 5 items). Sample item "I find it easy to manipulate people / I don't like it when I find myself manipulating people".
- Vanity (V – 3 items). Sample item "I don't particularly like to show off my body / I like to show off my body".
- Entitlement (EN – 6 items). Sample item "I will never be satisfied until I get all that I deserve / I take my satisfactions as they come".

The scale has acceptable internal consistency (Raskin & Terry, 1988). In this study Cronbach's alpha was A α=0.79, SS α=0.43, S α=0.65, E α=0.55, EX α=0.49, V α=0.73 and EN α=0.46.

6.3.9 Demographics

A set of demographic questions was also included assessing participant's gender, age, ethnicity, occupational status and educational attainment.

6.3.10 Participants

Participants were recruited through paranormal groups and sceptic societies. Additionally, a number of undergraduate university students were invited to take part. Participants could complete the questionnaire pack either online or by filling in a paper copy of the questionnaire pack. A total of 142 participants returned questionnaire pack 2. Respondents (71 male and 71 female) ranged in age from 19 to 81 years, with a mean age of 42 years (SD – 14.36 years).

6.4 Procedure

Participants who had completed study one and had expressed an interest in participating in further studies were invited to complete the questionnaires in Study 2, additionally new participants were asked to complete both the Study 2 questionnaires and the PIEQ. Questionnaires were distributed to members of paranormal groups and sceptical groups at group meetings and conferences. Additionally, members of these groups were invited to complete the questionnaire set online if they would find this easier. Respondents who asked for a paper copy were asked to either complete the questionnaire at the time, take one home to complete and return, or they could have the questionnaire emailed to them to fill in. Ethical approval was obtained from the University of Central Lancashire. The order of presentation of the questionnaires within the questionnaire pack was reversed to account for any possible biasing factors due to order of presentation, and the pack that participants were sent was randomly selected.

Ethical considerations were addressed as described in section 5.4.

6.5 Results

6.5.1 PIEQ

Results for the PIEQ were calculated in the same way as in section 6.5.1. and the participants split into three groups in the same way, giving 12 non-EVPers, 74 low-EVPers and 56 high-EVPers.

A one-way between groups analysis of variance was conducted to explore any differences between the three groups (non-EVP, low-EVP and high-EVP) for the various scales.

6.5.2 Oxford-Liverpool Inventory of Feelings and Experiences

When an ANOVA was run, the group sizes were different within the various analyses however when the Levene test for homogeneity of variances was calculated, all groups showed a non-significant result, so the results of the one-way between groups ANOVA were analysed. The group sizes were non-EVPers (n=12), low-EVPers (n=70), high-EVPers (n=54).

There was a significant difference in the scores between the three groups in the Unusual Experiences subscale (F (2,133) = 4.076, MSE=141.597, p =0.019, η_p^2 = 0.058)

and also in the Impulsive Nonconformity scale ($F(2,90) = 3.793$, MSE=52.706, p=0.026, $\eta_p^2 = 0.078$).

Table 2: Mean Individual Difference Ratings Across non-EVPers vs low-EVPer vs high-EVPer Group Type

		Non-EVPer		Low-EVPer		High EVPer		Significant mean differences		
		M	(SD)	M	(SD)	M	(SD)	Non vs low-EVP	Low vs high EVP	Non vs high EVP
OLIFE Scale										
Unusual Experiences	5.08	(6.54)	10.24	(6.40)	10.06	(5.00)	*		*
Cognitive Disorganisation	9.80	(6.11)	9.65	(5.92)	7.82	(5.92)			
Introvertive Anhedonia	7.70	(4.47)	9.85	(5.48)	8.65	(5.40)			
Impulsive Nonconformity	9.20	(4.24)	5.62	(3.36)	6.02	(3.96)	*		*
IPO Reality Testing subscale	33.17	(6.22)	41.65	(11.39)	40.46	(10.44)	**		**
Dissociative Experiences	13.08	(12.97)	15.26	(13.85)	13.98	(15.29)			
Fantasy Proneness	4.73	(3.44)	8.50	(4.64)	8.40	(4.11)	*		*
Hallucination Scale	30.37	(12.49)	38.79	(11.38)	45.71	(14.88)			*
Sleep Related	2.01	(1.07)	2.63	(1.09)	3.07	(0.89)			**
Vivid Daydreams	1.97	(1.35)	2.04	(1.14)	2.16	(1.18)			
Intrusive Thoughts	1.94	(1.05)	2.53	(1.15)	2.34	(1.02)			
Auditory Hallucinations	1.28	(0.71)	1.94	(0.86)	2.18	(0.96)	*		**
Death Anxiety	9.60	(4.55)	13.26	(7.70)	10.83	(8.99)			
Narcissistic Personality									
Authority	4.27	(1.90)	2.30	(2.01)	3.00	(2.61)	*		
Self-sufficiency	2.00	(1.48)	1.67	(1.41)	2.15	(1.49)			
Superiority	1.40	(1.26)	1.51	(1.40)	1.39	(1.32)			
Exhibitionism	1.91	(1.45)	0.73	(1.16)	1.00	(1.32)			
Exploitativeness	2.27	(1.74)	0.95	(1.02)	1.08	(1.19)			
Vanity	0.70	(1.25)	0.34	(0.78)	0.68	(1.05)			
Entitlements	0.64	(0.81)	0.89	(0.94)	1.24	(1.18)			
Significant group effect at the * p<.05 ** p<.01 *** p<.001 levels										

Post hoc Tukey tests were conducted for the significant result, and this showed that for the Unusual Experiences subscale the mean score for high-EVPers was significantly higher than for the non-EVP condition (p=0.025), as was the mean score for low-EVPers (p=0.016). For the Impulsive Nonconformity subscale, both high-EVPers (p=0.046) and low-EVPers (p=0.021) scored significantly lower than the non-EVPers.

6.5.3 IPO Reality Testing Subscale

An ANOVA was run to ascertain any significant differences between the three EVP groups and mean scores in the Reality Testing subscale of the Inventory of Personality Organisation. This showed a significant difference at the p<0.05 level (F(2,132) = 3.234, MSE=368.09, p=0.043, η_p^2 =0.047). The group sizes were different (19 non-EVP, 63 low-EVP and 55 high-EVP), and when the Levene test for homogeneity of variances was calculated, this showed a significant result indicating a violation of homogeneity of variances. Because homogeneity of variances was violated, the ANOVA was run again using Brown-Forsythe and Welch tests, as these are more robust to homogeneity of variances violations (Parra-Frutos, 2013). As well as a Tukey post hoc test, a Games-Howell was run. The Brown-Forsythe and Welch tests showed a significant result (p<0.01), so the post hoc tests were reported. The Games-Howell tests are reported here.

The mean score for both low-EVPers (p=0.02) and high-EVPers (p=0.01) were significantly higher than for the non-EVP condition.

6.5.4 Dissociative Experiences

There were no significant results found when analysing the differences between EVP groups for dissociative experiences (F(2,126) = 0.178, MSE=36.882, p=0.837). Additionally, none of the participants displayed pathological levels of dissociation.

6.5.5 Fantasy Proneness

When an ANOVA was run, the group sizes were different within the various analyses however when the Levene test for homogeneity of variances was calculated, all groups showed a non-significant result, so the results of the one-way between

groups ANOVA were analysed. A significant difference in reality testing was found (F(2,128) = 3.711, MSE = 70.272, p= 0.027, η_p^2 = 0.06.

The mean score for both low-EVPers (p=0.023) and high-EVPers (p=0.032) were significantly higher than for the non-EVP condition.

6.5.6 Hallucination

An ANOVA was run to compare mean scores, this showed a significant difference with a small effect size (F(2,128) = 3.43, MSE = 631.14, p=0.035, η_p^2 = 0.15). Levene's test of Homogeneity of Variances showed a non-significant result.
The mean score for high-EVPers was significantly higher than for non-EVPers (p = 0.03). The hallucination results were broken down into the four factors described by Larøi *et al* (2004).

Sleep related hallucinations showed a significant result (F(2,134) = 5.91, MSE = 6.10, p=0.003, η_p^2 = 0.08) as did Auditory hallucinations (F(2,137)=5.215, MSE = 4.121, p=0.007, η_p^2 = 0.07). For sleep related hallucinations, the mean score for high-EVPers was significantly higher than for non-EVPers (p = 0.006). For auditory hallucinations the mean score for high-EVPers was significantly higher than for non-EVPers (p=0.005). Low-EVPers also had a significantly higher score than non-EVPers (p=0.048).

Vivid daydreams and intrusive thoughts showed no significant differences.
As previously, Games-Howell post hoc test results were reported due to homogeneity of variance violations.

6.5.7 Death Anxiety

An ANOVA was run to compare mean scores, this showed no significant differences between the three groups (F(2,85) = 1.338, MSE=85.78, p=0.268).

6.5.8 Narcissistic Personality

An ANOVA was run to compare mean scores, this showed significant differences in Authority (F(2,92 = 3.36), MSE = 18.027, p=0.039, η_p^2 = 0.068). The score for low-EVPers was significantly lower than the score for non-EVPers (p=0.021).

6.5.9 Gender Differences

Independent samples t-tests were conducted to ascertain if there were any differences between males and females. No association was found between gender and EVPness when running a chi square test ($X^2(2)>=1.835$, $p=0.400$), so the analyses were reported. Significant results were as follows.

Oxford-Liverpool Inventory of Feelings and Experiences

Females scored significantly higher in the Unusual Experiences subscale (M=11.43, SD=6.10) than males (M=8.17, SD=5.53), $t(134)=3.27$, $p=0.001$.

IPO Reality Testing Subscale

Females scored significantly higher in the Reality Testing subscale of the Inventory of Personality Organisation (M=42.47, SD=10.87) than males (M=38.58, SD=10.47), $t(133)=2.13$, $p=0.035$.

Dissociation Proneness

There were no significant results.

Fantasy Proneness

Females showed higher fantasy proneness (M=9.49, SD=4.47) than males (M=7.12, SD=4.18), $t(129)=3.01$ $p=0.003$.

Narcissism

Males showed a higher Entitlement score (M=1.24, SD=1.13) than females (M=0.77, SD=0.88), $t(96)=2.28$, $p=0.025$. This fits in with previous studies looking at narcissism differences between sexes but shows no relevant results to the current study.

Hallucination

Females showed higher overall mean scores on the hallucination scale (M=44.24, SD=13.93) than males (M=36.22, SD=12.84), $t(129)=3.43$, $p=0.001$.

The hallucination results were broken down into the four factors described by Larøi, Marczewski and Van der Linden (2004).

Sleep related hallucination scores were significantly higher in females (M=3.05, SD=1.02) than males (M=2.43, SD=0.10), $t(135)=3.57$, $p=0.000$. Vivid daydream scores were also significantly higher in females (M=2.32, SD=1.29) than males (M=1.87, SD=1.02), $t(137)=2.27$, $p=0.025$.

Interaction Effects

As there were a number of scales wherein both high EVPers and Females displayed significantly higher mean scores, tests were run on split files to ascertain if there were any interaction effects related to gender.

There was a significant interaction between the effects of gender and EVPness on the OLIFE Unusual Experiences subscale with females in the low-EVP group displaying a greater number of unusual experiences than males ($p=0.034$), there were no significant results for males and females in the other EVP groups.

The main effect of gender on score in the Unusual Experiences subscale was not significant ($F(1,129) = 2.21$, $MSE = 69.80$, $p=0.14$) but the main effect of EVPness was significant ($F(2,129)=4.08$, $MSE= 129.05$, $p=0.019$). There was a significant interaction between EVPness and gender ($F(2,129)=3.47$, $p=0.034$, although the effect size was quite small $\eta_p^2 = 0.051$. For females, being in the low-EVP group significantly increased the score on the Unusual Experiences scale ($F(2,63)=4.00$, $p=0.023$, $\eta_p^2 = 0.113$, whereas it did not for males ($F(2.66)=3.04$, $p=0.06$).

When looking at hallucinations, there was a main effect of gender on the sleep related hallucinations score ($F(1,130)=10.96$, $MSE=10.15$, $p=0.001$, $\eta_p^2 = 0.078$) and also a main effect of EVPness ($F(2,130)=4.60$, $MSE=4.26$, $p=0.012$, $\eta_p^2 = 0.066$). There was a significant interaction between EVPness and gender ($F(2,130)$, $=3.93$, $MSE=3.64$, $p=0.022$, $\eta_p^2 = 0.057$). For males, being in the high-EVP group significantly increased the score on the Sleep Related hallucinations scale ($F(1,65)=11.03$, $MSE=8.44$, $p=0.000$), but this effect was not seen for females ($F(1,65)=0.015$, $MSE=0.016$, $p=0.985$).

There was a significant main effect of gender on the Exploitativeness subscale of the narcissism scale ($F(1,88)=4.44$, $MSE=5.65$, $p=0.038$, $\eta_p^2 = 0.038$), and also a significant main effect of EVPness ($F(2,88)=3.44$, $MSE=4.37$, $p=0.037$, $\eta_p^2 = 0.072$).

There was a significant interaction between EVPness and gender ($F(2,88)=6.49$, $MSE=8.26$, $p=0.002$, $\eta_p^2 = 0.128$). For males, being in the non-EVP group significantly increased the score on the Exploitativeness scale ($F(2,45)=9.97$, $MSE=14.89$, $p=0.000$) but this effect did not extend to females ($F(2,43)=0.966$, $MSE=1.007$, $p=0.389$).

6.6 Discussion

People who score highly on the Unusual Experiences (UE) factor of the schizotypy construct report anomalous experiences such as hallucinations. These people have been termed positive schizotypes, and as long as they are mentally healthy and show high levels of well-being (described as happy schizotypes), they tend to report unusual experiences, and also show higher levels of mental health and well-being than people displaying other schizotypy factors. Because of this it had been hypothesised that high EVPers would display high scores in the UE factor, and the participants in the current study did show this result. Both low- and high-EVPers showed significantly higher scores in the UE scale of the O-LIFE scale than non-EVPers, thus confirming the prediction that they would display positive schizotypy. However, there were no differences between low- and high-EVPers, which suggests that EVPness did not affect scores in the UE scale, and it was more likely to be a general belief in the paranormal that caused this result.

It was unexpected that the non-EVPers would show a significantly higher score in the Impulsive Nonconformity scale of the O-LIFE. Mason and Claridge (2006) describe how schizotypy can be reduced to three components which correspond to the three factors described as schizophrenic symptoms: positive schizotypy, cognitive disorganisation and negative schizotypy. They introduced a fourth factor into the O-LIFE scale, Impulsive Nonconformity, which they argue allows the O-LIFE to be useful in non-clinical populations to assess for risk of psychosis. This factor includes items which describe actions that are impulsive and antisocial (such as “Do you at times have the urge to do something harmful or shocking?”). There is debate about whether this factor can be thought of as a schizotypy factor, and it is commonly not used in studies, being regarded as being related to mental ill-health such as bipolar symptoms (Ödéhn & Goulding, 2018). Interestingly, Impulsive Nonconformity is more generally regarded as being associated with positive schizotypy in artists, and scores in both are generally lower in scientists, with scientists showing a narrow range of associations, an interest

in order and in routine (Nettle, 2006). It would be more likely that the non-EVPers would display lower Unusual Experiences and lower Impulsive Nonconformity. Perhaps it is simply because the assumption was originally made that non-EVPers would be sceptics, and more likely to be science-based, whereas in fact they just do not believe in the paranormal but have no strong feelings about it. This would allow for traits that are less likely to be shown in scientists to be displayed.

It was hypothesised that females would score more highly than males on the UE scale, and this proved to be true. This would also fit in with the finding from Study 1 that females score more highly on the Anomalous/Paranormal Belief scale, as paranormal belief has been shown to be correlated to positive schizotypy.

Deficits in reality testing have been described as both predicting paranormal belief and being present in hallucinators. This suggests that high EVPers would prove to be deficient in reality testing, which again proved true when analysing the results. Both high- and low-EVPers scored significantly higher than non-EVPers on the Reality Testing subscale of the IPO, showing that both groups of EVPers show a reality testing deficit when compared to non-EVPers. This is particularly relevant in the area of EVP, as suggestion is a factor often involved when interpreting sound clips, and it has previously been shown that hallucinators are more willing to believe stimuli are present – this has been interpreted as being due to a deficit in reality testing (Bentall & Slade, 1985). However, as both practicing and non-practicing EVPers both displayed the same results, it may again be that this finding is due to the paranormal belief shown by both groups, and not EVP specifically. Additionally, females are both more likely to report paranormal belief and they also displayed higher reality testing deficits, this would suggest that the results are more likely to be due to levels of general paranormal belief than due to levels of EVPness.

Dissociation has been described as being a factor in a number of apparently paranormal experiences, particularly precognition, apparitions, psychokinesis, volitional telepathy and clairvoyance. None of these experiences relate directly to EVP, apart from the fact that they can all be considered under the heading of paranormal phenomena. It was hypothesised that dissociation may have some relevance to EVP, particularly with Longden, Madill and Waterman (2012) describing the hearing of voices as a dissociative disorder. Additionally, it was hypothesised that the low-EVP group might show the highest dissociation, as high-EVPers might be using practical

experience of EVP as a way to manage any feelings of lack of control, which have been found to predict dissociative experiences. In the current study there were no significant differences between groups when looking at dissociation, this may simply mean that for EVP, dissociation does not play a part in the hallucinatory process like it does for some other paranormal experiences.

Fantasy proneness has been reported as being a main factor in participants who report hearing a song in a white noise clip, therefore it was expected that high EVPers would show higher levels of fantasy proneness than low/non EVPers. Both low- and high-EVPers showed higher levels of fantasy proneness than non-EVPers. As in the previous significant findings in the current study, it would appear that fantasy proneness is correlated to higher levels of paranormal belief, with fantasy proneness facilitating a belief in the paranormal, and that belief then providing the conditions required to create an experience (Irwin, 1990). This seems to be related to paranormal belief in general, rather than specifically a belief in, and experience of, EVP. This is also supported by the fact that females again showed a significantly higher level of fantasy proneness than males, which would correlate with the higher level of paranormal belief shown in females.

As the core experience of EVP involves the hearing of voices within noise, it was expected that high EVPers would demonstrate a high level of hallucination. For the Hallucination Scale as a whole, high-EVPers scored significantly higher than non-EVPers, which was the hypothesised result. When the scale was split into the four subscales previously described, high-EVPers scored significantly higher on the sleep related scale than non-EVPers, additionally females scored more highly than males. Sleep related hallucinations have been associated with individuals who report sleep problems, including insomnia and daytime sleepiness (Ohayon, Caulet & Guilleminault, 1996). They have also been reported to be associated with apparent anomalous experiences, with individuals assigning an anomalous source or content to the hallucination (Sherwood, 2002). If this is the case, it may be that high-EVPers are more likely to take note of any sleep related hallucinations, as they are interpreting them in an anomalous way, whereas low- and non-EVPers are not placing as much importance on them, and therefore not reporting them as often.

Auditory hallucinations also showed a significant result, although it had been hypothesised that high-EVPers would display the highest mean score, which they did,

it proved that both low- and high-EVPers displayed significantly higher levels of auditory hallucination than non-EVPers. Again, females displayed a significantly higher mean score than males. This would suggest that both low-and high-EVPers are more likely to experience auditory hallucinations, and therefore more likely to report EVP voices, but that there must be another factor that causes high-EVPers to actually go out and seek out these anomalous voices. Low-EVPers are just as likely as high-EVPers to report hearing voices, they just have not had the opportunity to put it into practice.

There were no significant results from the death anxiety scale, which supported the findings from previous studies. It had been hypothesised that maybe non-EVPers would have low death anxiety as they had no specific beliefs about life after death, and high-EVPers would have a low death anxiety as they regularly communicate with spirit and therefore feel they know what the afterlife will be like. Low-EVPers would display the highest death anxiety as they had no "proof" from the spirits about what an afterlife would be like. Certainly, a number of EVP researchers (for example Cardoso, 2017) report that their communication with EVP voices has given them a view of the afterlife that is compatible with what they would wish the afterlife to be like. Perhaps with the majority of EVP experiencers using EVP as a tool to contact spirits of the dead in haunted buildings, they are not obtaining these descriptions of life after death, and therefore are no more anxious about death than non-EVPers.

There was one significant difference between groups when looking at narcissistic personality – non-EVPers displayed a significantly higher level of Authority than low-EVPers. Study 1 showed no significant differences between groups in the Big 5 personality factors, so these were not repeated for Study 2. However, it is interesting to note that Openness to Experience has been associated with Paranormal Belief (Mikloušić, Mlačić and Milas [2012]), and also negatively associated with Authority. It would have been interesting to have had participants complete the Big 5 inventory to see if indeed paranormal belief was associated with Openness in this sample, and whether this matched the negative relationship with Authority. This effect was only seen for low-EVPers in the current study, high-EVPers did not significantly differ from non-EVPers which suggests there might be another factor involved, as if the negative relationship between Paranormal Belief and Authority, mediated by Openness held true for all paranormal believers, there should have been a corresponding significant result in the current study.

The only other significant result for the narcissistic personality scale was that males showed a significantly higher score for Entitlement than females. This has been demonstrated in previous studies, with females being less likely to display open feelings of entitlement, potentially due to social factors and stereotypical role expectancies (Tschanz, Morf & Turner, 1998). This has no relevance to the current study and would need to be explored as a separate study examining gender roles within the paranormal context.

The results overall show that the personality scales measured are not able to distinguish between low and high-EVPers, however they do distinguish between EVPers and non-EVPers, this is due to both the EVP groups displaying a higher level of paranormal belief and experience, rather than due to any intrinsic "EVP factor". As the hallucination scale showed some significant differences between groups, and it might be expected that EVPers would be more prone to hallucinations, a further study will be conducted to investigate these results using auditory listening tasks.

There may be a confounding factor in the study, in that in recent years the use of a number of EVP techniques has increased significantly, and therefore instead of hypothesised differences between participants who use EVP and general paranormal believers, this is now being masked with a significant number of paranormal believers now using EVP techniques on their ghost hunts. Instead of it being a technique that only a specialised subset of believers were aware of, it is now a more mainstream and recognised technique, and practitioners can no longer be considered as a specialised subgroup of paranormal believers when investigating more general personality variables. The two studies so far have shown that whilst it is possible to compare paranormal believers with non-paranormal believers when investigating personality factors that have previously been reported on by other researchers, none of the factors studied in the current thesis have shown that they are capable of distinguishing between low- and high-EVPers. This would suggest that there is some other factor that is separating the two groups and causing one group to actively seek out and report hearing anomalous voices. This factor (or factors, as there may be a number of them) would explain both why certain paranormal believers seek out these anomalous voices, and why they are misinterpreting the voices as paranormal. The number of factors that may impact on their decision to utilise EVP could vary from opportunity, to a desire to "prove" that the paranormal exists, to trying to establish if there is life after

death, and if there is then what it may consist of. There is scope in the future to carry out qualitative analyses of EVP practitioners to ascertain what drew them to the technique in the first place, and what makes them continue to use it. There was a limited amount of qualitative data gathered as part of Studies 1 and 2, however the subject would benefit from more in-depth investigation. As the main component of the EVP experience is hearing voices in noise, and interpreting these in a paranormal manner, the next study in the thesis will examine response to auditory signal detection tasks, to ascertain if high-EVPers display differences in hit rate, sensitivity and criterion when completing tasks to identify voices within noise. This may provide an answer as to why they are interpreting noise as paranormal voices, which may provide a signpost as to their motivation in reporting these voices.

7 Study 3 – The Effect of Paranormal Belief and Experience with Electronic Voice Phenomena on Response Bias in an Auditory Task

7.1 Abstract

A number of personality variables were shown in Study 2 to correlate with belief in and experience of the paranormal. It was also shown that it was possible to distinguish between participants on the basis their belief in and experience of Electronic Voice Phenomena when compared with non-believers. A number of personality variables have been previously shown to affect how participants respond in auditory listening tasks, so this study investigated if these variables correlated with EVPness and task instruction when participants were instructed to listen for speech within noise in a listening task. It proved difficult to recruit participants for the study, so the participants were split into low and high-EVPers, as there were no non-believers willing to take part. The results of studies 1 and 2 had shown that it was possible to distinguish between non- and low/high participants in a number of personality measures, however as there were no non-believers in the current study, there were no significant differences shown. There were no significant differences between low and high-EVPers when distinguishing between signal and noise on a signal detection task, however when the task was introduced as an EVP task rather than a non-paranormal task, participants showed a higher criterion value regardless of EVPness, so were less likely to report hearing a voice.

Whilst it did not prove possible to distinguish between participants using EVPness as a measure, it did prove possible to distinguish using gender. The group as a whole were paranormal believers, and results supported previous research that females showed a higher level of positive schizotypy and dissociative experiences than males. Females were less able to distinguish signal from noise, and also displayed a lower criterion, so were more likely to report hearing a signal within noise. The group most likely to report hearing voices in noise were females in the non-paranormal primed task, and the group least likely to report hearing voices in the noise were males in the EVP-primed task.

The results indicate that there are a number of contributory factors involved when individuals report EVP voices, however gender and task priming are the most significant.

7.2 Introduction

Study 2 (see section 6) investigated the differences between non-, low- and high-EVPers when looking at a number of personality measures. The results showed that whilst it was possible to differentiate between non-EVPers and low/high EVPers when examining Unusual Experiences, Impulsive Nonconformity, Reality Testing, Fantasy Proneness and Hallucination, it was not possible to distinguish between low- and high-EVPers. The exception to this was in hallucination proneness, where high-EVPers showed a significantly higher rate of hallucination proneness overall, and also a significantly higher rate of sleep-related hallucinations. It was hypothesised in Study 2 that there may be one, or many, factors that are causing high-EVPers to practice EVP techniques and also to report hearing voices in noise. As the factors already investigated have mainly failed to produce this distinguishing factor, it would be practical to investigate the hallucination proneness finding. As high-EVPers are misinterpreting noise and creating speech from the sounds within, they could be prone to both misperception of sounds and hallucinations.

There is some evidence that brain networks are disturbed when an individual experiences auditory verbal hallucinations – specifically the language, auditory and memory/limbic systems (Ćurčić-Blake *et al*, 2017). There is debate regarding the exact mechanisms of these disturbances, but connectivity between brain hemispheres has been observed to be increased in non-clinical patients, whereas in clinical patients connectivity initially increases, then subsequently decreases (Ćurčić-Blake *et al*, 2017). There is some similarity between the reports of auditory verbal hallucinations (AVHs) and reports of EVP voices, for example if hallucinating patients are asked to imagine a voice, they will not experience it as a hallucination, the voice has to appear out of control of the participant (Lavigne *et al*, 2015). This mimics reports of EVP, which are reported as being spontaneous - whilst the participants may ask for the voices to appear they do not try and create them. The phenomenon of hearing voices reported by EVP experiencers however have an extra component, of manifesting over a noisy background. It may be that EVP experiencers show two different mechanisms, a

propensity to hallucinate caused by non-clinical brain disturbances, overlaid with a tendency to misperceive random noise and interpret it as paranormal due to top-down processing.

As EVP involves the misperception of sounds and interpreting these sounds as voices, it may be that EVPers show differing responses to non-EVPers when ascertaining if speech is present within noise. To facilitate this, a listening task was used to investigate any differences between groups of participants.

There are a number of potential factors that may influence whether an individual is likely to report hearing EVP voices. It might be that personality differences might explain how some individuals report hearing anomalous voices, whereas others do not. A potential cause may be deficient mechanisms in perception, and this may be related to the mechanisms proposed for explaining more clinical reports of auditory verbal hallucinations. A number of previous studies, for example Bentall & Slade (1985) and Vercammen, de Haan and Aleman (2008) have shown that participants who are hallucinators are more likely to report a signal being present within noise during auditory tasks.

Daalman, Verkooijen, Derks, Aleman & Sommer (2011) describe how the mechanism behind auditory verbal hallucinations may be caused by an imbalance between the normal top-down and bottom-up processes that occur during perception. They describe how non-psychotic hallucinators make more top-down errors than healthy control participants. This difference was not shown in psychotic patients, leading them to suggest that clinical and non-clinical individuals may be displaying different cognitive mechanisms in their hallucinations. They describe a process of perception in which bottom-up information combines with top-down information which uses knowledge gained from previous situations and causes a perceptual expectation. Whilst previous studies have concentrated on sematic expectation (for example presenting participants with sentences with the final word masked [Daalman *et al,* 2011]), this model could still apply to ghosthunting EVPers, despite them commonly reporting single word or short, ungrammatical sentence responses. The EVPers enter an alleged haunted building with an expectation of what they might hear, based on previous experience and knowledge of the supposed haunting, and are therefore either consciously or unconsciously expecting certain responses (particularly as they are asking specific leading questions). Even the supposed serious researchers

do appear to show this bias of top-down processing – for example Cardoso (2010) describes asking one of the voices if they are speaking from a particular place. The voice apparently replied “Yes, as promised” in Portuguese, although Cardoso herself says that the voice used the word “prometiu” which she interprets as the Portuguese for “promised”, even though she admits that the correct word would be “prometido”, and “prometiu” is not a word in the Portuguese language. When investigating the evolution of hallucinations within a clinical population, Nayani and David (1996) describe how the hallucinations become more complex and more detailed over time, which also has the effect of reducing the distress suffered by the patient. Interestingly, EVPers report a newer technique that can be used, which they call Direct Radio Voice, which consists of the voices manifesting through a radio loudspeaker, enabling real time communications. (Cardoso, 2010). These direct voices enable longer, more complex and more detailed communications than are available using standard EVP techniques, so in some ways the evolution of the voice phenomenon mirrors the evolution of the clinical hallucination phenomenon.

The finding that top-down processing errors are responsible for auditory verbal hallucinations has been disputed by Alderson-Day et al (2017), who discovered that non clinical voice hearing participants can detect the presence of speech in samples of sine wave speech earlier than control participants, even though they have not been primed that the task will contain speech. This suggests that expectation is not as important a factor in discriminating speech, and points to the hallucinators showing a spontaneous ability to discern linguistic information. This differs slightly from the mechanism displayed in EVPers, whereby they discern linguistic information from noise that contains no specific speech signals, however due to the brain’s ability to perceive speech in less than optimal conditions (for example, Kashino, 2006), added to ambient sounds impinging on noisy EVP recordings (Plitchta, 2002), it may be that the noisy EVP recordings contain signals that mimic the degraded speech found in tasks such as sine wave listening tasks and EVPers would therefore be more likely to construct voices where there are none.

Alganami, Varese, Wagstaff and Bentall (2017) found that participants with high levels of hallucination proneness, who display impairments in source monitoring under normal conditions, may be persuaded into a full hallucination by cues and context. They describe how contextual factors could include how likely the individual is

to think that a perceptual event might occur, and this may continually change according to the conditions, and hence explain how they experience events. This may explain why high-EVPers frequently report hearing voices, particularly in a supposedly haunted building where their interpretation of a number of external factors may be influenced by not just the location they are in, but also the responses of the people around them. These factors could combine to create the conditions required to misinterpret random sounds as speech coming from an agent.

Hallucinating clinical patients have been shown to be very susceptible to auditory suggestions (Haddock, Slade & Bentall, 1995) which when combined with the suggestibility of paranormal believers when the suggestion is consistent with the existence of paranormal phenomena (Wiseman, Greening & Smith [2003]) could explain why EVPers are more likely to report hearing voices in noise. Warren (1968) describes how verbal transformations (illusory changes in interpretation of a word of phrase when played repeatedly to participants) show greatest distortions with simple stimuli – this may be a process that affects interpretation of EVPs, particularly as they tend to be short, and are played repeatedly to discern the meaning within them. Kondo and Kashino (2007) describe how noise present in daily life can affect how we hear signals, and they hypothesise that the brain needs to be able to create potential percepts from these ambiguous inputs and fluctuate between them in the manner described in the verbal transformation effect. This would make sense in the case of EVPers, particularly as the speech they report is produced under noisy conditions.

There is also a potential priming effect that may be present in EVPers, particularly those who have been using EVP techniques regularly. These EVPers report obtaining information that validates their previous beliefs (for example Cardoso, 2017), so it may be that they approach an EVP session with a predefined idea of what may be said on tape, and therefore are more likely to hear what they are expecting. Vercammen and Aleman (2010) reported that semantic expectations were important in the forming of verbal hallucinations. Gibson, Bergen and Piantadosi (2013) further report that speech perception rarely occurs in pure and non-noisy conditions, and listeners use the syntax of sentences to create meaning in noisy conditions. Very few EVPs are produced in ghosthunting scenarios that contain full sentences, or even more than a word or two, but even a small number of words can be enough to provide syntactic meaning – for example a sound that is interpreted as the word “get” is likely

to have a subsequent sound interpreted as the word “out” if the percipient is investigating a location that has had reports of an angry spirit that does not want visitors.

Conditioning may also be a factor in perception of EVP voices in regular experiencers. Kot and Serper (2002) found that hallucinating patients who were conditioned in an auditory task not only heard the experimental tone more often than hallucinating patients, but they were also more resistant to extinguishing the hallucinatory tone. They describe this as supporting the theory that some clinical hallucinating patients are susceptible to both acquiring and maintaining hallucinations through both classical and operant conditioning. Although these findings were reported in a clinical population, they may have relevance to EVPers, as once they have interpreted random noise as a voice, they will be more likely to interpret the noise recorded as containing voices. They may also obtain gratification from sharing these examples of EVP, particularly ghost hunters, who share their clips on social media and attract great attention for their supposed proof of the paranormal.

Study 2 showed that low and high-EVPers show a significantly increased reality testing deficit - Bentall and Slade (1985) describe how hallucinators show deficits in reality testing, which causes them to mistake internal events for external stimuli, which supports the theory that subvocalisation may be the cause of hallucinations. Subvocalisation is unlikely to be a factor in EVP reports, as participants are misinterpreting noises heard on the recordings, so there is something audibly present, however this does not rule out reality testing deficits as a possible factor in their misinterpretations.

In Study 2, both high and low-EVPers had displayed significantly higher scores on the Unusual Experiences subscale of the O-LIFE scale than non-EVPers, which suggested they were displaying positive schizotypy. Galdos *et al,* (2011) reported a positive association between positive schizotypy and speech illusion in non-clinical participants. However, Pries *et al* (2017) found that there was no association between positive schizotypy and speech illusion, which suggests that the picture is more complicated. It may simply be due to the fact that the previous studies were focussing on clinical symptoms of psychosis and schizotypy in the general population in a comparison with clinically psychotic patients, as opposed to investigating positive schizotypy related to paranormal belief in healthy individuals.

Moskowitz and Corstens (2008) suggest that auditory hallucinations can be conceptualised as dissociative experiences appearing in individuals predisposed to hear voices when placed under stress. Individuals exploring haunted houses may be considered to be under a form of stress, as typically the experience of looking for spirits in a haunted house can be considered as a stressful situation, even if an enjoyable one for some participants. They further suggest that the voices require some form of nurturing to make their meaning clear, again this has a parallel with EVP where practitioners state that practice is required to obtain the voices (Raudive, 1971). Varese, Udachina, Myin-Germeys, Oorschot and Bentall (2011) also support this finding, that stress can cause dissociation, and this predicts auditory hallucinations, and although this is reported in a clinical population they suggest that fluctuations in dissociative states due to a stress response may be common in both clinical and non-clinical individuals (although greatly magnified in a clinical population).

Despite suggestibility being a factor in causing a signal to be heard in noise, this is not the whole story, there are other factors present. One such is fantasy proneness – in Study 2 this showed as being higher in both low and high-EVPers than in non-EVPers. Merckelbach and van de Ven (2001) found that when participants were tested on the White Christmas task (whether they reported hearing the song White Christmas in white noise), participants who reported hearing the song most often also had higher scores on hallucination proneness and fantasy proneness. However, the contribution of fantasy proneness was greater than that of hallucination proneness – they interpret this as fantasy-prone individuals being more likely to endorse odd items. They do admit that fantasy proneness may drive a response bias which reflects impaired reality testing, or an overlap between fantasy proneness and schizotypal traits. As the picture is unclear, it was decided that the current study would not only compare results from listening tasks but would also ask participants to complete some of the questionnaire sets from Study 2.

The types of recording usually created with EVPs are generally noisy, from either the tape quality or from the environment (OpenLearn, 2018). Sounds present on the recordings may simulate fragments of human speech sounds. Due to a number of factors known to act on speech perception, such as phonemic restoration, movement of speech boundaries and linguistic category differences between languages (Kashino, 2006), ambiguous sounds are likely to be perceived as human speech, particularly if

the EVP experiencers are expecting and searching for it. Because of this, an auditory task was proposed to see if EVP experiencers would be more likely to report hearing voices in ambiguous sound clips.

Because in Study 2 the high and low-EVPers had shown that they had higher reality testing deficits, higher levels of fantasy proneness, higher levels of positive schizotypy, and high-EVPers displayed higher levels of hallucinations, it was hypothesised that high-EVPers would also be more likely to report hearing voices within white noise than non-EVPers.

Due to conditioning and suggestion, it was also hypothesised that high-EVPers who were told that the task might contain EVP voices would also be more likely to report hearing voices within white noise. Therefore, the group reporting the most voices within white noise clips were hypothesised to be high-EVPers who were told that the task would contain EVP voices.

Conversely, it was hypothesised that non-EVPers who were told the task would contain EVP voices would be least likely to report voices, as they would be unlikely to report hearing apparently paranormal voices.

Some gender effects had also been found in Study 2, with females scoring higher than males in the Unusual Experiences subscale of the Oxford-Liverpool Inventory of Feelings and Experiences, Reality Testing deficits, Fantasy Proneness and Hallucination, so it was hypothesised that females would be more likely to report hearing a voice in white noise than males.

7.3 Method and Materials

Study 3 was a between participant quantitative experiment utilising an auditory signal detection task. The task utilised *pink noise*†, and pink noise overlaid with speech files. Independent variables were the effect of either being informed that the task was investigating EVP or not; participant status (EVP believer vs. sceptic) and the effect of a signal being present within the presented sound clips or not. The dependent variable was the participant's response to the signal/noise trials. In addition, the participants were asked to complete a questionnaire set measuring schizotypy, reality testing, dissociation, fantasy proneness and hallucination proneness. They were also asked to

†*Underlined and italicised words are defined in the glossary (Appendix B)*

complete the Paranormal Investigation Experience Questionnaire that was used in Studies 1 and 2.

7.3.1 Paranormal Investigation Experience Questionnaire

Participants were asked to complete the Paranormal Investigation Experience Questionnaire (PIEQ) as detailed in section 5.3.1

7.3.2 The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE)

Participants were asked to complete the Unusual Experiences subscale of the O-LIFE (Mason & Claridge, 2006). This is the 30 item subscale which has been shown to be associated with positive schizotpy and shows higher responses in paranormal believers. Details can be seen in section 6.3.2. In the current study Cronbach's alpha was α=0.77.

7.3.3 Inventory of Personality Organisation Reality Testing Subscale (IPO-RT)

The full 20 item scale which measures impairment in reality testing was used (see section 6.3.3). In the current study Cronbach's alpha was α=0.81.

7.3.4 Dissociative Experience Scale II (DES)

The 28 item self-report measure was used, details can be found in section 6.3.4. In the current study Cronbach's alpha was α=0.95.

7.3.5 Creative Experiences Questionnaire

The 25 item self-report measure of fantasy proneness was used, details can be found in section 6.3.5. In the current study Cronbach's alpha was α=0.56.

7.3.6 Launay-Slade Hallucinations Scale

The four factor scale used in Study 2 was used, details can be found in section 6.3.6. In the current study Cronbach's alpha was α=0.81.

7.3.7 Demographics

A set of demographic questions was also included assessing participant's gender, age, ethnicity, occupational status and educational attainment.

7.3.8 Participants

Participants were recruited through paranormal groups and sceptic societies by attending conferences and via social media. Additionally, undergraduate students at the University of Northampton received a course credit for taking part. Participants were required to be over 18 years of age and have no known hearing problems. A total of 46 participants were recruited. Respondents (22 male and 24 female) ranged in age from 19 to 81 years, with a mean age of 32.45 years (SD = 14.33).

7.3.9 Auditory Task

Prior to the commencement of Study 3, the sound files that were going to be used were piloted on a test group of participants who did not take place in the main study. These participants were recruited from people known to the investigator and covered a range of ages. The volume in dB of the sound clips to be used in the study was manipulated until the majority of participants reported hearing the voices present within the clips 50% of the time, this was the just noticeable difference level. The clips to be used in the main study were then set at four different volumes, 3 being set a small amount above, at, and below the just noticeable difference level, and the fourth being set at a level that the participants in the pilot study could hear. This would ensure that any participants in the main study who could not distinguish the voice at the level that was loud enough to be heard by all pilot study participants could have their results discarded, as potentially having hearing problems. In an ideal world, hearing tests would be carried out on all participants prior to them taking part in the study, however the technology and skills required for this were outside the scope of the present study.

Participants in the main study were asked to complete an auditory signal detection task. They were asked to listen to short clips of noise, and to indicate whether they thought a voice was present in the noise or not. The clips consisted of either pink noise or pink noise with a male voice present – these clips had been previously generated for an auditory study (Moseley, 2015). The voice used for the

clips was a male voice, and the clips were sections of a reading from a technical text book, examples of the speech clips being “these two sizes”; “measured in kilowatts”. There were a total of 80 trials for each participant, 48 of the trials had a voice present and the remaining 32 trials were pink noise only. Each trial lasted 5 seconds. The voice was present at one of four different volumes, these volumes had been set as being a small amount above and below the just noticeable difference level (found by playing clips to a pilot set of participants and finding the level at which participants reported hearing the signal 50% of the time). The voice present and voice absent trials were randomly presented by the software used (E-Prime v2.0.10.356). Additionally, participants were assigned to an EVP group (wherein they were told that the task was an EVP task and may contain EVP voices) or a non-EVP group (wherein they were only told that the task was an auditory listening task) - participants were assigned by odd-numbered participants being selected as the EVP group and even-numbered participants being selected as the non-EVP group.
The trials were conducted on an HP Notebook laptop, running Windows 10, and using Technika HP-109 full size headphones.

Participants were presented with an information screen which informed them that in most of the trials, some speech would be present in the noise, but that it would not be easy to hear, and participants may not be certain that they have heard a voice. They were instructed to press 'P' on the laptop keyboard if they thought speech was present, and 'A' if they thought there was no speech (speech Absent). During each sound clip, a fixation cross was presented on the screen so that the participant was aware that the trial was taking place, and to ensure that they had the same focus for each trial. After each sound clip, participants were prompted again to press P or A. After 40 trials participants are invited to have a short break, then press any key to restart and complete the remaining 40 trials.

7.4 Procedure

Participants were given an information sheet to read, giving them brief information about the study and details of whom the study was being conducted by, following which they were asked to sign a consent form. They were then given an instruction sheet, either informing them that the task was an auditory task or informing them that it was an EVP task, and given the opportunity to ask any questions

they may have about how the trials were going to be conducted. They were then given the headphones to wear, ensuring they were worn the correct way with the left earphone on the left hand side, and the task was started on the computer.

At the end of the auditory task, participants were taken to a separate room where they were asked to fill in the questionnaire sheets. Once they had completed the questionnaires, they were given a debrief sheet and asked if they had any questions about the study. They were asked if they wished to be kept informed of the results of the study, they were then free to leave.

Ethical considerations were addressed as described in section 5.4.

7.5 Results

Respondents (22 male and 24 female) ranged in age from 19 to 81 years, with a mean age of 32.45 years (SD = 14.33).

7.5.1 PIEQ and Personality Measures

The participant N was quite small due to unforeseen difficulties in recruiting, and it had proven difficult to recruit participants who showed high levels of either scepticism or high belief, so the participants were divided into 2 groups rather than the three groups used in the first two studies. The groups were split by participants who had responded to the second part of the PIEQ (regarding actual experience of EVP) being assigned as high-EVPers, and the rest of the participants being assigned as low-EVPers (as they displayed belief in EVP but had no actual experience of it – this matched the method of splitting participants in the first two studies). These groups were designated as low-EVP (N=32) and high-EVP (N=12).

One participant was excluded for not completing the appropriate questions in the PIEQ, so their EVPness could not be calculated.

One-way ANOVAs were run to ascertain any significant differences between the 2 EVP groups and mean scores in the personality measures tested.

There were no significant differences in mean scores in any of the measures, but this was not unexpected, as the differences shown in the previous two studies had been between non- and low/high, rather than between low- and high-EVPers, plus there were no particularly high EVPers found in the study.

O-LIFE Unusual Experiences Scale $t(42)=0.377$, $p=0.71$

IPO Reality Testing Subscale $t(42)=0.459$, $p=0.65$

Dissociative Experiences $t(42)=1.18$, $p=0.25$

Fantasy Proneness $t(42)=0.54$, $p=0.59$

Hallucination Scale (overall) $t(42)=0.14$, $p=0.89$

Sleep Related $t(42)=1.43$, $p=0.16$

Vivid Daydreams $t(42)=0.51$, $p=0.61$

Intrusive Thoughts $t(42)=1.65$, $p=0.11$

Auditory Hallucinations $t(42)=0.04$, $p=0.97$

Table 2:Mean Individual Difference Ratings across low-EVPer vs high-EVPer Group Type

Belief Subscale	Low-EVPer		High EVPer		
	M	(SD)	M	(SD)	Low vs high EVP
OLIFE Scale					
Unusual Experiences	9.69	(5.08)	9.08	(3.58)	ns
IPO Reality Testing subscale	41.47	(10.07)	39.92	(9.72)	ns
Dissociative Experiences	18.38	(14.95)	12.76	(11.34)	ns
Fantasy Proneness	9.13	(4.48)	9.92	(3.82)	ns
Hallucination Scale	37.47	(11.27)	38.00	(10.71)	ns
Sleep Related	2.38	(0.89)	2.80	(0.78)	ns
Vivid Daydreams	2.09	(0.99)	1.92	(1.09)	ns
Intrusive Thoughts	2.62	(1.10)	2.03	(0.93)	ns
Auditory Hallucinations	1.82	(0.71)	1.83	(0.99)	ns

7.5.2 Sound File Analysis

The results of the auditory task were analysed using signal detection theory (SDT). For each participant, the following scores were calculated:

- Number of hits p(H) (responding that there was a signal when a signal was present)
- Number of false alarms p(FA)responding that there was a signal when no signal was present)

The number of misses and correct rejections can be inferred from these figures but are not used in SDT calculations.

The p(H) and p(FA) values were calculated using the formulae p(H) = ((number of hits)/(number of hits + number of misses)) and p(FA) = ((number of false alarms)/(number of false alarms + number of correct rejections) (Tashchian, White & Sukgoo, 1988).

The participants were split into the two groups as described above – low-EVPers and high EVPers. The mean hit rate and false alarm rate for each group was then calculated.

Two participants who had not completed the four required questions in the PIEQ were excluded from the calculations.

To identify whether differences in hit rates were due to differences in detection or differences in bias, criterion (c) and sensitivity (d') were calculated.

The d' value was calculated using the Microsoft Excel formula

d' = NORMSINV(p(H)) – NORMSINV(p(FA)) (Stanislaw & Todorov, 1999).

There were some participants who made no false alarms, giving a p(FA) result of zero. This cannot be used to calculate d', as this would give a negative infinite number. To address this, the solution described by Stanislaw and Todorov (1999) was used, whereby the zero probability value was replaced by 0.5/n (where n is the number of trials in the signal absent condition).

The response bias was calculated using the Microsoft Excel formula c = -(NORMSINV(p(H)) + NORMSINV(p(FA))/2 (Stanislaw & Todorov, 1999). C was used as the criterion measure as this measure makes the assumption that participants will give a "present" response if the decision variable exceeds the criterion, and is directly related to the decision variable.

Table 3: Mean hit rate, D' and criterion scores between EVP Groups

	N	Hit rate	d'	c
Low EVP	31	0.84 (0.12)	2.71 (0.58)	0.26 (0.36)
High EVP	12	0.88 (0.07)	2.92 (0.61)	0.22 (0.29)

Independent T-tests were run to ascertain if there was a significant difference in the mean hit rate scores between the two EVP groups. No significant differences were found $t(41)=1.21$, $p=0.232$.

An independent T-test was carried out to establish if there was any significant difference in the d'mean values between the two groups. The sensitivity measure (d') uses the signal mean value and the noise mean value, and calculates the distance between these two means in standard deviation units. The higher the value of d', the greater the ability of the participant to distinguish between signal and noise. If the value of d' is zero, the participant cannot distinguish between signal and noise (Stanislaw & Todorov, 1999). None of the participants displayed the inability to distinguish between signal and noise, and there was no significant difference between the groups, indicating that all groups displayed a similar sensitivity $t(41)=1.06$, $p=0.296$.

An independent t-test showed no significant difference in the criterion level between the two EVP groups, showing that there was no difference in how the two groups were responding that they had heard a voice $t(41)=0.289$, $p=0.774$.
Further analysis was carried out to establish if the effect of being told the task was an EVP task affected the responses of the participants.

Table 4: Mean hit rate, D' and criterion scores for EVP vs non-EVP task condition

	N	Hit rate	d'	c
EVP task	23	0.83 (0.11)	2.87 (0.47)	0.36 (0.32)
Non-EVP task	22	0.87 (0.09)	2.59 (0.70)	0.097 (0.33)

An independent T test showed that the mean criterion score was significantly different between the two groups. The participants told the task was an EVP task (M=0.36, SD=0.32) showed a significantly higher mean than the participants not told the task was an EVP task (M=0.097, SD=0.33), $t(43)=2.73$, $p=0.009$. With the non-EVP task participants displaying a lower mean c value, this indicates that they were more likely to respond that they heard a voice in the sound clips than the participants in the EVP condition.

As expected from the above results, with there being no effect of EVPness on participant's responses, there was no interaction apparent between EVPness and whether the participants were told that the task was an EVP one or not for hit rate ($F(1, 40)=0.002$, $MSE=0.00$, $p=0.964$); d' ($F(1, 40)=1.46$, $MSE=0.499$, $p=0.235$) or criterion ($F(1, 40)=0.294$, $MSE=0.031$, $p=0.590$).

7.5.3 Gender Differences

Table 5: Mean Individual Difference Ratings between males and females

Belief Subscale	Male		Female		
	M	(SD)	M	(SD)	Significance
OLIFE Scale					
Unusual Experiences	7.76	(4.16)	11.13	(4.63)	**
IPO Reality Testing subscale	38.67	(8.48)	43.22	(10.74)	
Dissociative Experiences	11.17	(8.25)	22.03	(16.47)	*
Fantasy Proneness	8.10	(4.52)	10.48	(3.80)	
Hallucination Scale	35.86	(10.44)	39.22	(11.48)	
Sleep Related	2.42	(0.90)	2.57	(0.85)	
Vivid Daydreams	1.97	(0.86)	2.12	(1.15)	
Intrusive Thoughts	2.17	(0.93)	2.73	(1.16)	α
Auditory Hallucinations	1.83	(0.74)	1.83	(0.83)	

Significant group effect at the * p<.05 ** p<.01 *** p<.001 levels α=approaches significance

Independent t tests showed that there were significant differences in some of the individual difference measures between males and females. The Unusual Experiences subscale of the OLIFE measure showed a significantly higher mean score for females than for males, $t(42)=2.53$, $p=0.02$. Females also displayed a higher mean score in the dissociative experiences scale than males, $t(42)=2.72$, $p=0.009$.

Non-significant results were:

Reality Testing $t(42)=1.55$, $p=0.13$

Fantasy Proneness $t(42)=1.90$, $p=0.06$

Hallucination scale (overall) $t(42)=1.01$, $p=0.32$

Sleep Related $t(42)=0.598$, $p=0.55$

Vivid Daydreams $t(42)=0.48$, $p=0.63$

Intrusive Thoughts $t(42)=1.71$, $p=0.09$

Auditory Hallucinations $t(42)=0.003$, $p=0.998$

Table 6: Mean hit rate, D' and criterion scores for males vs females

	N	Hit rate	D’	c
Males	21	0.83 (0.11)	2.93 (0.49)	0.40 (0.23)
Females	24	0.87 (0.09)	2.55 (0.64)	0.09 (0.37)

Independent t tests showed that there was no significant difference in the hit rate scores between males and females. However, there was a significance in both the d’ and criterion values between the two groups, with the mean d’ prime values for females being significantly lower than for males [$t(43)=2.21$, $p=0.032$) and the criterion values for females also being significantly lower than the mean criterion value for males [$t(43)=3.27$, $p=0.002$]. This indicated that females were significantly less able to distinguish signal from noise and were also more likely to respond that they had heard a voice in the sound clips than males.

However, females were no more likely to be high-EVPers than males. The mean scores for the PIEQ measure for females was M=1.26, SD=0.45 (N=23) and for males M=1.23, SD=0.53 (N=22).

A Univariate Analysis of Variance was undertaken to investigate if there was any interaction effect between gender and EVP task condition on both d’ ($F(1,41)=1.603$, $MSE=0.504$, $p=0.213$) and criterion ($F(1,41)=1.27$, $MSE=0.106$, $p=0.266$) mean scores. This showed that there were no significant interactions.

These results show that the group most likely to report hearing voices in the sound clips were females in the non-EVP group, and the group least likely to report hearing voices were males in the EVP condition group. Overall, males were less likely to report hearing voices in the clips than females, and participants in the EVP group were less likely to report hearing voices than the participants in the non-EVP condition group. There was no effect of EVPness on participant’s responses to the sound clips.

Being told the task was an EVP task caused participants to show a stricter criterion when assessing the sound clips. They were significantly less likely to report hearing a voice when they were told the clip may contain EVP voices. Regardless of EVP status, participants are significantly more likely to show a more sceptical bias when the possibility of EVP is introduced.

7.6 Discussion

Study 2 had shown that it was possible to distinguish both low- and high-EVPers from non-EVPers in a number of personality measures, however it was not possible to distinguish low-EVPers from high-EVPers in most of the personality measures tested. It had however been possible to distinguish between high and non-EVPers when measuring hallucination proneness, particularly sleep-related hallucinations. As Study 3 had only managed to recruit low- and high-EVPers, and not non-EVPers, it was not expected that there would be individual differences displayed between participants, apart from potentially in hallucinations. Study 3 found no differences between low- and high-EVPers in any of the personality measures used, which was as expected, however there were no differences in hallucination proneness between the two groups either, which was not expected.

There have been a number of previous studies which suggest that there are a variety of factors that may cause hallucinators to report hearing voices, particularly in a noisy environment. Daalman et al (2011) report that bottom up information combines with top down information, utilising previous knowledge from similar situations which causes a perceptual expectation leading to the content of the hallucination. Alderson-Day et al (2017) however report that priming, and therefore top-down processing, does not have an effect on detecting speech. The conditions under which EVPs are generally reported (for example in a supposedly haunted building) would lend themselves to causing both bottom-up and top-down errors, as the conditions are noisy, and the participants are expecting to hear something on the recording. There may be a component of hallucination proneness present, however this may be present in both low- and high-EVPers, and it may just be that low-EVPers have not had the opportunity to try out EVP techniques. It was not possible to test for this effect in the current study, due to the lack of non-EVPers taking part.

Hallucinating patients have been reported to be very susceptible to auditory suggestions (Haddock, Slade & Bentall, 1995), so it might be expected that task condition (being told that the task is an EVP task) might have an effect on the results. Paranormal believers have been shown to be suggestible when the suggestion is consistent with the existence of paranormal phenomena (Wiseman, Greening & Smith, 2003). One of the task conditions present in Study 3 was the suggestion that the task was an EVP task and might contain spirit voices. It had been expected that this would

have an effect on participants, potentially that high-EVPers might be more likely to report hearing voices if they believed that the task might contain EVP voices. A significant result was found in the study when looking at task condition – the group who were told that the task was a simple auditory task were more likely to respond that they had heard a voice than the group who were told the task was an EVP task. The original hypothesis, that high EVPers were more likely to report voices, particularly if they were told that the task was an EVP one, proved not to be true – not only were high-EVPers no more likely to report hearing a voice, but all groups were less likely to report hearing a voice when they were told that the task was an EVP one. This would suggest that the model of believers having more belief (and therefore reporting more voices) in a paranormal task is incorrect, and actually all participants raise their criterion value when the possibility of a paranormal cause is introduced. This may be because the high-EVP participants believe that there is more at stake when the possibility of the paranormal is introduced, and they do not want to make mistakes and show that they are confabulating voices, so they raise their criterion value. The same could apply to the low-EVPers – they have less experience in EVP, but again do not want to appear to endorse a paranormal explanation to a phenomenon. The paranormal believer participants in the study were drawn from a number of paranormal groups, who generally show an open-minded approach to investigating the paranormal, and it may be that if the study was repeated and the ghost hunting participants were widened to include a wider range of individuals (for example, people who do not belong to an organised group but attend paid for ghost hunts, and individuals who endorse techniques reported by paranormal televisions shows) and also sceptics participated, the results may prove to be different. The hypothesis that the group with the lowest criterion would be non-EVPers who were told that the task was an EVP could not be demonstrated as there were no non-EVPers in the study, however this result was shown in the low-EVPers – again if the participants had included sceptics this result might have been even more marked.

There were some differences shown in the personality measures when looking at gender – females showed higher scores in the Unusual Experiences subscale of the O-LIFE, suggesting that they might display higher levels of positive schizotypy, and they also showed a higher level of dissociative experiences. This was not unexpected, as previous research has shown that females score more highly in magical thinking and

odd beliefs in schizotypy scales (Bora & Arabaci, 2009), and they have also been shown to report more dissociative experiences (Wolfradt, 1997). It was hypothesised that females would report hearing a voice more than males. The results showed that females were overall less likely to be able to distinguish a signal from noise. The reason for this may be due to the level of background noise present in the clips. Males have been shown to be able to tolerate a higher intensity of background noise level than females whilst still being able to interpret a signal (Rogers, Harkrider, Burchfield & Nabelek, 2003), so they are more likely to be able to hear voices within noisy clips. In contrast, females displayed a lower criterion, meaning that they were more likely to reply that they had heard a voice within the noise. This contradicts previous research by Barkus, Smallman, Royle, Barkus, Lewis and Rushe (2011) which whilst showing that participants displaying higher scores on the Unusual Experiences subscale were more likely to report hearing a voice, also reported that females were more conservative in their response than males, which is opposite to the findings reported in the current study where females were less conservative than males. The results in the current study would appear to make sense, as higher scores on the Unusual Experiences subscale predict a less conservative criterion which corresponds to being more likely to report hearing a voice (Barkus et al, 2011), and females display higher scores on the Unusual Experiences subscale, so it would appear likely that females would display a less conservative criterion.

The results showed that the group most likely to report hearing voices in the noise were females in the non-EVP task group, and the group least likely to report hearing voices in the noise were males in the EVP task group. Females were no more likely than males to be high-EVPers, which again reinforces the finding that EVPness did not have an effect on tendency to report voices within the noise. This would suggest that the factors underlying whether an individual reports EVP or not are more likely to be related to gender and suggestion rather than any innate personality factors.

The greatest drawback with the study proved to be the difficulty in recruitment. Neither high nor non-EVPers appeared willing to take part, with sceptics proving particularly difficult to engage. Despite numerous attempts to engage the sceptic population via both online and in-person discussion, none were willing to take part in the study. This may have just been a consequence of the sceptics approached,

or it may point to a deeper reason why sceptics are unwilling to take part in research concerning the paranormal. It may be that they do not see the point (one personal communication wondered about the validity of researching a phenomenon that "does not exist"). Or it may be that the sceptics are unwilling to take part in studies such as this, as it might produce results that do not correspond with their world view – Lamont, Coelho and McKinlay (2009) describe how sceptics can offer an explanation for apparent paranormal events without actually explaining anything, and perhaps being in a position where the researcher could be thought of being an authority figure might mean the sceptic is worried that they might be "uncovered" as not having the knowledge to explicitly explain away the phenomenon.

The lack of diversity of belief of participants would also explain the lack of significant results when looking at the personality measures – in the previous studies, the differences found were between non- and low/high EVPers – with the current study only having low and high-EVPers, there were no differences found. This would also explain the lack of differences found when looking at the sound clip results – both low and high-EVPers showed the same sensitivity and criterion when responding if they could discern a voice in the noise.

The sound clips used in the study were ones that had been used in previous research (Moseley, 2015), and they consisted of clips of a male voice reading text from a technical manual. As the clips were all of the same voice, there is a possibility that participants became accustomed to the sound and pitch of the voice during the trials, and therefore the task became easier as it progressed. It might be beneficial in future research to use a variety of clips containing both male and female voices, and at different pitches, as this might more closely replicate the experience of hearing an EVP.

To assess if the results found in the current study are replicable, the study needs repeating with both more and more varied participants (to include sceptics and high believers). Study 2 showed that there were significant differences in hallucination proneness between non-and high EVPers, so Study 4 was proposed to repeat the tests in Study 3, but also to investigate the effect of hallucination-proneness on participants' responses to voices in noise. Additionally, it has been shown that individuals with schizotypal personality traits, particularly if they are prone to auditory hallucinations, might have a non-lateralisation of the brain in regard to speech processing (Asai,

Sugimori & Tanno, 2009). To investigate this further, study 4 was designed to investigate hallucination proneness and handedness, in combination with directionality of the signal in noise.

8 Study 4 – The Effect of Paranormal belief, Handedness and Experience with Electronic Voice Phenomena on Response Bias in an Auditory Task

8.1 Abstract

A number of personality variables were shown in previous studies to correlate with beliefs and experiences of the paranormal, and by extension their expression in a population of EVP believers and sceptics. The current study was designed to investigate the influence of some of these personality variables when combined with participant's handedness and task condition, on responses on an auditory listening task utilising voices within noise. It proved difficult to recruit participants with beliefs at either end of the scale (non-EVPers and high-EVPers), and subsequently this was demonstrated in the lack of differences between groups when analysing the personality variables.

High hallucinators were more likely to say they had heard a voice than the low hallucinators, and they also displayed a lower criterion value, indicating that they were more likely than low hallucinators to report hearing a voice despite showing the same task sensitivity. When breaking the hallucination scale down into subscales, it was found that high auditory hallucinators displayed a higher hit rate than low auditory hallucinators, but with no corresponding lowering of their criterion. In contrast, the Intrusive Thoughts subscale did show that participants high in this factor both displayed a higher hit rate and had a lowered criterion value when compared to participants low on this scale, therefore Intrusive Thoughts appeared to have more of an effect on the decision making process when deciding if a voice was present or not than did auditory hallucination.

There were no differences between strong and weak right handers when looking at the overall results of the auditory task, however there were some differences when the results were looked at in detail. Participants who were high hallucinators were more likely to report non-directional voices, which could be as a result of a reduction in language centre laterality. This finding was also discovered for the auditory hallucinations subscale.

Participants with a weak right hand preference were more likely to report hearing a voice in their left ear, and less likely to respond that they heard a voice in their right ear. Strong right handers were more likely to miss directional voices (from either left or right).

The brain laterality of the participants could only be implied from extrapolating from previous research regarding schizotypy, hallucination proneness and handedness.

8.2 Introduction

Results from the three previous studies had shown varying results – Study 2 showed that it was possible to distinguish between non- and low/high EVPers in a number of personality variables – the Unusual Experiences subscale of the Oxford-Liverpool Inventory of Feelings and Experiences, Reality Testing, Fantasy Proneness, and Hallucination proneness. It was not possible to distinguish between low and high-EVPers on these measures. These results were not replicated in Study 3, however it had proved difficult to recruit non-EVPers to study 3, so it was not unexpected that Study 3 showed no significant differences between low and high-EVPers. It was decided that it would be worth asking participants in Study 4 to complete the personality measures, as a number of these measures have been found to relate to hallucination proneness.

Study 3 found that task condition had a significant effect on the response of participants in an auditory listening task – participants who were told that the task was a simple auditory task were more likely to report hearing a voice in noise than participants who were told the task contained Electronic Voice Phenomena. Females in the non-EVP task were the most likely to report hearing voices, and males in the EVP task were least likely to report hearing voices.

Handedness has been shown to affect language processing, Prete, D'Anselmo, Brancucci and Tommasi (2018) report that around 90% of right handers display a left brain hemisphere dominance in speech, and only 70% of left handers display this dominance. Additionally, they report that the percentage of right brain hemisphere language lateralisation is higher in left handers than right handers (compared to the more usual left hemisphere language lateralisation). In addition to this handedness related difference, this same atypical pattern is also displayed in schizophrenics with

clinical patients displaying both non-right-handedness and right hemisphere language lateralisation (Ocklenburg, Güntürkün, Higdahl & Hirnstein, 2015).

Ocklenburg *et al*,(2013) report that reduced language lateralisation can be a trait marker for auditory hallucinations in a clinical schizophrenic population, but they suggest that this might not be the case for healthy participants. However, it should be noted that previous research has shown that hallucinations can be correlated with positive, healthy schizotypy (Fisher, Mohanty, Herrington, Koven, Miller & Heller, 2004), so it is reasonable to assume that this reduced lateralisation might be present in a healthy population of paranormal believers and EVP practitioners.

Ocklenburgh *et al*, (2013) report that if auditory hallucinations are due to internal misrepresentations of speech generated by the left temporal lobe, then hallucinating patients should struggle to identify external speech when presented to the right ear, as this speech would be processed by the left hemisphere, leading to a decrease in lateralisation.

Prete *et al*, (2018) found that right ear responses are more common both when a voice was present and when a voice was absent. They also found this result when asking participants to imagine hearing a voice, with the imaginary voice being reported in the right ear more frequently than in the left ear. However, in the task they describe, participants were informed that every trial would contain a voice, rather than suggesting that a voice may or may not be present, so this may be utilising a slightly different perceptual mechanism than that used when participants are unsure if a voice is present or not. They suggest a structural reason for this, in that auditory input to the right ear reaches the left linguistic hemisphere directly, and this drives an attentional bias to the right ear. They also report no correlation between apparent asymmetry and scores in the Unusual Experiences subscale of the O-LIFE, a finding also reported by Pries *et al*, (2017). In contrast however Randell, Goyal, Saunders and Reed (2010) report that high scorers on the Unusual Experiences subscale report more words that were not actually present, as well as reporting more abstract words – they suggest that their methodology could be used for future studies as hallucinations are more likely in the presence of ambiguous environmental stimuli similar to the white noise they were using, which would also mimic the model seen in EVP where a combination of environmental stimuli and white noise combine to produce the illusion of voices.

In addition to left and right handedness, there is a population of mixed-handers, who do not show a total preference for one hand for tasks. These have been shown to display higher schizotypy scores, as well as less brain lateralisation (Annet & Moran, 2006).

It has been reported that in vowel processing tasks, females display greater left brain than right brain hemisphere activity, a finding which was not shown in males (Obleser, Eulitz, Lahiri & Elbert, 2001). This suggests that males have less brain lateralisation than females. Brain differences between males and females have however also been disputed, for example Kaiser, Haller, Schmitz and Nitsch (2009) report that, rather than an implicit gender difference, differences found in brain imaging are more likely to be due to neuronal plasticity due to life experiences and gender roles, rather than an effect simply of biological sex.

High hallucinators have been reported to be more likely to respond that a signal is present in a signal/noise task when there is no signal present (Bentall & Slade, 1985) – they suggest that this is due to deficient reality testing. In contrast, Mintz and Alpert (1972) reported the same results but concluded that both vivid auditory imagery and a reality testing impairment were the cause of auditory hallucinations, however this was in a clinical sample of participants so cannot necessarily be extrapolated to the non-clinical population.

Individuals displaying high levels of positive schizotypy are more likely to report hallucinatory experiences than normal controls (see section 6.2), and in Study 2 both low and high-EVPers displayed higher levels of positive schizotypy than non-EVPers, so it is likely that participants in auditory tasks who display this higher schizotypy would also be more prone to hallucinations. Barkus, Stirling, Hopkins, McKie and Lewis (2007) used a signal detection task to investigate hallucination-like experiences in a non-clinical population, they report that participants showing higher schizotypy reported more false perceptions of hearing a voice, and that this was due to their decisional bias. They also report that a small number of the high schizotypy participants recorded a large number of the false alarms, which they suggest indicates that there is another factor present influencing the results, however they could not determine what that factor might be. As it is possible to distinguish between non- and low/high-EVP participants by their level of schizotypy, it was hypothesised that high schizotypy

participants would report a higher number of false alarms when taking part in an auditory listening task.

Reality testing has been found to be deficient in hallucinators (Bentall & Slade, 1985). Interestingly, Slade (1976) reports finding that the failure in reality testing is displayed in a listening task as participants reporting improbable words and phrases – he describes that the hallucinating participants are hearing and reporting more unrelated words because they are not testing their initial perceptions accurately. This could be a reason why EVPers are reporting words that do not appear to be there – they have a failure of reality testing which means that they are not examining if their perception is real or not, they are simply confabulating a word or phrase that also fits with their previous beliefs. Randell, Goyal, Saunders and Reed (2011) also describe that participants who score highly on the Unusual Experience scale of the O-LIFE are more likely to report out-of-context false reports, so a combination of reduced reality testing and high schizotypy would cause individuals to create more abstract and unusual verbal hallucinations. Barkus, Stirling, Hopkins, McKie and Lewis (2007) report a reaction time effect in a study designed to investigate verbal hallucinations – they found that high hallucinators increased their reaction times as the study progressed. They interpret this as high hallucinators being prone to an over-readiness to make a judgement about ambiguous information, a model which has been used to describe how an unusual perceptual experience might progress to an auditory hallucination. This would also fit in with EVPers using their prior belief and expectation to make a judgement about an ambiguous sound, and thereby create the illusion of hearing a voice.

There is evidence that there is a link between dissociation and hallucination proneness, for example Perona-Garcelán *et al,* (2008) found that participants with hallucinations displayed the highest dissociation score, although this was in a clinical population. Dissociation has also been found to mediate the relationship between inner speech and auditory hallucinations, and it has been suggested that dissociative experiences may predispose individuals to develop auditory hallucinations (Alderson-Day, McCarthy-Jones, Bedford, Collins, Dunne, Rooke & Fernyhough [2014]). It is unlikely that dissociation plays a role in EVP experiences, as participants do not report any dissociative feelings when listening to recordings, in fact they tend to place great emphasis on concentrating on the recordings, however as it is a factor that is related

to auditory hallucinations it is worth investigating if it has an effect in the EVP population. It has also been suggested that both paranormal beliefs and dissociation are the consequences of fantasy proneness, used as a means to cope with the uncontrollability of life (Wolfradt, 1997).

As fantasy proneness has been implicated in paranormal beliefs, it was therefore also decided to ask participants to complete the same measure of fantasy proneness as in studies 2 and 3. Additionally, Merckelbach & van de Ven (2001) showed that whilst both predisposition to hallucinations and fantasy proneness were more prone to hallucination, fantasy proneness was the more important contributor to the effect. Indeed, they also hypothesise that a proportion of the population over-endorse bizarre items, which would fit in with people creating voices within EVP.

As a result of the previous studies and previous research, it was hypothesised that:

- non-right-handers would report a higher number of false alarms when taking part in an auditory listening task.
- EVPers would display higher levels of Unusual Experiences, Reality Testing deficits, Dissociative Experiences, Fantasy Proneness and Hallucinations than non-EVPers
- Females would display higher levels of Unusual Experiences, Reality Testing deficits, Fantasy Proneness and Hallucination
- Females would be more likely to report hearing a voice in noise than males
- Right handers would be more likely to report hearing a voice in their right ear
- Non-right handers would be less likely to report hearing a voice in their right ear
- High hallucinators would be more likely to report hearing a voice
- High hallucinators would be less likely to report hearing a voice in their right ear

To investigate this, a study was devised that would ask participants to discern not only whether they could hear a voice within noise, but also that if they did hear a voice they were asked to report which direction the voice was coming from. The sound clips with a voice present were manipulated so that the voice would be presented to either the left ear, the right ear, or from the centre. This would allow analysis to discern if

there were any differences between participants both when reporting direction of voice signals, and also reported direction of a voice when there were none present.

8.3 Method and Materials

Study 4 was a between participant quantitative experiment utilising an auditory signal detection task. The task utilised *pink noise*†, and pink noise overlaid with speech files. Independent variables were the effect of either being informed that the task was investigating EVP or not; participant status (EVP believer vs sceptic); the effect of a signal being present within the presented sound clips or not, and the direction the signal came from (in the signal condition). The dependent variable was the participant's response to the signal/noise trials. In addition, the participants were asked to complete a questionnaire set measuring schizotypy, reality testing, dissociation, fantasy proneness and hallucination proneness. They were also asked to complete the Paranormal Investigation Experience Questionnaire that was used in all 3 previous studies, and a measure of handedness.

8.3.1 Paranormal Investigation Experience Questionnaire (PIEQ)

Participants were asked to complete the Paranormal Investigation Experience Questionnaire (PIEQ) as detailed in section 5.3.1

8.3.2 The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE)

Participants were asked to complete the Unusual Experiences subscale of the O-LIFE (Mason & Claridge, 2006). This is the 30 item subscale which has been shown to be associated with positive schizotpy, and shows higher responses in paranormal believers. Details can be seen in section 6.3.2. Cronbach's alpha for the current study was α=0.84.

8.3.3 Inventory of Personality Organisation Reality Testing Subscale (IPO-RT)

The full 20 item scale which measures impairment in reality testing was used (see section 6.3.3). Cronbach's alpha for the current study was α=0.87.

†*Underlined and italicised words are defined in the glossary (Appendix B)*

8.3.4 Dissociative Experiences Scale II (DES)

The 28 item self-report measure was used, details can be found in section 6.3.4. Cronbach's alpha for the current study was α=0.94.

8.3.5 Creative Experiences Questionnaire

The 25 item self-report measure of fantasy proneness was used, details can be found in section 6.3.5. Cronbach's alpha for the current study was α=0.76.

8.3.6 Launay-Slade Hallucinations Scale

The four factor scale used in study 2 was used, details can be found in section 6.3.6. Cronbach's alpha for the current study was α=0.88.

8.3.7 Handedness

The Annett Hand Preference Questionnaire was used as a measure of handedness (Annett, 2004). The questionnaire consists of 12 questions asking participants which hand they habitually use for a number of activities, for example "To write a letter legibly", "To throw a ball to hit a target". Participants were also asked whether they were single born, or one of twins or triplets. There were two free-text questions: "If you use the right hand for all of these actions, are there any one-handed actions for which you use the left hand", and "If you use the left hand for all of these actions, are there any one-handed actions for which you use the right hand". The questions were scored according to participant response of right, left or either hand. Cronbach's alpha for the current study was α=0.83.

8.3.8 Demographics

A set of demographic questions was also included assessing participant's gender, age, ethnicity, occupational status and educational attainment.

8.3.9 Participants

Participants were recruited through paranormal groups and sceptic societies by attending conferences and via social media. Additionally, undergraduate students at the University of Northampton received a course credit for taking part. Participants were required to be over 18 years of age and have no known hearing problems.

Participants who had completed Study 3 were not recruited to Study 4, as participation in Study 3 would potentially bias participants as to their responses.
A total of 55 participants were recruited. Respondents (17 male and 38 female) ranged in age from 19 to 75 years, with a mean age of 44 years (SD = 16.67).

8.3.10 Auditory Task

Prior to the commencement of Study 4, the sound files that were going to be used were piloted on a test group of participants who did not take place in the main study. These participants were recruited from people known to the investigator and covered a range of ages. The volume in dB of the sound clips to be used in the study was manipulated until the majority of participants reported hearing the voices present within the clips 50% of the time, this was the just noticeable difference level. The clips to be used in the main study were then set at four different volumes, 3 being set a small amount above, at, and below the just noticeable difference level, and the fourth being set at a level that the participants in the pilot study could hear. This would ensure that any participants in the main study who could not distinguish the voice at the level that was loud enough to be heard by all pilot study participants could have their results discarded, as potentially having hearing problems. In an ideal world, hearing tests would be carried out on all participants prior to them taking part in the study, however the technology and skills required for this were outside the scope of the present study.

Participants in the main study were required to complete an auditory signal detection task. They were asked to listen to short clips of noise, and to indicate whether they thought a voice was present in the noise or not. The clips consisted of either pink noise or pink noise with a male voice present – these clips had been previously generated for an auditory study (Moseley, 2015). The voice used for the clips was a male voice, and the clips were sections of a reading from a technical text book, examples of the speech clips being “these two sizes”; “measured in kilowatts”. Additionally, if the participants indicated that they thought a voice was present, they were then asked to indicate which direction they thought the voice was coming from (right, left or centre). There were a total of 100 trials for each participant, 48 of the trials had a voice present and the remaining 32 trials were pink noise only. Each trial lasted 5 seconds. The voice was present at one of four different volumes, these

volumes had been set as being a small amount above and below the just noticeable difference level (found by playing clips to a pilot set of participants and finding the level at which participants reported hearing the signal 50% of the time). The voice present and voice absent trials were randomly presented by the software used (E-Prime v2.0.10.356). Additionally, participants were assigned to an EVP group (where they were told that the task was an EVP task and may contain EVP voices) or a non-EVP group (where they were only told that the task was an auditory listening task) - participants were assigned by odd-numbered participants being selected as the EVP group and even-numbered participants being selected as the non-EVP group.

The trials were conducted on an HP Notebook laptop, running Windows 10, and using Technika HP-109 full size headphones.

Participants were presented with an information screen which informed them that in most of the trials, some speech would be present in the noise, but that it would not be easy to hear and participants may not be certain that they have heard a voice. They were instructed to press 'P' on the laptop keyboard if they thought speech was present, and 'A' if they thought there was no speech (speech Absent). During each sound clip, a fixation cross was presented on the screen so that the participant was aware that the trial was taking place, and to ensure that they had the same focus for each trial. If a participant responded “yes” to a trial, they were then presented with another screen which asked them where they experienced the speech, with Left Ear on the left hand side of the screen, Middle of Head in the centre of the screen, and Right Ear on the right hand side of the screen. The participants used the laptop mouse pointer to point to where they thought the sound was coming from, then clicked to select. After this, they were then shown the prompt screen to select “P” or “A” ready for the next clip. If they did not hear a voice and had selected “A” for Absent, they were taken straight to the “A” and “P” prompt screen.

8.4 Procedure

Participants were given an information sheet to read, giving them brief information about the study and details of whom the study was being conducted by, following which they were asked to sign a consent form. They were then given an instruction sheet, either informing them that the task was an auditory task or informing them that it was an EVP task, and given the opportunity to ask any questions

they may have about how the trials were going to be conducted. They were then given the headphones to wear, ensuring that they were oriented the correct way, and the task was started on the computer.

At the end of the auditory task, participants were taken to a separate room where they were asked to fill in the questionnaire sheets. Once they had completed the questionnaires, they were given a debrief sheet and asked if they had any questions about the study. They were asked if they wished to be kept informed of the results of the study, they were then free to leave.

Ethical considerations were addressed as described in section 5.4.

8.5 Results

Respondents (17 male and 38 female) ranged in age from 19 to 75 years, with a mean age of 43.85 years (SD = 16.67).

8.5.1 PIEQ and Personality Measures

Four participants were excluded as they had not completed the relevant PIEQ questions to enable an EVP category to be calculated for them. Again, there was a very low rate of response from sceptics (3 non-EVP, 34 low-EVP and 14 high-EVP). The groups were however split in the same way as in studies 1 and 2 – participants who scored zero on the relevant items on the PIEQ scale were classed as non-EVPers, ones who responded to the second half of the PIEQ (regarding actual experience of EVP) being assigned as high-EVPers, and the remainder being assigned as low-EVPers (as they displayed belief in EVP but had no actual experience of the technique). See section 5.5.1 for full details.

Both ANOVAs and Independent samples T test were run to ascertain any significant differences between the EVP groups (statistics were run for three groups, and for two groups (just low- and high-EVP, with a median split being used) to ascertain if there were any significant differences in the personality measures tested. Levene's tests for homogeneity of variances were carried out, and showed non-significant results, however due to the differing group sizes, both parametric and non-parametric analyses were carried out to ensure significant reports were not obtained incorrectly. Both parametric and non-parametric tests showed the same results.

Table 7: Belief Ratings across non-EVPer vs low-EVPer vs high-EVPer Group Type

Belief Subscale		Non-EVPer		Low EVPer		High EVPer		
		M	(SD)	M	(SD)	M	(SD)	Low vs high EVP
OLIFE Scale								
Unusual Experiences		3.67	(2.52)	8.79	(5.17)	9.71	(6.49)	
IPO Reality Testing subscale		31.00	(1.00)	40.88	(10.92)	43.36	(13.73)	
Dissociative Experiences		7.26	(4.26)	15.26	(11.78)	13.86	(3.54)	
Fantasy Proneness		3.67	(2.31)	8.24	(4.15)	8.00	(4.61)	
Hallucination Scale		23.33	(2.52)	36.38	(11.10)	41.21	(15.02)	
Sleep Related		1.48	(0.46)	2.42	(0.75)	2.83	(1.03)	*
Vivid Daydreams		1.00	(0.00)	1.89	(0.89)	2.21	(1.22)	
Intrusive Thoughts		2.00	(0.33)	2.55	(0.97)	2.55	(1.34)	
Auditory Hallucinations		1.00	(0.00)	1.72	(0.85)	1.95	(1.01)	

Significant group effect at the * p<.05 ** p<.01 *** p<.001 levels α=approaches significance

OLIFE Unusual experiences subscale

There were no significant differences between the groups (F(2,48)=1.51, MSE=45.30, p=0.231).

IPO Reality Testing Subscale

There were no significant differences between the groups (F(2,48)=1.42, MSE=189.12, p=0.25)

Dissociative experiences

There were no significant differences between the groups (F(2,48)=0.63, MSE=91.04, p=0.535)

Fantasy proneness

No significant differences between the groups were found ($F(2,48)=1.62$, $MSE=28.86$, $p=0.21$)

Hallucination scale

There was no significant difference between any of the groups in the overall hallucination scale ($F(2,48)=2.81$, $MSE=140.89$, $p=0.07$)

The Hallucination Scale was broken down into four factors (as previously described), and this showed a significant difference in the Sleep Related subscale, with a significantly higher mean score for the high-EVPers when compared with the non-EVPers ($p=0.021$). There were no significant differences in the other subscales: Vivid Daydreams ($F(2,48)=2.01$, $MSE=1.89$, $p=0.15$); Intrusive Thoughts ($F(2,48)=0.375$, $MSE=0.43$, $p=0.69$), Auditory Hallucinations ($F(2,48)=1.49$, $MSE=1.15$, $p=0.235$).

Independent t tests showed that there were no significant differences in any of the personality scales when looking at gender:

OLIFE Unusual experiences subscale $t(53)=1.01$, $p=0.28$

IPO Reality Testing Subscale $t(53)=0.48$, $p=0.64$

Dissociative experiences $t(53)=0.68$, $p=0.50$

Fantasy proneness $t(53)=1.53$, $p=0.13$

Hallucination scale $t(53)=1.06$, $p=0.30$

- Sleep related $t(53)=1.84$, $p=0.07$
- Vivid Daydreams $t(53)=0.40$, $p=0.69$
- Intrusive Thoughts $t(53)=0.45$, $p=0.66$
- Auditory Hallucinations $t(53)=1.08$, $p=0.29$

8.5.2 Sound File Analysis

The results of the auditory task were analysed using signal detection theory (SDT). See Study 3 (7.5.2.) for details of the statistics calculated.

The participants were split into the three groups as described –non-EVPers, low-EVPers and high EVPers. The mean hit rate and false alarm rate for each group was then calculated.

Two participants were excluded from the analysis, as they showed a significant number of incorrect responses to the audible sound file clips, which cast doubt on their hearing accuracy (one participant showed an incorrect response rate of 44%, the other 39%). Four participants who had not completed the required questions in the PIEQ questionnaire were also excluded as this made it impossible to discern their EVP status.

To identify whether differences in hit rates were due to differences in detection or differences in bias, criterion (c) and sensitivity (d') were calculated as in Study 3 (7.5.2.).

The d' value was calculated using the Microsoft Excel formula

Table 8: Group mean hit rate, D' and criterion scores across Non, Low and High-EVPer Group Type

	N	Hit rate	D'	c
Non-EVP	2	0.51 (0.17)	2.32 (0.43)	1.14 (0.22)
Low-EVP	33	0.77 (0.15)	2.60 (0.54)	0.51 (0.44)
High-EVP	14	0.72 (0.20)	2.58 (0.76)	0.58 (0.34)

An independent T test and an ANOVA were run to ascertain if there was a significant difference in the mean hit rate, d' and criterion scores between the EVP groups. The results showed that there was no significant difference in the hit rate between the EVP groups ($F(2,46)=2.45$, $MSE=0.06$, $p=0.098$).

None of the participants displayed the inability to distinguish between signal and noise, and there was no significant difference between the groups, indicating that all groups displayed a similar sensitivity (d') ($F(2,46)=0.19$, $MSE=0.07$, $p=0.82$).

The mean criterion score was also not significantly different between the groups ($F(2,46)=2.22$, $MSE=0.37$, $p=0.12$).

Further analysis was carried out to establish if the effect of being told the task was an EVP task affected the responses of the participants, as this had been the main significant factor between groups in study 3.

Table 9: Group mean hit rate, D' and criterion scores for EVP and non-EVP Task Conditions

	N	Hit rate	d’	c
Non-EVP condition	27	0.74 (0.17)	2.54 (0.60)	0.55 (0.46)
EVP	26	0.75 (0.17)	2.65 (0.57)	0.55 (0.39)

Independent T tests showed that there was no effect on hit rate ($t(51)=0.189$, $p=0.85$), d’($t(51)=0.64$, $p=0.52$) or criterion ($t(51)=0.002$, $p=0.998$) of being told the task was EVP-related.

8.5.3 Gender Differences

Table 10: Group mean hit rate, D' and criterion scores between males and females

	N	Hit rate	d’	c
Male	16	0.74 (0.17)	2.77 (0.44)	0.66 (0.36)
Female	37	0.75 (0.17)	2.51 (0.63)	0.49 (0.44)

Independent T test were run to ascertain if there was a significant difference in the mean hit rate, d’ and c scores between the males and females. The results showed that there was no significant difference in the hit rate between the two groups ($t(51)=0.07$, $p=0.94$). There was also no significant difference in the mean d’ value between groups ($t(51)=1.48$, $p=0.15$), indicating that both males and females displayed the same sensitivity, and no significant difference in the mean c value ($t(51)=1.37$, $p=0.18$), showing that there was no difference in the decision criteria between the two groups.

8.5.4 Hallucinations

The participants were split into low- and high-hallucinators depending on their score on the Launay-Slade Hallucination Scale. Using the median value, the high hallucinators scored >=38 (N=25) and the low hallucinators scored <38 (N=28). This

followed the example set by previous researchers, who have used the median split technique to split participants into high- and low-hallucinating groups (Aleman, Bocker & De Haan, 1999; Castiajo & Pinheiro, 2017).

Table 11: Group mean hit rate, D' and criterion scores for high vs low hallucinators

	N	Hit rate	d’	c
Low hallucinators	25	0.69 (0.20)	2.56 (0.55)	0.69 (0.42)
High hallucinators	28	0.80 (0.11)	2.62 (0.62)	0.43 (0.39)

Independent T tests were run to ascertain the effect of hallucination proneness on the hit rate, d prime and criterion. A significant result was found on hit rate, with high hallucinators scoring significantly higher than low hallucinators [$t(51)=2.45$, $p=0.018$]. There was no significant difference in mean d’ scores [($t(51)=0.35$, $p=0.73$], however a significant result was found on criterion with the high hallucinators scoring significantly lower than the low hallucinators [$t(51)=2.28$, $p=0.027$. This indicated that the high hallucinators were significantly more likely to say that they had heard a voice in the sound clips than low hallucinators.

There is some debate in the literature concerning the validity of using median splits on data, so linear regressions were considered. However, with the sample size being low, it was decided that this would not be appropriate (Hsieh, 1989).

High hallucinators were significantly more likely to report hearing a voice when it was not directional than low hallucinators [$t(51)=2.57$, $p=0.013$]. They were also correspondingly more likely to produce a correct centre response than low hallucinators [$t(51)=2.37$, $p=0.022$]. This matches the signal detection scores which showed that high hallucinators were significantly more likely to report hearing a voice than low hallucinators, but these results show that it is specifically in non-directional sound clips that this result is seen.

High hallucinators were also significantly more likely to report not hearing sound clips presented to their left ear than low hallucinators [$t(51)=2.21$, $p=0.033$. High hallucinators were significantly more likely to report a signal presented to the left ear as coming from the centre than low hallucinators [$t(51)=1.96$, $p=0.049$.

High hallucinators were significantly more likely to report a voice from the right hand side when there was no signal present than low hallucinators [$t(51)=2.12$, $p=0.034$].

Table 12: Group mean hit rate scores for hallucination proneness for auditory files

		Low hallucinators N=25		High hallucinators N=28		Sig. Effect
		M	(SD)	M	(SD)	
Respond right ear		14.40	(4.62)	14.89	(4.40)	
Respond left ear		13.40	(4.45)	14.07	(4.71)	
Respond centre		12.40	(5.46)	17.71	(8.94)	*
Right ear correct response		13.40	(4.15)	13.75	(4.02)	
Left ear correct response		12.52	(3.97)	13.32	(4.30)	
Centre correct response		8.44	(2.65)	10.11	(2.49)	*
Right ear incorrect response		0.84	(1.18)	0.54	(1.00)	
Left ear incorrect response		0.76	(1.67)	0.46	(0.84)	
Centre incorrect response		2.36	(2.74)	5.00	(7.02)	
Right ear hear nothing		3.20	(4.08)	1.68	(2.55)	
Left ear hear nothing		4.08	(4.34)	1.89	(2.50)	*
Centre hear nothing		8.36	(3.05)	6.96	(2.63)	
Right ear say centre		1.28	(2.44)	2.39	(3.47)	
Left ear say centre		1.08	(1.35)	2.61	(3.69)	*
Right ear say left		0.08	(0.28)	0.18	(0.61)	
Left ear say right		0.32	(0.63)	0.18	(0.48)	
Centre say right		0.52	(0.77)	0.36	(0.73)	
Centre say left		0.68	(1.65)	0.29	(0.54)	
No sound say right		0.16	(0.37)	0.61	(0.99)	*
No sound say left		0.12	(0.33)	0.29	(0.81)	
No sound say centre		1.60	(3.22)	2.61	(3.97)	

The tests were repeated, this time looking at the Auditory Hallucinations subscale.

The participants were divided according to a median split of scores in the subscale.

Table 13: Group mean hit rate, D' and criterion scores for high vs low auditory hallucinations

	N	Hit rate	d’	c
Low auditory hallucinators	33	0.71 (0.19)	2.47 (0.57)	0.59 (0.48)
High auditory hallucinators	20	0.82 (0.08)	2.79 (0.57)	0.47 (0.29)

Independent T tests were run to ascertain the effect of hallucination proneness on the hit rate, d prime and criterion. A significant result was found on hit rate, with high auditory hallucinators scoring significantly higher than low auditory hallucinators [$t(51)=2.37$, $p=0.02$]. There was no significant difference in mean d’ scores [$t(51)=2.00$, $p=0.053$), or criterion [($t(51)=1.05$, $p=2.45$), indicating that the auditory hallucination factor was not solely responsible for the difference between the groups found in the auditory hallucination scale as a whole.

Table 14: Group mean hit rate, D' and criterion scores for high vs low intrusive thoughts

	N	Hit rate	d’	c
Low Intrusive Thoughts	24	0.68 (0.19)	2.59 (0.55)	0.74 (0.35)
High Intrusive Thoughts	26	0.80 (0.12)	2.63 (0.62)	0.42 (0.43)

The figures were repeated for the other subscales of the hallucination scale, there were no significant results apart from the Intrusive Thoughts subscale, which showed a significant difference in both hit rate and criterion. Participants high in intrusive thoughts displayed a higher hit rate [$t(48)=-2.65$, $p=0.013$] and a lower criterion level [$t(48)=2.87$, $p=0.006$) than participants high in intrusive thoughts. This suggests that participants displaying intrusive thoughts were more likely to respond that they could hear a voice within the noise.

High auditory hallucinators were significantly more likely to report not hearing a stimulus in the right ear than low auditory hallucinators [$t(51)=2.05$, $p=0.02$]. They were also significantly more likely to report not hearing a sound presented to the left ear than low hallucinators [$t(51)=2.69$, $p=0.002$].

Table 15: Group mean hit rate scores for auditory hallucination proneness for auditory files

		Low auditory hallucinators N=33		High auditory hallucinators N=20		Sig. Effect
		M	(SD)	M	(SD)	
Respond right ear		13.94	(5.03)	15.85	(3.10)	
Respond left ear		13.18	(4.88)	14.70	(3.89)	
Respond centre		14.64	(8.18)	16.15	(7.52)	
Right ear correct response		12.91	(4.52)	14.70	(2.89)	
Left ear correct response		12.36	(4.49)	13.90	(3.35)	
Centre correct response		9.00	(2.77)	9.85	(2.48)	
Right ear incorrect response		0.73	(1.07)	0.60	(1.14)	
Left ear incorrect response		0.67	(1.47)	0.50	(0.95)	
Centre incorrect response		3.27	(5.63)	4.55	(5.48)	
Right ear hear nothing		3.12	(3.93)	1.20	(1.85)	*
Left ear hear nothing		3.91	(4.16)	1.30	(1.56)	**
Centre hear nothing		8.00	(2.97)	7.00	(2.73)	
Right ear say centre		1.85	(3.29)	1.90	(2.69)	
Left ear say centre		1.42	(2.73)	2.65	(3.12)	
Right ear say left		0.09	(0.29)	0.20	(0.70)	
Left ear say right		0.30	(0.59)	0.15	(0.49)	
Centre say right		0.42	(0.71)	0.45	(0.83)	
Centre say left		0.58	(1.46)	0.30	(0.57)	
No sound say right		0.30	(0.34)	0.55	(1.00)	
No sound say left		0.12	(0.33)	0.29	(0.81)	
No sound say centre		1.60	(3.22)	2.61	(3.97)	

The tests were repeated for participants according to scores on the intrusive thoughts subscale. Significant results were obtained showing that individuals high in intrusive thoughts were more likely to respond Centre [$t(48)=3.221$, $p=0.002$], to respond centre correctly [$t(48)=2.82$, $p=0.007$], to hear no stimulus in their left ear [$t(48)=2.27$, $p=0.03$] and to hear no stimulus in the centre [$t(48)=2.29$, $p=0.027$]. Combined with their previous results, this suggests that whilst a higher score in the intrusive thoughts subscale of the hallucination scale indicated that participants were more likely to respond that they heard a voice, they were less likely to hear in their left

ear, and their lowered criterion was more likely to make them respond that they had heard a voice coming from the centre.

8.5.5 Handedness

The scores on the handedness scale were collected as a score of 1 for right hand, 2 for left hand, and 3 for either hand. To enable comparison between handedness groups, the scores on the Handedness scale were adjusted to give outcome scores of 60 to indicate total right handedness, minus 60 to indicate total left handedness, and zero to indicate total non-preference. The scale was also split into Annett's (2004) descriptions of primary and secondary activities to ascertain if there were any differences between these groups (see Appendix D for classification of actions).

The handedness of participants was less definite for secondary actions, and more defined in the primary actions, as might be expected. Looking at the overall figures, there were 4 participants who scored below zero and can be classified as left handers (8%), two who scored around zero, indicating no particular hand preference (4%), and 43 who showed a preference for the right hand (88%), 23 of whom showed a strong right hand preference).

As the numbers of participants was low, participants were split into strong right hand preference (N=23, participants who were exclusively right handed for all tasks), and not-strong right hand preference (N=26, including left hand, no preference, and using left hand for some tasks).

Table 16: Group mean hit rate, D' and criterion scores for handedness

	N	Hit rate	d'	c
Weak right hand	28	0.78 (0.12)	2.69 (0.56)	0.49 (0.36)
Strong right hand	24	0.71 (0.21)	2.50 (0.62)	0.60 (0.49)

Mean hit rate, d' and criterion scores were analysed with t tests for both strong and weak right handers.

There were no significant effects of handedness on the hit rate ($t(50)=1.49$, $p=0.14$), d' ($t(50)=1.18$, $p=0.24$) or criterion ($t(50)=0.92$, $p=0.36$) scores, indicating no difference between strong and weak right handers.

The tests were repeated, but looking at which direction participants were more likely to decide a voice was coming from (whether the voice was present or not).

This showed that participants who displayed a weaker right hand preference were significantly more likely to report hearing a voice in their left ear than strong right handers [$t(50)=2.69$, $p=0.012$].

This was accounted for by the weaker right hand preference group scoring significantly higher than the strong right hand group [$t(50)=2.34$, $p=0.032$], when correctly responding to hearing a voice in their left ear.

There was no significant comparable result when looking at right ear or centre correct responses.

Participants who showed a strong right hand preference were significantly more likely to not hear a stimulus in their right ear [$t(50)=2.39$, $p=0.03$].

When looking at incorrect responses to stimuli (for example, saying right ear when the stimulus was presented to the left ear), there were no significant responses.

When looking at participants who did not respond to stimuli (i.e. they reported hearing nothing, even though a stimulus was present), strong right handers were significantly more likely to report hearing nothing when the stimulus was directional (either right or left ear) than weak right handers. For stimuli presented to the right ear, strong right handers were significantly more likely to respond that they had not heard a voice than weak right handers [$t(50)=2.39$, $p=0.03$]. Similar results were found for no response to stimuli in the left ear between strong right handers and weak right handers [$t(50)=2.06$, $p=0.044$].

There were no significant results when the statistics were repeated to look at gender rather than hand preference.

Table 17: Group mean hit rate scores for handedness conditions for auditory trials

		Strong Right handed N=28		Not-strong right handed N=24		Sig. Effect
		M	(SD)	M	(SD)	
Respond right ear		13.54	(5.53)	15.64	(3.20)	
Respond left ear		12.00	(5.12)	15.25	(3.56)	*
Respond centre		15.67	(9.92)	15.00	(5.92)	
Right ear correct response		12.75	(5.22)	14.29	(2.68)	
Left ear correct response		11.35	(5.16)	14.12	(2.68)	*
Centre correct response		9.48	(3.23)	9.12	(2.12)	
Right ear incorrect response		0.54	(0.88)	0.82	(1.25)	
Left ear incorrect response		0.33	(0.67)	0.86	(1.65)	
Centre incorrect response		3.79	(7.43)	3.75	(3.51)	
Right ear hear nothing		3.58	(4.35)	1.39	(2.00)	*
Left ear hear nothing		4.00	(4.84)	1.96	(1.84)	
Centre hear nothing		7.57	(3.37)	7.62	(2.47)	
Right ear say centre		1.54	(3.72)	2.14	(2.45)	
Left ear say centre		2.25	(3.83)	1.61	(1.91)	
Right ear say left		0.08	(0.28)	0.18	(0.61)	
Left ear say right		0.21	(0.42)	0.29	(0.66)	
Centre say right		0.33	(0.64)	0.54	(0.84)	
Centre say left		0.25	(0.53)	0.68	(1.57)	
No sound say right		0.25	(0.44)	0.54	(1.00)	
No sound say left		0.13	(0.34)	0.25	(0.80)	
No sound say centre		2.33	(4.14)	2.00	(3.28)	

8.5.6 Schizotypy

The participants were split into low- and high-positive schizotypy depending on their score on the O-LIFE Unusual Experiences subscale using the mean value as described by Randell, Goyal, Saunders and Reed (2011). This produced 26 low positive schizotypes and 27 high positive schizotypes.

Table 18: Group mean hit rate, d' and criterion scores for schixotypy

	N	Hit rate	d’	c
Low schizotypy	26	0.70 (0.19)	2.51 (0.59)	0.565 (0.44)
High schizotypy	27	0.80 (0.12)	2.67 (0.58)	0.44 (0.38)

Independent T tests were run to ascertain the effect of schizotypy on hit rate, d prime and criterion. There was a significant difference on hit rate, with high schizotypes scoring significantly higher than low schizotypes $t(51)=2.43$, $p=0.019$, however there was no significant results for d’ $t(51)$-0.97, $p=0.34$ or criterion $t(51)=1.83$, $p=0.07$.

This showed that participants displaying high positive schizotypy were more likely to respond that they heard a voice in the centre $t(51)=2.06$, $p=0.045$, and also to correctly report that they heard a voice in the centre $t(51)=2.05$, $p=0.046$. They were also more likely to not hear a signal presented to their left ear $t(51)=2.28$, $p=0.027$.

Table 19: Group mean hit rate scores for schizotypy conditions for auditory trials

		Low schizotypy N=33		High schizotypy N=20		Sig. Effect
		M	(SD)	M	(SD)	
Respond right ear		14.27	(4.45)	15.04	(4.54)	
Respond left ear		13.50	(4.40)	14.00	(4.77)	
Respond centre		13.00	(6.36)	17.33	(8.74)	*
Right ear correct response		13.31	(4.504)	13.85	(4.11)	
Left ear correct response		12.58	(3.93)	13.30	(4.36)	
Centre correct response		8.58	(2.77)	10.04	(2.41)	*
Right ear incorrect response		0.77	(1.14)	0.59	(1.04)	
Left ear incorrect response		0.77	(1.63)	0.44	(0.85)	
Centre incorrect response		2.42	(2.70)	5.04	(7.15)	
Right ear hear nothing		3.23	(3.97)	1.59	(2.61)	
Left ear hear nothing		4.04	(4.24)	1.85	(2.57)	*
Centre hear nothing		8.27	(3.11)	7.00	(2.59)	
Right ear say centre		1.31	(2.40)	2.41	(3.53)	
Left ear say centre		1.12	(1.34)	2.63	(3.75)	
Right ear say left		0.12	(0.33)	0.15	(0.60)	
Left ear say right		0.27	(0.53)	0.22	(0.58)	
Centre say right		0.50	(0.76)	0.37	(0.74)	
Centre say left		0.65	(1.62)	0.30	(0.54)	
No sound say right		0.19	(0.40)	0.59	(1.01)	
No sound say left		0.15	(0.37)	0.26	(0.81)	
No sound say centre		2.00	(4.00)	2.26	(3.31)	

8.6 Discussion

In studies 1 and 2, it was discovered that it was possible to distinguish low and high EVPers from non-EVPers by a number of personality variables. It was hypothesised that this would also be seen in the current study, with differences in the Unusual Experiences subscale of the O-LIFE, Reality Testing deficits, Dissociative Experiences, Fantasy proneness and Hallucination proneness. This was not found in the current study, with the exception of high-EVPers showing a greater tendency to

sleep-related hallucinations than non-EVPers. This could be due to the small number of participants, and the fact that it had again proven difficult to recruit both high-EVPers, and particularly sceptics. It could be that these differences only manifest if individuals display extremes of belief, and are not seen where beliefs cluster around an average.

It had been discovered in Study 3 that both gender and task condition affected whether participants reported hearing a voice in auditory noise clips. It was expected that this would also be seen in the current study, however neither factor showed significant results. There was an effect of hallucination on response rate, with high hallucinators displaying a lower criterion when responding, indicating that they were more likely to report hearing a voice in the noise. This has been demonstrated in previous studies, although differing reasons for the results have been given. Bentall and Slade (1985) report that this is due to a reality testing deficit within high hallucinators, whereas Mintz and Alpert (1972) concluded that an impairment of reality testing coupled with vivid auditory imagery were likely to be the cause. A reality testing deficit is unlikely to be the cause in the current study, as there were no significant results found when investigating reality testing deficits between participants.

It has been stated that language processing preferentially occurs in the left brain hemisphere in the majority of the right handed population, and that this occurs less frequently in left or mixed handed individuals (Prete, D'Anselmo, Brancucci & Tommasi, 2018). There is also a degree of delateralisation apparent in schizophrenics and participants who display higher positive schizotypy scores (Annet & Moran, 2006). Because of this, it was hypothesised that the degree of brain lateralisation to be found in EVPers would be less marked than that in non-EVPers due to their higher levels of positive schizotypy. To investigate this, an auditory detection task was used, and it was expected that high-EVPers would be less likely to report a voice in their right ear, whether this was a real voice (in the signal condition) or a hallucinated voice (in the noise condition). There were no significant differences between the EVP groups in the current task. This could be due to similar reasons as study 3, as there were very few non-EVPers, and a reduced number of high-EVPers, so identifying differences would be less likely without extremes at either end of the EVP scale. However, there may be a number of confounding factors also present – Hull and Vaid (2006) report that second language acquisition can affect brain laterality. They report that individuals who speak

only one language, and bilinguals who learned their second language after the age of 6, both display left hemisphere dominance for language. However, bilinguals who are exposed to a second language during their first 6 years show more of a bilateral involvement of the brain hemispheres. They further report that the lateralisation in monolinguals is not as defined as previously thought, and there is right hemisphere involvement in language processing. Without knowing the language status of the participants in the current study, it is difficult to draw conclusions about how defined their language processing hemisphere are.

There are also other factors that have been separately considered in the current study which may affect language lateralisation – namely handedness and hallucination proneness.

Study 2 showed gender differences between males and females, with females displaying higher levels of positive schizotypy, sleep related hallucinations and vivid daydreams, fantasy proneness and reality testing deficits, so it had been hypothesised that this would also be shown in the current study. However, there were no significant differences found between males and females. As females had previously been shown to report these higher levels of personality variables that also predispose to experiencing anomalous phenomena, it had been hypothesised that females would be more likely to report hearing a voice in noise than males. This was not shown in the current study, however this is not surprising given the lack of significant differences in the personality variables examined.

Study 3 had shown that there was a significant effect of task instruction on the response to the task – all participants were less likely to respond that they had heard a voice when they were in the EVP task condition. This result was not repeated in the current study. This may be due to simple participant selection – both study 3 and study 4 were lacking in non- and high-EVPers, so it is difficult to replicate results across a general, and relatively small sample. Or it may be that the increased cognitive load of asking participants to listen for voices coming from different directions was enough to concentrate all participants on the task, so they would not show criterion differences between the two conditions. Hoffman, von Helversen and Rieskamp (2013) report how differing cognitive load can either hinder or assist in different tasks, and whilst it is unlikely that there is much of a load effect in amending the task to include directionality, this may be enough to reduce the probability of participants amending

their criterion value when judging if a voice is present or not. It is possible that when the task consists simply of being asked if a voice is present or not, and being told it is an EVP task or not, allows participants to assume that there might not be a voice present and display a more conservative criterion. However, when the additional requirement of deciding which direction the voice is coming from is added, it may be that participants are less likely to be concerned about the fact that the voice may or may not be paranormal, and are more focused on deciding where the voice may be coming from. Whilst the task is still a fairly simple one, the additional load on the working memory of having to also remember that the task may be an EVP task might cause the participants to forget or ignore that part of the task instruction.

Hallucination proneness has been shown to correlate with a number of personality factors which have also been described as being common in paranormal believers (and by extension, EVPers). For example, high hallucinators have been shown to be deficient in reality testing (Bentall & Slade [1985]), prone to dissociation (Perona-Garcelán et al [2008]), fantasy proneness (Merckelbach & van de Ven [2001]) and positive schizotypy (Barkus, Stirling, Hopkins, McKie & Lewis [2007]). It was therefore hypothesised that high hallucinators would display a higher tendency to report voices within noise. This proved to be true when splitting participants on the overall hallucination proneness scale. High hallucinators showed both a higher hit rate and a lower criterion – they were using a lower decision threshold when deciding if there was a voice present in the noise than low hallucinators were, and so were more likely to make errors. This would suggest that high hallucinators are not just more likely to have spontaneous hallucinations in everyday life, but that this can be shown in the laboratory. Due to the similarity between the task in the current study and the conditions used when ghosthunting (asking participants to decide if a voice is present under noisy conditions), it is reasonable to assume that high hallucinators are creating voices of spirits from the white noise being played on their EVP devices. This also ties in with the concept of illusions, as an illusion is creating a voice by misinterpreting sound that is already there, rather than creating a voice from nothing (Norton & Corbett, 2000), and this does seem to fit the mechanism by which EVPers are confabulating voices.

The analysis was repeated, but specifically investigating auditory hallucinations. This did still show a significant difference in hit rate between low and high auditory

hallucinators, but there was no corresponding difference in criterion value, showing that the auditory hallucination factor was not solely responsible for the differences between groups found when looking at hallucinations as a whole.

The analysis was repeated again to include the other hallucination subscales. This found that there was a significant difference in the Intrusive Thoughts subscale, with both hit rate and criterion being significantly different between low and high scores on the subscale. This showed that participants high in Intrusive Thoughts were displaying a higher hit rate and a lower criterion level, indicating that they were displaying a lower decision criterion, and therefore more likely to say that they could hear a voice in the noise. This finding supports previous research, that participants who report auditory hallucinations also report more intrusive thoughts (Morrison & Baker, 2000). Although this was in a clinical population, Morrison and Baker (2000) also report that these participants also reported their intrusive thoughts are more distressing, uncontrollable and unacceptable than control participants. This could be a mechanism whereby EVPers unconsciously externalise their intrusive thoughts into hearing apparent spirit voice. This could be a mechanism for them to deal with intrusive voices, as they are not a clinical population they are not externalising as voices in the way that schizophrenic patients do, but rather imposing them onto an already ambiguous white noise, in a way that they can then control them.

Language processing areas in the brain had been considered when investigating the results for EVPness related to schizotypy. There were no significant results of EVPness, however schizotypy was also considered as a separate factor. There was a significant difference in hit rate between low and high schizotypy participants, but there were no significant results when looking at d' and criterion, so no conclusions could be drawn.

Handedness can also cause delateralisation of the language areas in the brain, so it was hypothesised that handedness would affect response on the auditory task. There were no significant differences between strong right handers and weak right handers when looking at hit rate, sensitivity and criterion, suggesting that there were no differences in how participants were deciding to respond. This was not unexpected, as this was not looking specifically at which ear the participants were favouring or not favouring, and was simply assessing if there were any general differences in whether they reported hearing a voice or not.

The results of the auditory task were then investigated in more detail, to see if there was any effect found due to the directionality of the voices in the sound clips. It was found that high hallucinators were more likely to report hearing a voice when it was not directional, being presented from the centre rather than from the left or right. This result was found regardless of whether the centre response was correct or incorrect, so whilst they were more likely to respond centre, they were also more likely to respond centre correctly. Previous studies have shown that voices are more commonly hallucinated in the right ear, due to a right ear advantage utilising the left speech hemisphere of the brain (Prete, D'Anselmo, Brancucci & Tommasi [2018]). It can be assumed that the high hallucinators have less laterality in their brain speech areas due to correlating factors such as high schizotypy (Ocklenburg, Westerhausen, Hirnstein and Higdahl, 2013) it would make sense that they are more likely to report voices in the centre, as they do not have the right ear advantage, but their speech areas are shared more between the brain hemispheres. Of course, this must be balanced against the other reasons that can affect brain laterality, both ones considered in the current study (high schizotypes) and ones not covered (language acquisition, possible brain sex differences). High hallucinators were also more likely to report a voice in the left ear as coming from the centre - again, this may be due to decreased brain laterality causing participants to be unclear which side the voice was coming from, although interestingly there was no corresponding reporting of right ear sounds coming from the centre.

Previous studies have shown that there is a left ear advantage for some tones, as opposed to speech (Siniger & Bhatara, 2012). This may have had an effect on the participants as they may only be hearing degraded portions of speech within the white noise, which may not necessarily be interpreted as speech but rather as tones. However, as the participants had been primed that there may be speech within the white noise, if they heard what they thought was a tone, the effect of top down processing could have caused them to try and assimilate the fact that they had heard a tone in their left ear, but were then trying to interpret it as speech.

High hallucinators were also more likely to hallucinate a voice in their right ear than low hallucinators. Prete, D'Anselmo, Brancucci & Tommasi (2008) report that right ear responses are more common both when a voice is present and when one is absent, however this seems to not concur with the fact that hallucinators are less likely

to display a right ear advantage. However, Nayani and David (1996) report that they found that hallucinations were reported as more commonly coming from the right in a population of hallucinators, regardless of the handedness of participants. Brugger, Regards and Landis (1996) report that hallucinations in general are more commonly reported to occur on the right side, including phantom limb syndrome, out of body experiences and reports of a sense of presence. Brugger et al (1996) also report that whilst other studies have reported a left sided hallucination, this has been associated with severe depression and suicidal ideation, which would not be expected in the participants in the current study, both as it was not a clinical population being studied, and EVPness is more likely to be associated with positive schizotypy.

When the details were investigated for the auditory hallucination individual difference measure, it was found that high auditory hallucinators were significantly more likely to not hear a stimulus in either their right ear or their left ear. This would suggest that either the high hallucinators as a group were displaying a hearing problem (unlikely as there were 26 participants in this group), or that for some reason they were unable to distinguish directional sounds. This is similar to the high total hallucinators, who were more likely to hear a voice when it was not directional, but instead of showing a positive preference for voices coming from the centre, the high auditory hallucinators were displaying a negative ability to hear directional sounds.

When considering handedness in the auditory task, it was found that weak right handers were significantly more likely to correctly report hearing a voice in their left ear. It had been expected that the weaker right handers would be less likely to report hearing a voice in their right ear, which proved true, but it was not expected that they would also display such a left ear advantage. Overall, right handers were less likely to report hearing a voice if it was directional (from the left or right). Handedness has been found in previous studies to affect language processing, with 90% of right handers reported as displaying a left-brain hemisphere dominance in speech, as opposed to 70% of left handers (Prete, D'Anselmo, Brancucci & Tommasi[2018]). There have been some differences described in brain laterality of language processing, and this had been hypothesised to potentially affect the reporting of voices in an auditory task. Right brain hemisphere language lateralisation has been reported as being higher in left handers than right handers (Prete et al, 2018), leading to a reduced right ear advantage (Steinmann, Leicht, Andreou, Polomac & Mulert, 2017). Additionally,

stronger interhemispheric auditory pathways have been described in early schizophrenia, leading to reduced language lateralisation which can be a trait marker for auditory hallucinations in clinical schizophrenics (Ocklenburg et al, 2015). Whilst this is in a clinical population, it was hypothesised that this may also be apparent in EVPers, as hallucinations can be correlated with positive schizotypy (Fisher et al, 2004).

Most of the studies examining right ear advantage for speech have concentrated on using dichotic listening tasks, whereas the current study was speech in noise, so it makes it difficult to make direct comparisons. Dichotic listening tasks generally ask participants to report which side they can hear best or first when sounds are presented to both ears. This ignores the possibility that participants might report a sound as being perceived centrally, even if it is being presented directionally. This also makes it difficult to compare the current methodology to dichotic listening studies. Additionally, Sætrevik and Hugdahl (2007) report a negative priming effect in listening tasks which may have an effect if we assume that a noise stimulus in one ear has been ignored, then the participant might be more likely to ignore a further stimulus in the same ear, if the speech embedded is at such a level that it is ambiguous.

It was not possible with the current study to state that none of the participants had any hearing difficulties – none were subjected to a hearing test before taking part. However, not only were they asked before agreeing to take part whether they had any known hearing conditions, it would have been obvious in their results if they displayed hearing levels significantly lower than other participants (two participants were excluded from the study for just that reason – they displayed considerably higher error rates than the other participants).

To obtain true results for the auditory tasks, it would be helpful to use fMRI as this would indicate which areas of the brain are being activated both when hearing speech and when hallucinating speech, thereby enabling a comparison between groups. There have been a number of studies investigating the role of connections between brain areas in auditory verbal hallucinations, with evidence of abnormalities in a number of networks, including auditory, language and memory/limbic networks (Ćurčić-Blake et al, 2017). The previous studies have been primarily conducted on a clinical population, and might prove that similar mechanisms might be displayed in a non-clinical population, but with specific differences (for example inter-hemispheric connectivity is increased in early schizophrenia and decreases in later stage

schizophrenia (Ćurčić-Blake et al, 2017), and it might be assumed that an early stage pattern might be displayed in a non-clinical population).

The voices used in the auditory task were ones that been used in a previous auditory task (Moseley, 2015), and were therefore not specifically created to mimic EVP voices. It was noted by some of the participants that as the voice was the voice of the same person in all the clips (although saying different words), it was possible to become used to the tone of voice so that it was easier to distinguish it from the noise. For future studies, it would prove beneficial to vary the speaking voices so that participants were not able to predict what they would sound like, although this would cause technical issues around thresholds for each voice.

Most of the research to date has concentrated on auditory hallucinations, rather than auditory illusions. More research needs to be conducted into illusions, and how the brain constructs speech from random noise, in order to further explain why EVPers regularly misinterpret random noise as voices speaking to them. This may demonstrate that whilst there may be a common basis between hallucinations in a clinical population and the voices reported by EVPers, there might be a specialised pathway consisting of misperception and illusion that is driving the reports of apparent voices. Further studies would also benefit from utilising EVP clips provided from EVP practitioners, as there may prove to be some commonality in the sounds that are being interpreted as voices. Although these clips would not be controlled, if particular clips seemed to promote misinterpretation, they could then be analysed more closely using dedicated speech analysis software to ascertain if there might be specific sounds that mimic speech segments that are causing paranormal believers who are in a state of expectation to create voices out of the noise.

It would be beneficial to repeat the study if it proved possible to recruit from the high and non-EVP population, as this may well show the differences that were evident when a larger sample size of mixed participants was obtained.

9 General Discussion

9.1 Summary of Study Details

Paranormal belief has been investigated for many years, with the purpose of identifying which factors might be responsible for an individual to believe in a range of phenomena for which there is no current scientific evidence. A number of individual differences have been described in paranormal believers, including demonstration of positive schizotypy (Holt, Simmonds-Moore and Moore, 2008); decreased reality testing (Irwin, 2004); increased dissociation (Richards, 1991); and increased fantasy proneness (Smith, Johnson & Hathaway, 2009). A subset of paranormal believers are individuals who claim to record the voices of deceased people, in an apparent demonstration of spirit communication. These Electronic Voice Phenomena (EVP) have been described since the beginning of the 20th century, yet despite this, no in-depth studies have taken place regarding the people who practice the techniques and report obtaining voices of spirits on recording devices. Given that recording of these voices involves the use of specific techniques and interpretation of audio recordings, it was hypothesised that it might be possible to identify people who use these techniques as a specific subgroup within paranormal believers on the basis of a number of individual differences and responses to auditory studies. A number of personality variables have been found to correlate with belief in the paranormal, although the picture appears complicated by an inter-relationship between a number of those variables. It was proposed that there may be measurable differences between people who do not believe in the paranormal/EVP (non-EVPers), people who believe in EVP but do not practice the techniques (low-EVPers), and people who reportedly obtain EVP voices (high-EVPers).

A new questionnaire (the Paranormal Investigation Experience Questionnaire) was developed to distinguish between the three groups of non-, low- and high-EVPers. This proved that it was possible to distinguish between the groups, and the questionnaire showed a high reliability.

It was discovered when examining the personality variables studied that it was possible to distinguish between non- and low/high EVPers, but not generally possible to distinguish between low- and high-EVPers. The exceptions to this were in a measure

of Superstition, where low-EVPers scored more highly than non-EVPers, whereas there were no significant differences with high-EVPers. This was interpreted as possibly due to the Superstition subscale of the Revised Paranormal Belief Scale not measuring superstition as a complete concept, as it only asks questions regarding negative superstitions (Vyse, 2013), and only discusses beliefs, not behaviours (Irwin, 2009). It might be that low-EVPers have less practical experience than high-EVPers and therefore feel compelled to carry out more superstitious behaviour to dispel any perceived negative effects of contacting the spirit world. For example, Myers (n.d.) describes how ghost hunters recite prayers of protection before beginning an investigation. It may be possible however that whilst low-EVPers have little experience with EVP, they may have more practical experience in other areas of paranormal research (for example Mediumship), however this is unlikely to be the case, as high-EVPers demonstrated a higher level of Anomalous/Paranormal Ability than both non- and low-EVPers, which would suggest that low-EVPers have less practical experience of practical paranormal investigating than high-EVPers. High-EVPers also scored more highly than the other two groups on the hallucination proneness scale, and specifically on the sleep related hallucinations subscale.

It can be concluded from the personality variable results that there are no significant differences between EVP experiencers and general paranormal believers, which suggests that there could be other factors which transform an individual from simply believing in the paranormal to seeking out experiences and reporting regular contact with apparent deceased spirits via audio recordings. One route of investigation might be to compare the experiences reported by EVPers with those reported by spirit mediums (those who receive purported communications from the dead [Hunter, 2015]). There appear to be a number of similarities between the experiences reported by mediums and those reported by EVPers, for example Rock, Beischel and Cott (2009) discuss the finding that mediums obtain auditory information, usually comprising of either identifying information concerning the spirit itself, or with a message for a person still living. In the case of a medium, the spirit communicates directly with the medium leaving no external evidence of the communication, whereas the EVPer professes evidence in the form of sounds present on recordings, which are interpreted as speech from a spirit. Rock, Beischel and Cott (2009) also report that the spirit appears to be independent of the medium and functions as an independent being,

which also matches the experience reported by the EVP experiencers. They describe further characteristics of the medium experience as being information appearing in other modalities (for example visual and tactile) – it might be that EVPers are displaying a subset of the characteristics displayed by mediums, yet the experience has the same psychological or physiological basis.

Sleep related hallucinations have been reported as reasonably common in the general population – Ohayon, Priest, Caulet and Guilleminault (1996) report 37% of the general population reporting hypnagogic hallucinations and 12.5% of the population reporting hypnopompic hallucinations. As these appear to be a fairly common phenomenon in the general non-clinical population, it is interesting that high-EVPers displayed significantly more of these hallucinations than other groups. There is no obvious common mechanism between hearing hypnagogic hallucinations and hearing EVP voices, although as hypnagogic hallucinations are described as being dissociated manifestations of REM sleep (D'Agostino & Limosani, 2016), it is possible that some EVP reports are generated due to ghosthunters briefly dropping into REM sleep as they try to stay awake monitoring a haunted house overnight. If they hallucinate a voice at the point of sleep, they may try to find the hallucinated voice on their tape recording, and create a voice out of the random noise on the tape to support their hallucination. Jones, Fernyhough and Larøi (2010) state that a third of student participants reported auditory hypnagogic or hypnopompic hallucinations, and most of the hallucinations reported were unclear voices with an occasional clear word, and a mixture of recurrent and one-off voices, which also appears to replicate the voices reported by EVPers in that EVP voices tend to be unclear and require repeated listening and interpretation to decipher.

There were some gender differences in the results, with females showing significantly higher levels of positive schizotypy, hallucinations, fantasy proneness and reality testing deficits in Study 2, but these results were only found in Studies 1 and 2, and were not replicated in Studies 3 or 4.

As EVP involves the misperception of sounds to create voices, it was proposed that there may be a difference between low and high-EVPers when taking part in a listening task wherein voices were embedded in noise. EVPness did not predict ability to discern voices, however task condition did, with participants who were told that the voices in the task could be paranormal being less likely to report hearing a voice.

Overall an effect of gender and task condition combined resulted in females in the non-EVP primed task being most likely to report hearing a voice, and males in the EVP-primed task being least likely to report hearing a voice.

One of the factors that distinguished high-EVPers when looking at personality variables was hallucination proneness, and as this directly relates to the reporting of voices in noise, the effect of hallucination proneness was investigated. As language processing has also been shown to be affected by handedness (Prete et al, 2018), the effect of varying the voice stimulus between left ear, right ear, and centre, was also investigated. High hallucination correlated with the tendency to report hearing a voice in noise, although when the hallucination subscales were examined, intrusive thoughts appeared to be the factor that affected the decision making process. This mirrors results from previous studies where participants reporting auditory hallucinations also report more intrusive thoughts (Morrison & Baker, 2000). High hallucinators displayed a more liberal criterion, which indicated that they were more likely to report hearing a voice in the noise. High hallucinators were more likely to report non-directional voices, as were participants reporting high intrusive thoughts and participants reporting higher positive schizotypy. Previous research concerning auditory verbal hallucinations has concentrated on whether the hallucination appears to be internal or external to the percipient (for example Zanello, Bâ & Sentissi, 2018), whereas for EVPers the voice is reported outside the head, as it is recorded on an audio device. Therefore, it could be argued that despite high EVPers displaying hallucination proneness, there may be a separate mechanism in action to the one described in previous research into hallucination prone individuals, particularly as the participants in the current study were more likely to report non-directional voices. A number of factors appeared to be displayed in participants who were more likely to report not hearing a voice in their left ear, namely high hallucination, high auditory hallucination, high positive schizotypy, high intrusive thoughts and right handedness. However, two of these groups also reported not hearing a voice in their right ear, namely right handers and high auditory hallucinators. Previous research has reported that external auditory hallucinations are most commonly heard in both ears (McCarthy-Jones et al, 2014), and although this was in a clinical population there is no reason to expect that this would be different for non-clinical participants, and this would support the findings in the current study.

Weak right handers were more likely to report hearing a voice in the left ear – it had been expected that weak right handers might display a weaker right ear advantage for identifying speech, but it had not been predicted that they would display a significant left ear advantage. It has been demonstrated in the past that 15-20% of right handed individuals display no specific ear advantage, or they display a left ear advantage in listening tasks, which may be due to both differences in directional biases of attention, and also left brain hemisphere connectivity differences (Schmithorst, Farah & Keith, 2013). More participants would have to be studied to ascertain if the effect seen in the current studies was due to a specific left ear advantage seen in weak right handers in auditory tasks, or whether the population participating in the study were biased towards displaying a left ear advantage given that up to a fifth of the population might display this advantage. Participants displaying high hallucination scores were more likely to report a voice from the rurčht when there was no voice present, this is supported by previous research which found that hallucinations are more often reported from the right hand side (Nayani & David, 1996).

A number of models have been proposed to account for auditory verbal hallucinations (AVHs), Looijestijn et al (2018) describe four models that have been described to account for their appearance: memory intrusions into language processing; disrupted monitoring of inner speech; aberrant cerebral lateralisation; and unbalanced top-down and bottom-up processing. Disrupted monitoring of inner speech is unlikely to apply to EVPers as rather than perceiving internal voices as external, EVPers appear to be misinterpreting external sounds as speech. There may be differing mechanisms involved between differing EVP experiences, for example Cardoso (2012) describes how a positive, relaxed but engaged mindset is conducive to the appearance of the voices. Ćurčić-Blake *et al* (2017) describe how memory fragments are inhibited during focused attention, but in conditions of relaxation and daydreaming they may become less inhibited. If a memory occurs in this relaxed state, areas of the brain that were active during the initial experience that is being remembered may be activated, and this allows the memory to be perceived as a current experience (Ćurčić-Blake *et al*, 2017). It is possible that this mechanism could be associated with a top-down processing error when the percipient is expecting an EVP voice, particularly as a number of EVP researchers report contacting the same deceased individuals repeatedly. This might not explain the mechanism by which

ghosthunting EVPs are obtained, as these are rarely obtained under conditions of quiet relaxation, they are more often reported as part of an organised ghost hunt, where individuals are in a heightened state of expectation (Wiseman et al, 2015), so memory intrusions are unlikely to be the cause of the misinterpretation.

9.2 Overall Discussion

The results of the four studies have shown that it may not be possible to distinguish between groups of participants by using a simple measure of EVPness – whether individuals disbelieve in EVP; believe but have no experience; or believe and have experience. This may well be due to the phenomenon being an as yet under-researched one, necessitating more qualitative studies to ascertain the underlying foundations of the belief that an individual is contacting the spirit world.

Previous studies report that paranormal belief may be a predictor of pathological personality traits, however the current study demonstrated that the personality variables investigated did not show this hypothesised result. This might support the position that belief in EVP voices does not predict these personality variables and may therefore indicate another cause for belief in EVP voices that may be unrelated to paranormal belief. In this case future studies would benefit from ascertaining any physical factors that might predispose to hearing the voices, as it does not appear that EVPness can be distinguished using general personality traits. These findings were also reported from the audio studies, whilst there were some small differences seen between groups, there were no overall results that could be used to describe EVPers as a separate group distinguishable from non-EVPers. Whilst the results obtained do not show differences in EVPers, this can still be regarded as providing useful information regarding EVPness, as it shows that EVPness is not dependent on personality factors in the same way that paranormal belief has been reported. This might suggest that EVPness is a completely separate factor that depends on factors other than those that have traditionally been described when studying paranormal belief, and may encompass physical factors of hearing and interpretation rather than being dependent on purely personality traits. This might also extend to non-believers, and there may prove to be commonality in interpretation of sound clips regardless of beliefs.

9.3 Limitations and Future Research

The greatest limitation in the studies was the limited number of participants, particularly non-EVP sceptical participants, and also participants of all types for the auditory studies. It proved difficult to recruit sceptics, as they proved difficult to engage, and even when engaged they proved resistant to taking part. This was unfortunate, as it had originally been envisaged that useful information concerning sceptics could be obtained as well as information about EVPers. In recent years interest has moved towards the psychology of the sceptic (for example Wright & Cooper, 2019; Lamont, Coelho & McKinlay, 2009) so it would have been an opportunity to potentially add to current knowledge pertaining to a sceptical viewpoint. It was far easier to recruit participants to take part in an online study, hence the number of participants being increased for Study 2, where social media was used to recruit, and the questionnaires were available online. It is not possible to carry out auditory studies online, as participants may have differing PC sound cards, and listen to clips at different volumes, so these have to be conducted in a controlled fashion using the same equipment.

It may prove difficult to unpick the effect of personality variables with regard to EVP, as a number of the variables studied have been implicated in a number of different apparently paranormal experiences. Whilst it is easy to put all paranormal experiences into one category, the general paranormal, the term actually covers a number of different experiences which may not have the same underlying cause. Most previous research has concentrated on a general measure of paranormality – it would be worth in the future continuing to try to assess if different forms of paranormal belief show different individual differences, as the particular phenomenon that is believed in may have a different underlying belief and cause than other phenomena.

There may have been an issue with the definition of EVP practitioner used in the current study. Previously, EVP practitioners were a defined subset of people who dedicated time to researching and obtaining these anomalous voices. However, in recent years a form of EVP technique has become popular within the ghosthunting community. This may be masking effects, as the two types of investigator appear to have differing approaches to the subject – the ghosthunter is trying to obtain evidence of the paranormal (Radford, 2006), and the traditional EVP practitioner is trying to obtain descriptions of life after death (Cardoso, 2017). Additionally, there are

also a number of people who attend organised ghost hunts for entertainment purposes, however these events are advertised as being genuine, so participants believe that they have heard genuine voices of the dead. It may prove impossible to untangle the different types of belief and experience, however it might be worth ignoring the sceptical side for future studies, and concentrating on attempting to distinguish the different types of EVPer. It might be worthwhile to approach the subject differently, and to perhaps investigate factors that might be common amongst EVPers.

Future studies should try to separate out potential differences in motivation of EVP experiencers, as there does appear to be a number of motivations for attempting to record the voices. Some researchers report a desire to ascertain what life after death consists of, and their motivation is purely to contact the apparent spirit world in an attempt to find this information and pass it to the rest of humanity (Cardoso, 2017). Others report that they use the technique to provide proof of the paranormal (Radford, 2006). And others report using the technique simply because they have seen others do so on television programs (reported in the current study by a number of participants). These groups may prove to be separate and distinguishable both in the way they attempt to obtain voices and in the way they are interpreting them.

Future research should also investigate further the interpretation of sound clips – there have been a number of research studies over the years regarding interpretation of signals in noise, however there would be benefit in starting with a simple study to ascertain how people interpret a number of different signals, and building up from there. Studies could commence by simply playing a range of simple words or short phrases and assessing how participants report these voices. Context can then be added to include priming and suggestion to ascertain how this affects the reporting.

The voice clips used in the current studies were not created with any attempt to mimic apparently paranormal clips, but were simply a male voice repeating a number of words and short phrases. This allowed for comparison and interpretation of results in a quantitative manner, however lost some of the ecological validity of using EVP clips obtained from investigators. Future studies would benefit from obtaining apparently genuine EVP voices, then analysing them to ascertain if they do appear to contain genuine human speech. These clips can then be used in studies to ascertain if there is a commonality in interpreting certain voices and sounds. The other drawback

to using one standard voice is that there was a possibility that participants became used to the voice, and were therefore listening out for a certain pitch and tone. If mixed voices (male/female, high pitch/low pitch, fast/slow) were used, this may provide more variety and mimic more closely the conditions found in EVP experiments. Studies should also be undertaken to isolate apparently genuine EVP clips to discern if there are any common factors in the clips being reported. For example there may be certain speech segments that are easily interpreted in certain predictable ways, also there may be certain non-speech sounds that are commonly interpreted as certain words or short phrases. If this proves to be the case, it may be that there is a commonality in interpreting certain sounds which does not rely on an individual's professed belief (or non-belief) in either EVP or the paranormal, it may be that sounds are interpreted in a specific way regardless of beliefs, and it is only the explanation that may differ between individuals.

More work needs to be undertaken to look at the role of illusions rather than hallucinations. There is a lack of studies regarding illusions, however illusions are more likely to have an effect on what is being reported as EVP than hallucinations. This is due to the inherently noisy conditions that a lot of EVP clips are recorded under, although again it depends on the type of EVP being recorded and the motivations of the EVP researchers – people who are investigating haunted houses are more likely to report illusory voices as they generally use techniques that produce a lot of background noise.

To follow on from this, the actual recording techniques used would benefit from an investigation – there are a number of different applications and devices being used by EVPers and it may be that certain devices are more prone to produce specific errors in interpretation. A comparison of devices and techniques and the results recorded by EVPers may help to distinguish between methods and show how some of the EVP voices are obtained.

9.4 Conclusions

The studies undertaken have shown that there are a number of variables that may be seen to vary between non and low/high-EVPers, however there do not seem to be robust personality differences between low and high-EVPers. As this is one of the first studies to attempt to investigate the processes underlying the reporting of EVP

experiences, there are a number of factors which can be investigated in the future to attempt to understand why a population of individuals believe that they are communicating with the dead via audio recordings. Previously, EVP experiencers were a specific subgroup of paranormal believers who used EVP techniques as a method of contacting the spirit world, however the field has now grown to include both paranormal investigators and members of the public attending paid for ghost hunts, making it more difficult to discern EVP from more general suggestion and entertainment provided on a paid for ghost hunt. It is suggested that due to conflicting previous research, the investigation of psychological factors within paranormal belief (and by extension, EVP) would benefit from a bottom-up review to ensure that we are measuring what we assume we are measuring. It may be that EVP experiencers do not display personality differences to non-EVPers, and the only difference is in reporting and potentially interpretation of the voices. First steps would be to approach the subject from two directions – firstly to try and define exactly what distinguishes EVPers from non-EVPers (from considering what factors cause them to seek out and experience the voices), and secondly to assess commonalities or differences in interpretation of ambiguous sounds/voices regardless of EVPness to discover how the sensory system interprets sounds as speech. In addition a comparison of EVP experiencers with individuals who report contact with spirits via other techniques (for example mediumship) may provide some insight into the processes underlying the belief in communication with spirits via audio recordings.

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11 A – PIEQ Descriptive Results

Analysis was also undertaken for the responses of participants from all four studies to the PIEQ questionnaire, which looked specifically at paranormal experiences. Overall there were responses from 118 male and 145 female participants, although not all participants answered all questions.

102 participants were members of a paranormal investigation group, and 160 were not members.
Of the people who reported that they were interested in the paranormal, the mean length of time that they had been interested in the subject was 26.66 years, with a minimum length of time of 0.5 years, and a maximum length of time of 60 years.

37% of participants reported that they actively searched for ghosts and spirits of the deceased, and overall 79% of participants had heard of Electronic Voice Phenomena. 31% of participants reported that they had heard at least one EVP that they considered evidence of communication with the dead. When broken down by sex, 40% of female participants reported that they had experienced on at least one occasion EVP that they considered evidence of communication with the dead, compared with 32% of male participants.

39% of participants used white noise when they record EVPs, and 52% have a psychic medium present either sometimes or always when recording EVPs.

90% of participants do not hold regular sessions to record EVP, they record to no fixed schedule. This is interesting, as the original recommendations for carrying out EVP experiments was to try and hold regular sessions to enable the spirits to communicate more easily, however EVP experiments for study participants appear to be carried out on a more ad hoc basis, usually when they have the opportunity to visit an allegedly haunted location.

23% of participants think that EVP is not a paranormal phenomenon, compared with 43% who think it is a paranormal phenomenon. When broken down by sex, 14% of males and 9% of females think EVP is not a paranormal phenomenon, and 16% (males) and 26% (females) think EVP is a paranormal phenomenon. The rest of the participants did not express a preference either way.

The majority (58%) of EVP experiences are described as lasting between 1 and 2 seconds. This means that the majority of EVPs that are obtained are short in duration – 90% are less than 5 seconds long. EVP practitioners who describe carrying out EVP experiments in a "scientific" fashion describe receiving long messages via EVP, so more amateur EVPers appear to be receiving much shorter messages. This increases the possibility that they are in fact misinterpreting natural phenomena.

The majority of EVP voices are reported as being from someone that the EVPer did not know. This would make sense in a ghosthunting context, as the locations that are generally investigated are outside of the EVPers' home location, usually consisting of any reportedly haunted location (locations mentioned by respondents in the questionnaire include public houses and castles). A future study will look in more detail at the qualitative data to see if there are correlations between where people report EVP and the types of EVP they report.

A small percentage of people reported hearing EVP voices of someone who they knew was still alive at the time of the recording, which is interesting as this would be at odds with the usual explanation for EVPers amongst practitioners, which is that they are voices from the spirit world. 15% of participants reported hearing a voice that appeared to be their own – this would suggest that there may be some influence of schizotypy amongst these participants, and they may be externalising their internal voice. It would be useful in the future to target participants reporting these experiences to see if they hear their voice as they hear it internally, or as it actually sounds externally - our own voice sounds different when we hear it recorded than it sound to us when we talk [Jaekl, 2018).

Nearly a third of participants reported that they had recorded a voice of someone that they subsequently learned was not alive at the time of the EVP. This may be related to other paranormal phenomena such as reports of seeing a vision of someone known to

you, who subsequently turns out to have died at the same moment. Of course, it may just be that the participants have assigned a personality to the spirit they are conversing with, and they subsequently assign this to any historical person they discover lived in the building and is now deceased.

Nearly half of participants report that the EVP voices respond to commands and actions. This may well be assigning causality to events, particularly if coincidental events occur (for instance asking a spirit to make a sound, and a natural sound occurs straight away, this can be misinterpreted as the spirit answering).

The majority of EVPers report their experiences as being positive and friendly, which would suggest that they may be using the technique as a coping mechanism that allows them to cope with the uncontrollability of life (Irwin, 1994).

There does not seem to be any specific messages being imparted by EVP, most participants report that the messages they receive have no importance either to themselves, their paranormal investigation group, or the world in general. This is at odds with the reports from researchers such as Cardoso (2017) who report that the messages have great importance about a life after death, even stating “I believe this goal is vital for humanity and our world as a whole”. Again, this may just be due to the fact that the majority of EVP practitioners are using it as a ghost-hunting tool, rather than as a tool to discover more about life after death.

Table 20: PIEQ Descriptive Results

	Never	At least once
How many times have you experienced EVP that are personal to you (e.g., from a friend or relative?	62 (73%)	28 (27%)
How many times have you experienced EVP that are from someone who, when alive, you have never met or know personally?	32 (31%)	70 (69%)
How many times have you experienced EVP that are form someone who would, when alive, be considered famous or a "household name" (e.g., an actor, royalty)?	89 (87%)	13 (13%)
How many times have you experienced EVP that was from someone who, at the time, you knew to be alive?	83 (83%)	17 (17%)
How many times have you experienced EVP that was from someone who, after the event, you subsequently learned was still alive?	94 (93%)	7 (7%)
How many times have you experienced EVP that was from someone who, after the event, you subsequently learned was not alive at the time of the EVP?	68 (68%)	32 (32%)
How many times have you experienced repeated contact from one EVP voice?	49 (49%)	51 (51%)
How many times have the EVP voices responded directly to your questions?	45 (45%)	54 (55%)
How many times have the EVP voices addressed you by your own name?	68 (68%)	32 (32%)
Have you ever recorded EVPs that appear to be your own voice, but you are sure that you did not speak?	85 (85%)	15 (15%)
Have EVP voices ever responded to your commands or actions?	53 (53%)	47 (47%)

	Yes	No	Don't Know
Do you record EVP in a controlled environment (e.g., shielded from radio waves)?	29 (38%)	31 (40%)	17 (22%)
Have you ever had EVP communications that were not human-like voices (for example animal communication)?	23 (31%)	43 (58%)	8 (11%)
My EVP experiences have generally been positive and/or pleasant	50 (49%)	16 (16%)	36 (35%)
EVP messages tend to be friendly	38 (37%)	13 (13%)	51 (50%)

EVP messages tend to include messages that are personal to me and/or specific to me personally	16 (16%)	55 (54%)	30 (30%)
EVP messages tend to include messages that have deep importance to me personally (e.g. my own well-being)	12 (12%)	60 (60%)	28 (28%)
EVP messages tend to include messages that are important to other members of my paranormal investigation group (e.g. personal to them)	7 (7%)	53 (54%)	39 (39%)
EVP messages tend to include messages that are important to everyone in the world (e.g. the future of the human race)	7 (7%)	70 (67%)	25 (25%)
My EVP experiences have generally been negative and/or unpleasant	12 (12%)	64 (63%)	25 (25%)

In your experience, approximately how long does a typical EVP last?

Less than 1 second	10
1-2 seconds	57
3-5 seconds	21
6-10 seconds	6
11-20 seconds	2
21-60 seconds	0
61+ seconds	2

12 Appendix B – Glossary

Glossary

Broadband

A wide range of audible frequencies (Gracey & Associates, n.d.).

Broadband noise

Noise that carries acoustic energy over a wide range of audible frequencies (Gracey & Associates, n.d.).

Broadband receiver

A device which is capable of receiving *broadband*† signals

Broadband transmitter

A device which is capable of transmitting *broadband*† signals

Carrier wave

A carrier wave is a sound wave that consists of a fixed amplitude and frequency. A carrier wave can be modulated either in amplitude, frequency or phase, to carry a signal, for example this is how radio transmissions work (Collins English Dictionary, n.d.).

Conation

The ability to apply intellectual energy to a task, as needed over time, to achieve a solution or completion (Reitan & Wolfson, 2000).

Electrodermal response

Changes in the electrical conductance of the skin, usually in response to emotional and cognitive states (Critchley, 2002).

Electrostatic Noise

An unwanted signal that interferes with a recording, generated by the presence of a voltage (either with or without current flow) (Vaseghi, 2000).

First speech formant

The lowest speech *formant*†

Formants

Formants are concentrations of acoustic energy which are concentrated around particular speech frequencies. They are produced due to resonances of the human vocal tract, and as such are described as resonant frequencies of the vocal tract. Adjusting the vocal tract to change the frequency relationships between the first two formants results in the production of vowel sounds (Magill & Jacobson, 1978).

Fundamental frequency

The fundamental frequency of a voice is produced by the rate of vibration of the vocal cords, and is lower in males than in females (Feinberg, Jones, Little, Burt and Perrett, 2004). The lowest resonant frequency of any vibrating object is called its fundamental frequency (http://hyperphysics.phy-astr.gsu.edu/hbase/Waves/funhar.html).

Group A voices: can be heard and understood by any listener with normal hearing who also possess knowledge of the language being spoken. Listening training is not required to interpret these voices, and listeners interpret the voice in the same way without prompting (Raudive, 1971; Wingert, n.d.).

Group B voices: voices are more rapid and soft than *Group A* voices. Can be heard and understood by people who have been trained to listen, or by people who have been prompted as to what the voice is saying (Raudive, 1971; Wingert, n.d.).

Group C voices: these voices are the most difficult to understand, even for trained listeners. Some experimenters dismiss these, however others regard them as the most interesting of the EVP categories. (Raudive, 1971; Wingert, n.d.).

Ghost hunter

A ghost hunter is a person who investigates potentially paranormal, site-based anomalies (Fraser, 2015).

Harmonics

A harmonic is a whole number multiple of the fundamental frequency of an object, or human voice (http://hyperphysics.phy-astr.gsu.edu/hbase/Waves/funhar.html).

Jürgenson wave band

A radio frequency of around 1,500 kHz, described by Cardoso in her experiments (Cardoso 2006).

Noise floor

Noise present on recordings even when no sound is being recorded, it consists of the noise generated by all the devices being used (Recording Connection, n.d.)

Phoneme

The smallest unit of speech distinguishing one word (or word element) from another. Britannica.com

Pink Noise

Pink noise is white noise that has been altered to make the sound pressure level of each frequency band constant (Kawada & Suzuki, 1993). It decreases in intensity by three decibels per octave, which mimics natural sounds heard by the human ear (Berg, 2018).

Signal intensity

The intensity of the speech (or formant) signal is its loudness (Feldstein & Bond, 1981)

Sine wave

Speech consists of formants, harmonic structure and fundamental frequency. The formants display a sine wave pattern which is a repeating curve (Tun, 2018).

Sinus wave

More commonly known as *sine wave*[†].

Sine wave speech

Speech that is synthesised using time-varying sine waves which contain the frequency and amplitude variations of the first three speech formants (Barker & Cooke, 1999).

Square wave

A periodic wave form consisting of instantaneous transitions between two levels. Shows a distinct square shape when graphed (Weisstein, n.d.)

Superior harmonic

A superior harmonic is any harmonic that is higher than the first harmonic (the first harmonic is also known as the *fundamental wave*). A superior harmonic is more commonly known as a higher harmonic. Higher harmonics generally display a smaller amplitude as they increase in frequency (Smith, 1997).

Timbre

A quality of speech determined by the harmonics of the sound (Collins, n.d.)

Upper formant frequency

Fundamental and *formant frequencies* are generally lower in males than in females. In EVP clips, whilst the fundamental frequency may correlate with the voice being heard, the formant frequencies above the fundamental frequency (the upper formant frequencies) may display higher than expected values (Assman, Nearey & Dembling, 2006), (Cardoso, 2006).

White noise

Noise that consists of every frequency in the audio bandwidth, at equal energy levels (Kefauver, 2001).

13 Appendix C – Methods of Obtaining Electronic Voice Phenomena

13.1 Microphone Method

This method consists of connecting an ordinary microphone to a tape recorder. Both Raudive and Jürgenson adjusted the speed of the tape to optimally obtain apparent voices. Once the tape is recording, there is a protocol to be followed which involves the lead experimenter stating the date and the names of the people present, then asking if there are any presences present, and asking questions of these presences (in much the same way as a séance is performed). Recordings are kept relatively short (no more than ten to fifteen minutes) due to the length of time required to analyses the tapes subsequent to the session.

Voices obtained this way are described as being soft and quick, and are often masked by the voices of the experimenters. This method has been described as an unreliable way of capturing anomalous voices (Bander, 1972).

13.2 Radio Method

The Radio Method imitates the same method used to record a radio program onto tape, by coupling a wireless receiver to the tape recorder, although rather than tuning the radio to a station the radio is tuned to a point in the medium wave band between stations where only white noise may be heard. Schneider (in Raudive, 1971) describes how some investigators use talk-based radio programs, preferably lectures with long pauses between groups of words rather than white noise. Raudive stresses the importance of the sense of hearing to this method, which suggests that the voices are harder to distinguish, however he also describes the messages as longer, and with better pronunciation with this method. Raudive describes how Jürgenson maintains that this method of communication requires a “mediator”, who passes on information about the transmitting station, wavelength, and time that a recording should be made. To contact the mediator, the radio dial is swept from one side to the other across the stations until a voice is heard saying something appropriate, such as “now”, or “make recording”. At this point the recording should commence, even of the radio is at this point tuned to a station. This then necessitates distinguishing the voices from the radio

transmissions, with the attendant problems in misidentification. However, Raudive discusses how the anomalous voices have certain characteristics which enable them to be identified. Raudive himself discovered that he did not need a mediator if he tuned the radio to a point in the medium wave band between stations where only white noise could be heard, and this allowed the voices to be more clearly heard. Schneider (in Raudive, 1971) describes how some investigators use talk-based radio programs, preferably lectures with long pauses between groups of words rather than white noise.

13.3 Radio Microphone Recording

Raudive discovered a method of combining both radio and microphone recordings. The tape recorder is set to the microphone setting, and the microphone is placed close to the radio. The radio is tuned to white noise, then the experiment is conducted in the same way as previous techniques. The difference with this method is that when the tape is played back, the voices can be heard to answer the experimenter's questions, as both are being recorded in real time.

13.4 Frequency Transmitter Recording

Also described as the auto-transmission method, this is one of two methods Raudive invented with the physics professor Alex Schneider. A transmitter is coupled to the receiver's aerial box (usually the aerial antenna of a radio), which produces a *carrier wave*† which is free from interference. This allows slightly clearer recording of voices, which are free from other sources of interference.

13.5 Diode Method

The second method Raudive developed in collaboration with Schneider, the Diode method utilised a similar technique to the radio method, but used a diode which had a similar mechanism of action to the old crystal radio sets, and required variation of the aerial length to obtain the optimum signal (Bander, 1972). This produces the clearest voices of the techniques, however is subject to interference by wireless transmitters.

13.6 The Psychophone

The psychophone was designed by Franz Seidl specifically to obtain anomalous voices (in Raudive, 1971). The device incorporates a broad band radio transmitter, which

generates the carrier waves required by the voices, a radio receiver, and also a microphone to record voices. The theory behind the psychophone is that the spirits sending messages can utilise a frequency best suited to them, and it also provides an energy source they can utilise to send their messages.

13.7 Modern Tape/Digital Recording

There appears to be no consensus regarding the correct approach to obtaining anomalous voices. Some researchers state that the highest quality devices should be used, with high quality multidirectional microphones, to remove the possibility of misinterpretation of machine noise (Strom, 2019). However other researchers suggest that, due to the fact that voices allegedly require noise to manifest, less expensive equipment may be more beneficial and the internal microphone within modern digital recorders is sufficient to obtain EVPs (Baker & Baker, 2016).

14 Appendix D – Annett's Hand Preference Questionnaire

Primary actions: writing a legible letter; throwing a ball to hit a target; holding a racket in tennis, squash or badminton; holding a match whilst striking it; hammering a nail into wood; holding a toothbrush while cleaning your teeth.

Secondary actions: cutting with scissors; guiding a thread through the eye of a needle; which hand is at the top of a broom while sweeping; at the top of a shovel when moving sand; dealing playing cards; unscrewing the lid of a jar

15 Appendix E Paranormal Investigation Experiences Questionnaire

Paranormal Investigation Experiences Questionnaire

Please answer the following questions either by circling the appropriate response option, or inserting the appropriate answer (e.g., number of years) in the space provided.

For the purpose of this survey, a Paranormal Investigation Group refers to any group that investigates apparently paranormal phenomena, including parapsychological research and investigation. The term "paranormal" refers to events that are currently outside the range of normal experience or scientific explanation.

01	Are you currently a member of a paranormal investigation group?		yes	no
02.	How many years have you been a member of this particular paranormal investigation group?		____	years
03.	Do you consider that this paranormal investigation group carries out serious scientific study of the paranormal?		yes	no
04.	How many years have you been interested in the paranormal?		____	years
05.	How many years have you been a member of *any* paranormal investigation group?		____	years
06.	Do you visit allegedly haunted buildings to actively search for ghosts and spirits of the deceased?		yes	no
07.	Have you heard of Electronic Voice Phenomena (EVP)?		yes	no

08.	How often do you use EVP as a paranormal investigation tool?		0		never
			1		very rarely
			2		rarely
			3		occasionally
			4		often
			5		very often
			6		always

09.	How many times have you experienced EVP that you		0		never
	consider evidence of communication with the dead?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
10.	During a typical paranormal investigation, how likely		0		never use
	are you to use EVP as a tool for communication?		1		very unlikely
			2		unlikely
			3		occasionally
			4		likely
			5		very likely
			6		certain to use
11.	Approximately how long do you spend recording for EVP		0		Never record
	each week?		1		0-2 hours
			2		3-4 hours
			3		5-6 hours
			4		7-10 hours
			5		over 10 hours
			6		don't know
12.	Do you mainly record your EVPs only when alone, only		0		never record
	when you are with other people or in both situations?		1		alone
			2		with others
			3		both
			4		don't know
13.	Do you use white noise (such as the hissing sound		0		never record
	produced by a de-tuned radio or television) when you		1		yes
	record EVPs?		2		no
			3		don't know
14.	Do you have a psychic medium present when you		0		never record
	record your EVPs (either yourself or another person)?		1		sometimes
			2		always
			3		never
			4		don't know
15.	Do you hold regular sessions to record EVP (for		0		never record
	example once a week on the same day) or do you		1		regular sessions
	record to no fixed schedule?		2		no fixed schedule
			3		both
			4		don't know
16.	What made you begin recording for EVP? (please answer as fully as possible using the reverse side of this page if necessary)				

17. Why do you experiment for EVP?
(please answer as fully as possible using the reverse side of this page if necessary)

Please answer the following questions using the 7 point scale provided below. You may use any of the numbers between one and seven.

strongly disagree	disagree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

18.	To what extent do you think EVP is a paranormal phenomenon?		1	2	3	4	5	6	7
19.	To what extent do you think EVPs are misperceptions of normal (i.e. non-paranormal) sounds?		1	2	3	4	5	6	7
20.	To what extent do you think EVPs provides evidence that some aspect of personality survives bodily/physical death?		1	2	3	4	5	6	7
21.	To what extent do you consider EVP to be a scientific technique?		1	2	3	4	5	6	7

Please answer the following questions if you have heard what *you consider* to be a genuine EVP. If you have <u>never heard an EVP</u> you need not complete items 22 to 43 on this particular questionnaire.

22.	How many times have you experienced EVP that are		0		never
	personal to you (e.g., from a relative or friend)?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
23.	How many times have you experienced EVP that are		0		never
	from someone who, when alive, you have never met or		1		1-2 times
	known personally?		2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
24.	How many times have you experienced EVP that are		0		never
	from someone who would, when alive, be considered		1		1-2 times
	famous or a “household name” (e.g., an actor, royalty)		2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times

25.	How many times have you experienced EVP that was		0		never
	from someone who, at the time, you *knew* to be alive?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
26.	How many times have you experienced EVP that was		0		never
	from someone who, after the event, you *subsequently*		1		1-2 times
	learned was still alive?		2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
27.	How many times have you experienced EVP that was		0		never
	from someone who, after the event, you *subsequently*		1		1-2 times
	learned was **not** alive at the time of the EVP?		2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
28.	How many times have you experienced repeated contact		0		never
	from one EVP voice?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
29.	How many times have the EVP voices responded directly		0		never
	to your questions?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
30.	How many times have the EVP voices addressed you by		0		never
	your own name?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
31.	In your experience, approximately how long does a typical		0		less 1 second
	EVP last?		1		1-2 seconds
			2		3-5 seconds
			3		6-10 seconds
			4		11-20 seconds
			5		21-60 seconds
			6		61+ seconds

32.	Have you ever recorded EVPs that appear to be your own		0		never
	voice, but you are sure that you did not speak?		1		1-2 times
			2		3-5 times

			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times
33.	Have EVP voices ever responded to your commands		0		never
	or actions?		1		1-2 times
			2		3-5 times
			3		6-10 times
			4		11-20 times
			5		21-50 times
			6		51+ times

34. In what location(s) do you usually obtain EVP?
(please list as many locations as possible using the reverse side of this page if necessary; else write "not applicable")

35.	Do you record EVP in a controlled environment (e.g.,		0		never record
	shielded from radio waves?)		1		yes
			2		no
			3		don't know
36.	Have you ever had EVP communications that were not		0		never record
	human-like voices (for example animal communication)?		1		yes
			2		no
			3		don't know

Please answer the following questions using the 7 point scale provided below. You may use any of the numbers between one and seven.

strongly disagree	disagree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

37.	My EVP experiences have generally been positive and/or		1	2	3	4	5	6	7
	pleasant								
38.	EVP messages tend to be friendly		1	2	3	4	5	6	7
39.	EVP messages tend to include messages that are personal to		1	2	3	4	5	6	7
	me and/or specific to me personally								
40.	EVP messages tend to include messages that have deep *importance to* me personally (e.g., my own well-being)		1	2	3	4	5	6	7

41.	EVP messages tend to include messages that are important		1	2	3	4	5	6	7
	to other members of my paranormal investigation group								
	(e.g., personal to them)								
42.	EVP messages tend to include messages that are important		1	2	3	4	5	6	7
	to everyone in the world (e.g., the future of the human race)								
43.	My EVP experiences have generally been negative and/or		1	2	3	4	5	6	7
	unpleasant								