

FURTHER
APPLICATIONS AND
EXAMPLES OF
RESEARCH METHODS IN
PSYCHOLOGY

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1. MEMORY ACCURACY, BARTLETT, LOFTUS, AND THE PRECISION OF THE LABORATORY EXPERIMENT

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1.1. INTRODUCTION

The accuracy of memory has been studied at length. Recall is far from accurate. Two key figures in memory research, Frederic Bartlett (<http://www-bartlett.sps.cam.ac.uk/>) and Elizabeth Loftus (<http://faculty.washington.edu/eloftus/>), have shown in different ways and at different times that "To be mistaken about details is not the result of a bad memory, but of the normal functioning of human memory" (Loftus and Ketcham 1983). Bartlett was working inbetween the two world wars mainly while Loftus has been studying memory since the 1970s.

1.2. FREDERIC BARTLETT

For Bartlett, "Remembering is a function of daily life, and must have developed so as to meet the demands of daily life" (1932 p16). Thus memory is not perfect and the point is that it does not need to be.

The memory for events is not an objective recording with the individual needing to find the correct place for accurate recall. Information is distorted in the way that stories are passed from person to person:

..A, repeating the story of B, involuntarily introduces slight changes, perhaps replacing the name of an object which, he has rarely or never seen by that of some other object with which he is familiar. B carries on he same process, and in this manner, by means of a number of alterations, many of them apparently trivial in nature, the material is gradually reduced to a relatively fixed form.. (Bartlett 1920 p31).

Individuals are not deliberately changing details of the event for malicious reasons, but it is to make the

event easier to remember. The rough edges of details are recalled in smooth form. This was called "effort after meaning" by Bartlett. It can be seen with the use of material that is culturally different or material that is unclear. In other words, the event or material does not make full sense to the recaller.

Bartlett (1920) tested this idea using a folk story, "The War of the Ghosts"¹ (table 1.1), containing unusual and unfamiliar aspects which participants read twice in fifteen minutes, and with pictures studied for four minutes. The participants had to recall the material fifteen minutes later in different ways.

One night two young men from Egulac went down to the river to hunt seals and while they were there it became foggy and calm. Then they heard war-cries, and they thought: "Maybe this is a war-party". They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said: "What do you think? We wish to take you along. We are going up the river to make war on the people."

One of the young men said, "I have no arrows." "Arrows are in the canoe," they said. "I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."

So one of the young men went, but the other returned home. And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water and they began to fight, and many were killed. But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac and the young man went ashore to his house and made a fire. And he told everybody and said: "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried. He was dead.

(Source: Bartlett 1932 p65).

Table 1.1 - "The War of the Ghosts" story.

i) Repeated reproduction by the same individual

¹ He also used other stories like "The son who tried to outwit his father" from Africa.

The participant was asked to recall the material a number of times, but not given access to previous versions. Participants tended to recall specific phrases of the folk story which were maintained throughout the different versions even if the phrase was not important. Bartlett (1920) called this "the persistence of the trivial".

Each recall version of the story builds more on the individual's own earlier version rather than the original story. In other words, the individual is recalling their earlier recalls rather than the actual story.

ii) Social reproduction

The first individual recalls the original story, and the next participant recalls their version and so on. As the story is passed from individual to individual, it develops in a certain form relating to potency (relevance to the individual). "The under potent is omitted, the normally potent is reproduced; the over potent is not only reproduced, but may so dominate all the rest as to change the whole course of the narration" (Bartlett 1920 p34).

The under potent refers to (a) omission of the irrelevant, (b) omission of the unfamiliar, and (c) omission of the unpleasant.

a) Omission of the irrelevant - For example, ghosts appear as "a mere temporal incident" in "The War of the Ghosts" story but they are central in the story. In the recall, mention of ghosts is dropped almost immediately. It did not make sense to Western participants.

b) Omission of the unfamiliar - For example, more familiar words appeared in the recalls, like "boats" instead of "canoes", and "rowing" replaced "paddling".

c) Omission of the unpleasant - Modes of speech and incidents "somewhat opposed to modern conventions" disappeared from the recalls.

Information was also transformed with each reproduction. Three types of transformation were noted: familiarisation, rationalisation, and dominance. With the first two, "the form of the material is changed into something which can be readily accepted because it is familiar" (Bartlett 1920 p37). But rationalisation is "only partially - it might be said only lazily - on intellectual process" (Bartlett 1932 p85).

Dominance is where some word, phrase or event stands out and influences the whole recall.

Transposition also takes place during serial recall. This includes the recall of information in the wrong

place in a story.

These processes of change can be seen in an example. Bartlett (1920) recorded one chain of serial reproductions for the following part of "The War of the Ghosts" story:

But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac and the young man went ashore to his house and made a fire.

The first participant recalled this extract thus:

Then one of the warriors called to the young Indian and said: "Go back to the canoe, for you are wounded by an arrow". But the Indian wondered, for he felt not sick.

And when many had fallen on either side, they went back to the canoes, and down the river again, and so the young Indian came back to Egulac (p38).

The next participant recalling the first participant's version wrote this:

Then one of the warriors called out to the young Indian: "Go back home now for you are wounded". "No that is not so, for I feel no pain". But the warrior sent him back to the canoe, for he had been wounded by an arrow, though he could not be convinced of it, for he felt not sick (p38).

Each participant attempted to recall the previous version of the story until the eighth person who produced this version:

In the course of the fight farther on the Indian was mortally wounded, and his spirit fled. "Take me to my home", he said, "at Momapan, for I am going to die". "No, you will not die", said a warrior. Then in the fight farther on he was mortally wounded, so that his spirit fled. "I am going to die", he said. "Take me back to Mombapan". "You are not going to die", said the warrior (Bartlett 1920 p39).

The story has been transformed to make sense to the Western participants, including changing the names (eg: Egulac becomes Momapan or Mombapan).

One participant was asked about the story after six

and a half years, and replied: "Was it on a pilgrimage that they met a hostile party and one brother was slain" (Bartlett 1932 p77).

Edwards and Middleton (1987) drew out three themes from Bartlett's work on memory:

i) The unity of mentality

Bartlett was interested in the "activity of remembering" rather than simply in memory. "He conceived of remembering as a functional, affect-driven activity in which any distinction between the processes of perception, imagination, affect, understanding and motivation was essentially arbitrary" (p78). Bartlett (1932) felt that "in order to understand what we remember, we must set in relation to this how and what we perceive" (p15).

ii) Conventionalization

This is the process where the recalling of experience is rooted in a culture and involves the transmission of meanings through symbols (Bartlett 1958).

iii) Conversational discourse

Bartlett analysed the reported speech of participants in a way that was the forerunner of the discursive approach to remembering (Edwards and Middleton 1986).

Bartlett (1932) argued that:

The actions and reproductions of everyday life come largely by the way, and are incidental to our main preoccupations. We discuss with other people what we have seen, in order that we may value or criticise, or compare our impressions with theirs. There is ordinarily no directed and laborious effort to secure accuracy. We mingle interpretation with description, interpolate things not actually present, transform without effort and without knowledge (p96).

And in 1935, he said:

Remembering, as it occurs in everyday life, is chiefly a reconstructive function, serving the needs of the moment, and following the laws of construction of relevant schemes, or frameworks which have been built up out of past events

and reactions (p1).

Bartlett's work on memory has a number of key strengths and weaknesses (table 1.2).

STRENGTHS

1. Early large-scale reasonably systematic study of memory.
2. Study of memory in everyday life rather than just recall of numbers or single words, which is typical of experimental research.
3. Study of memory using the techniques of repeated reproduction and serial reproduction.

WEAKNESSES

1. His methodology was not rigorous in comparison to the laboratory experiment used later.

In some cases, Bartlett stopped students in the street in Cambridge and gave them "The War of the Ghosts" story, then tested their memory whenever he met them again. This meant that there were different time intervals between learning and recall ("Mindchangers" 2003; BBC Radio 4; <http://www.bbc.co.uk/radio4/science/mindchangers3.shtml>).

In fact, Bartlett (1935) was critical of laboratory experiments:

Recognised laboratory methods for the study of memory are artificial to a high degree. They assume that remembering is primarily a recapitulatory function.. (p1).

2. Bartlett was more interested in "cultural symbol formation" than in memory, so he was nearer to anthropology than experimental psychology (Edwards and Middleton 1987). For example, serial reproduction is similar to how information is passed on in oral cultures.

3. His research is claimed by both cognitive psychologists and social psychologists as pioneering work for their disciplines: "These two traditions have, ironically, reconstructed Bartlett in their own image" (Edwards and Middleton 1987 p78).

Table 1.2 - Key strengths and weaknesses of Bartlett's work on memory.

1.3. ELIZABETH LOFTUS

Over more than thirty years Elizabeth Loftus has studied the accuracy of memory for events (as in eyewitness testimony) using laboratory experiments. She has also shown how information after the event and misleading questions can affect the memory. This is now called the "misinformation effect" (Loftus 2005).

Here are the details of two classic studies of the

many done by Loftus.

1.3.1. Loftus (1975)

This is a report of four experiments with 490 participants at the University of Washington on how the wording of questions asked immediately after an event can influence recall later.

Experiment 1

One hundred and fifty students saw a one-minute videotape of a car ("Car A") turning into a stream of traffic and causing a collision. This was followed by a ten-item questionnaire including the key question, "How fast was car A going when it ran the stop sign?" or "How fast was car A going when it turned right?" (the variations in the question was the independent variable). The dependent variable was the last question on the questionnaire - "Did you see a stop sign for car A?" - with the choice of "yes" or "no" responses.

Of the "stop sign" question group, 53% answered "yes" and 35% in the other group (a significant difference, $p < 0.05$). Recall was influenced by post-event information.

Experiment 2

Forty students were shown a three-minute videotape of a class being disrupted by eight demonstrators. In the subsequent twenty-item questionnaire, the key question asked, "Was the leader of the four (or twelve) demonstrators who entered the classroom a male?". The memory test was one week later, and included a question about the number of demonstrators. The "12 demonstrators" group recalled an average of 8.85 demonstrators in the videotape compared to 6.40 in the "4 demonstrators" group (significant at $p < 0.01$). False information after the event can influence recall of numerical facts.

Experiment 3

One hundred and fifty students watched a videotape of a car accident followed by a ten-item questionnaire. There was no barn in the film, but participants were asked either, "How fast was the white sports car going when it passed the barn while travelling along the country road?" or "How fast was the white sports car going while travelling along the country road?". At the memory test one week later, the key question was "Did you see a barn?".

Of the "barn" group, 17.3% replied "yes" compared to 2.7% for the other group (a significant difference at $p < 0.01$). This showed that post-event information can produce recall of a non-existent object for a small number of participants.

Experiment 4

One hundred and fifty students watched a three-minute film taken from inside a car which collides with a pram pushed by a man. The participants were divided into three groups for the subsequent forty-five-item questionnaire. Five questions were asked about non-existent objects (a school bus, a truck, a centre line in the road, and a barn) and false information (a woman pushing the pram).

Group 1 were asked directly (eg: "Did you see a school bus in the film?"), group 2 were asked indirectly ("false presupposition") (eg: "Did you see the children getting on the school bus?"), and group 3 did not have those five questions (control group). In the memory test, one week later, the "false presupposition" group were significantly more likely to recall non-existence objects in the film on all five questions, like a school bus (26% of group) compared to 12% of group 1 and 6% of the control group. Overall, 29.2% of group 2 recalled false information as opposed to 15.6% (group 1) and 8.4% (group 3).

Table 1.3 summarises the main findings of the experiments by Loftus (1975).

EXPERIMENT	KEY FINDING
1	Recall influenced by post-event information
2	False post-event information can influence recall of numerical facts
3	Post-event information can produce recall of a non-existent object
4	Wording of the post-event information can produce recall of non-existent objects

Table 1.3 - Summary of findings by Loftus (1975).

1.3.2. Loftus et al (1978)

Loftus et al (1978) reported a number of experiments using a standardised procedure to see how information supplied after the event influences recall. Over 1200 participants were used from the University of Washington.

Basic Procedure

1. Participants shown event - In this case, thirty slides of a car accident, for approximately three seconds each, where a red Datsun knocks down a pedestrian.
2. Detail varied between two conditions - One group shown the slides of the car stopping at a "stop" sign, and the other group saw a "give-way" sign.
3. Immediate recall test of twenty questions including one question that is misleading for the experimental group (eg: asked "Did another car pass the red Datsun while it was stopped at the 'stop sign'? when "give-way" sign in slide seen; misleading information) and correct for the control group.
4. Filler activity for approximately twenty minutes. The use of such a task has strengths and weaknesses (table 1.4).
5. Recognition test with fifteen pairs of slides (for approximately eight seconds each) - one old and one new slide. The focus is upon whether the experimental group recalled the sign seen or the one added after the event by the misleading question.

STRENGTHS

1. Distract participants and stop them from deliberately concentrating or remembering information, or holding information in short-term memory.
2. Often such distraction occurs in real-life eyewitness situations.
3. Helps participants to clear their minds and relax before the next stage of the experimenter and to avoid interference from new information presented too closely to the previous information. It is a kind of "natural mental barrier".

WEAKNESSES

1. The filler tasks are usually very dull and not like real-life (eg; counting backwards in threes from 999).
2. It makes the experiment last longer and adds extra demands of the participant which can produce fatigue or boredom later (during a more important part of the experiment).
3. Experiments that do not use a filler task can be shorter and focus upon the independent and dependent variables more.

Table 1.4 - Strengths and weakness of using a filler task in an experiment.

Experiment 1

One hundred and ninety-five students divided into ninety-five in the control group and one hundred in the experimental group. The control group recognised the correct slide ("give-way" or "stop" sign) 75% of the time, and the experimental group 41%. This was a significant difference ($p < 0.001$). Misleading information after the event reduces the accuracy of recall.

Experiment 2

The researchers were concerned that participants in the experimental group may have noticed the misleading question and, because of "demand characteristics", gave the wrong answer to "please" the experimenter. So a third group was added to the experiment with the question, "Did another car pass the red Datsun while it was stopped at the intersection?". There was no reference to a sign. Participants were also asked if they had noticed the misleading question.

Accuracy of recognition of the key slide was 70% for consistent information (21 out of 30 participants), 43% for misleading information (13 of 30) and 63% for the no reference to a sign group (19 of 30). Only 12% of the misleading information group admitted to saying the sign that was on the questionnaire when they knew it to be wrong.

Experiment 3

This experiment varied the length of time between the misleading information and the recognition test, and between the original slides and the misleading information. Intervals of twenty minutes, two days, and one week were used.

When the questionnaire was immediately after the slides and then an interval before recall, longer intervals produced better accuracy for the misleading information group (46% correct after one week). But recall accuracy declined for that group when the questionnaire was presented after an interval (31.5% correct after one week): "Presumably, the weaker the original trace, the easier it is to alter" (p25).

There are strengths and weaknesses related to immediate or later recall of information (table 1.5).

IMMEDIATE RECALL TEST

Strengths

1. Tests memory in short term.
2. Participants do not have to return to laboratory in future.

Weaknesses

1. Only tests memory over a few minutes or hours.
2. Dependent on how participant feels on that day including if tiredness or boredom sets in with a long experiment.

RECALL TEST AFTER TIME INTERVAL

Strengths

1. Test memory over longer term.
2. Time between learning and recall can be varied and used as the independent variable.

Weaknesses

1. Requires participants to return to laboratory again which risks drop-out and thus loss of data.
2. Not possible to control what happens inbetween learning and recall, like participants talking about what happened.

Table 1.5 - Strengths and weaknesses of an immediate recall test and a recall test after a time interval.

Experiment 4

Recall of information was tested in a different way here. Participants were asked to draw details that they recalled of the slides either on a blank road map or one showing the position of the car. Recall of the correct sign, irrelevant of the post-event question, was better for the latter drawing. This was because the drawing of the position of the car focused the participant's attention on the road junction, and consequently the sign.

Experiment 5

This experiment used new stimulus material - 20 colour slides of a car backing into a pedestrian in a car park. The critical slide involved a pair of skis leaning against a tree or a shovel there. Accuracy of recall, after ten minutes, was 55.3% for the misleading information (experimental) group and 70.8% where no object mentioned in the question.

The purpose of this experiment was to check if the earlier findings generalised to other stimulus materials and were a principle of memory rather than a facet of the earlier experiment.

Table 1.6 summarises the five experiments.

EXPERIMENT	NUMBER OF PARTICIPANTS	CONDITIONS
Pilot study	129	Misleading question vs correct question immediately after slides
1	195	As pilot study
2	90	Misleading question vs correct question vs no reference to sign in question immediately after slides
3	648	i) As 2 but time interval between question and recognition test ii) As 2 but time interval between slides and question asked
4	90	Misleading question/correct question recall using blank map or containing position of car
5	80	As 2 with new stimulus material

Table 1.6 - Details of five experiments by Loftus et al (1978)

1.3.3. Loftus and Palmer (1974)

Loftus and Palmer (1974) reported two experiments which showed how the wording of the question can influence recall of information based on estimates as well as non-existent objects.

Experiment 1

Seven films from the Evergreen Safety Council and the Seattle Police Department depicting a traffic accident were shown to forty-five students. The films lasted between 5-30 seconds. Participants were asked to "give an account of the accident you have just seen" and to answer specific questions. The most important was, "About how fast were the cars going when they ___ each other?". The blank space used a different word (which was the independent variable) for the nine participants in each of the five conditions - hit, smashed, collided, bumped, or contacted.

The speed of the cars in four of the films were known by the experimenters as they were staged crashes. One collision took place at 20 mph and the mean estimate of speed by the participants was 37.7 mph. The other collisions were 30, 40 and 40 mph, and the mean estimates were 36.2, 39.7 and 36.1 mph respectively. Firstly, this research showed that estimates of speed from memory are generally poor.

Secondly, the word used to describe the crash distorted the estimates of speed further. The mean estimate of speed for "smashed" was 40.8 mph, "collided" 39.3 mph, "bumped" 38.1 mph, "hit" 34.0 mph, and "contacted" 31.8 mph. The estimate of speed based on the wording of the key question was the dependent variable.

Experiment 2

One hundred and fifty students saw a one-minute film of a multiple car accident (which lasted for four seconds). The students were given a post-film questionnaire similar to experiment 1. This time there were only three conditions - a control group who were not asked about the speed, and the question, "About how fast were the cars going when they hit (or smashed into) each other?".

One week later the participants were given ten questions about the film. The key question asked, "Did you see any broken glass?" (when there was none). The wording of the speed question influenced how many participants recalled broken glass - 32% for the "smashed" group, 14% for "hit", and 12% in the control group. The chi-squared (X^2) test score was 7.76 ($df = 2$) and significant at $p < 0.025$. There are strengths and weaknesses in using the chi-squared test to analyse the data here (table 1.7).

STRENGTHS

1. Best non-parametric statistical test from limited number available for nominal data (ie: yes or no answers).
2. Can be used with multiple categories (six in this case: 3 groups x two words).
3. Easier to code and calculate than many other statistical tests.

WEAKNESSES

1. Not as powerful or sensitive to data as parametric tests.
2. Care needs to be taken in interpreting the results of the statistical test when more than four categories of data involved. The chi-squared test shows the results (observed frequency) are different

to chance (expected frequency) not necessarily that they are in the direction the hypothesis predicts.

3. It is of limited use with small samples (less than twenty participants). But this is not a problem for Loftus and Palmer.

Table 1.7 - Strengths and weaknesses of using the chi-squared statistical test to analyse the data.

The word used in the question influenced the estimate of speed and the perception/recall of the event. For example, of those who gave the highest estimate of speed (16-20 mph) in response to "smashed", 62% said "yes" to broken glass and the remainder "no". "Smashed" suggested that there must be broken glass. Furthermore, for those participants who estimated the speed as 6-10 mph, 27% of the "smashed" group recalled broken glass compared to only 9% of the "hit" group for the same speed.

Loftus and Palmer explained the results thus:

..the subject first forms some representation of the accident he has witnessed. The experimenter then, while asking "About how fast were the cars going when they smashed into each other?" supplies a piece of external information, namely, that the cars did indeed smash into each other. When these two pieces of information are integrated, the subject has a memory of an accident that was more severe than in fact it was. Since broken glass is commensurate with a severe accident, the subject is more likely to think that broken glass was present (p588).

Loftus and Zanni (1975) showed that varying the word "a" or "the" can influence memory using the question, "Did you see a/the broken headlight?".

1.3.4. Powers, Andriks and Loftus (1979)

Powers et al (1979) reported two experiments showing gender differences in susceptibility and resistance to suggestion to misleading post-event information.

Experiment 1

Twenty-five female and 25 male undergraduates from the University of Washington were presented with twenty-four slides (each for five seconds) showing the theft of a red wallet.

The slide sequence opens with a young woman walking down a busy street. She meets a friend and stops to talk for a moment. As the woman continues down the street, she is approached by a man wearing a cowboy hat who bumps into her, causing her to drop her shopping bag. The man and woman both stoop to pick up some articles that had fallen out. When the woman is looking the other way, the man reaches into her shoulder bag and takes her wallet. The woman does not notice and the two part. Soon, the victim becomes aware that her red wallet is missing, at which point two other women cross the street toward her and gesture in the direction of the fleeing man (p341).

This was followed by a filler task which involved naming various colours on a chart.

Next the participants completed a thirty-item multiple-choice questionnaire about the slides including questions about the clothes worn and actions of the central characters; eg: "The victim's friend was carrying ___ ; (a) a newspaper, (b) a shopping bag, (c) a notebook, (d) an umbrella, (e) none of the above" (p341). For each question participants rated their confidence about their accuracy on a scale of 1-3. The questionnaire had been piloted previously with one hundred other undergraduates.

The participants returned next day to the laboratory and read a "suggestibility paragraph" (ie: misleading information). They were told that this was another person's recall and the task was to proofread it. There were two versions of the paragraph containing the correct information about four facts from the slides (eg: victim's friend had a green notebook) or a misleading version (eg: blue notebook). A ten-minute filler activity preceded the final twenty-item recall test for the slides.

The experimenter group gave an average of 1.56 erroneous answers out of four (ie: recall of misleading information) compared to 0.16 for the control group ($p < 0.001$). Put another way, the control group were correct on these four items significantly more than the experimental group. The accuracy of recall was not linked to intelligence (as measured by a pre-university IQ test - Washington Pre-College Test) nor was suggestibility.

Significant gender differences were found in accuracy of recall for type of information. Women were more accurate in recall of women's clothing and appearance in the slides whereas men were better about the thief's appearance and the surroundings. However, there were more "male" items than "female" items tested.

Experiment 2

One hundred and fifty male and one hundred and fifty female students were tested this time. "The slide sequence used in Experiment 2 opens with a group of people sitting together on the grass. A man and a woman leave the group and begin walking through a parking lot where they spot two individuals who are apparently fighting with each other. The man rushes in to stop the fight while the woman goes off to a phone booth, apparently calling for help" (p344).

The procedure followed experiment 1, but the emphasis was upon equal number of questions on "male" items (eg: buildings) and "female" items (eg: clothing). Female participants recalled accurately more "female" items (77% vs 51%), and male participants "male" items (57% vs 73%). In terms of suggestibility to misleading information, female participants were suggestible on "male" items and the opposite for male participants.

The results can be explained by the fact that "individuals are more readily influenced to the extent that they lack information about a topic or regard it as trivial and unimportant" (Eagly 1978 p96).

1.3.5. Loftus Generally

The planting of information after the event has been found in real-life events. For example, Nourkova et al (2004) induced the recall of wounded animals after a terrorist bombing in Russia in 12.5% of Moscow University student participants when there had been none.

Recently, the misinformation effect experiments have been performed on participants during neuroimaging to show the brain activity involved (eg: Okado and Stark 2005).

Loftus (2005), reviewing thirty years of research, drew a number of conclusions about the misinformation effect from experimental work:

- a) Misinformation is more effective if introduced after a period of time;
- b) Warning people that there is/will be misinformation can increase the resistance to false information in some cases;
- c) Young children and the elderly are more susceptible to misinformation.

Loftus's work has a number of key strengths and weaknesses (table 1.8).

STRENGTHS

1. Detailed set of experiments which isolate variables in order to establish cause and effect.
2. Each set of experiments develops previous findings through control of the research situation. The refining of the experiments to remove any problems.
3. The transparency of the detail allows full replication.
4. A large number of participants have been used in all the experiments.
5. Able to show precisely how memory for events can be influenced by misleading questions.
6. Influential in showing that memory is not a simple recording of events but a reconstructive process

WEAKNESSES

1. Not real-life events used. Individuals will respond differently to seeing a real event to pictures or films. Also there is no emotional involvement by the witnesses as there would be with a real event.
2. The participants used were mostly students, and many of them were "forced" into participating for course credits.
3. Some aspects of the experiment are hard work for the participants (eg: 45 questions about a 3-minute film in Loftus 1975 experiment 4). Fatigue and boredom may influence their concentration levels and possibly memory.
4. The experiments study individual memory whereas most people talk about what they have seen with others in real-life witness situations.
5. Some variables were not controlled. For example, in the experiments involving one week between seeing the film and recall, no control over whether the participants talked about the experiment despite being told not to do so.
6. Only some participants are misled by false information, but most recall the correct information.

Table 1.8 - Key strengths and weaknesses of Loftus's experiments on memory.

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2. PSYCHOLOGY STUDENTS AS PARTICIPANTS IN PSYCHOLOGICAL RESEARCH

- 2.1. Students as Participants
- 2.2. Coerced Participants
- 2.3. References

2.1. STUDENTS AS PARTICIPANTS

Students generally have been the main source of participants for psychological research over many years. Valentine (1982) believed it was over three-quarters of research. While Kimmel (1996) estimated that 70% of studies in personality and social psychology, and 90% of cognitive psychology studies used students as participants. Their abundant use has led to the tag of "human fruit flies" (Rubenstein 1982).

Students are a minority group and make up less than 5% of the population. Thus the use of students in such situations produces sampling and participant bias into the research.

Sears (1986) notes how students vary from the general population:

- Their self concept may not be fully formed;
- Their social and political attitudes may be less crystallised;
- They may be more egocentric;
- They may have a stronger need for peer approval;
- They may have unstable peer relationships.

Also their intelligence is higher than the average.

When I looked at articles published in the "British Journal of Social Psychology", in 1991 73% of all participants were students (Brewer 2001a) and 60% in 1998 (Brewer 2001b).

2.2. COERCED PARTICIPANTS

It is not only that psychological research uses students, but that often the students (particularly psychology ones) did not have a choice (ie: coerced to participate). Menges (1973) calculated that 40% of participants in studies published in 1971 were psychology

students as part of their "course requirements".

Sieber and Saks (1989) reported that only about 40 of 366 US psychology departments used wholly voluntary student participants. The remainder were not forced to participate, but the choice to not participate was framed in negative terms:

The bottom line is that students learn very quickly that their departments want them and expect them to participate in research. This expectation, whether communicated implicitly or explicitly, may lead them to fear that their course tutors will downgrade them or penalise them in some way for not accepting the department's preferred option and research culture (Foot and Sanford 2004 p257).

If psychology students do agree to participate in departmental research, do they have the right to withdraw in a real sense?

Exercising the right to withdraw is difficult for students who probably still have to face and interact with the staff involved in the research, however, "relaxed" those staff members may appear to be about the withdrawal (Foot and Sanford 2004 p258).

Coerced participants may be more likely to sabotage the research, particularly by seeking to disrupt what they think are the expected findings (the "screw you" effect; Masling 1966). The opposite to "demand characteristics".

Table 2.1 outlines the advantages and disadvantages of using psychology students in psychological research.

ADVANTAGES

1. Convenient for university-based researchers.
2. Large numbers of students easily available.
3. Expensive and time-consuming finding non-student participants.
4. Students often more willing to participate in research than the general population because they are used to research taking place.
5. Psychology students experience research from both sides (as a participant here and as a student researcher later).

DISADVANTAGES

1. Students are not typical of the general population in terms of age, intelligence or social class, for example. This challenges the generalisability of findings from students to the general population.
2. Many students have to take part in research as a course requirement (especially in the USA).
3. Often students are recruited for research through opportunity sampling which risks being even more unrepresentative of the general population as well as the student population.
4. Students coerced to participate in research may be difficult (eg: the "screw you" effect).
5. Even with students volunteering for research, those who volunteer may not be typical of the general population (Brewer 2005).

Table 2.1 - Advantages and disadvantages of using psychology students as participants in psychological research.

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3. THE DIFFUSION OF RESPONSIBILITY AND BYSTANDER INTERVENTION AND APATHY: COMMONSENSE AND EXPERIMENTAL PSYCHOLOGY

- 3.1. Introduction
- 3.2. Darley and Latané (1968)
 - 3.2.1. Evaluation
- 3.3. References

3.1. INTRODUCTION

Bystander intervention is a term used to refer to whether individuals help in emergencies, and when they do not, it is known as bystander apathy.

Diffusion of responsibility (and blame) occurs when, at an emergency situation in front of many people, "each individual feels less responsible for taking action than they would if they were the only person available to help" (Burr 2007 p163). In other words, the more people present, the less likely an individual is to help. This is contrary to commonsense.

In New York city in 1964, Kitty Genovese was murdered by Winston Mosely in the early hours of the morning. What made this case memorable was that thirty-eight witnesses heard or saw part of the event, but nobody came to help her or even called the police (Rosenthal 1964) ².

This produced a mass response in the New York newspapers of the time as to the reason for bystander apathy. "Preachers, professors, and news commentators sought the reasons for such apparently conscienceless and inhumane lack of intervention. Their conclusions ranged from 'moral decay', to 'dehumanisation produced by the urban environment', to 'alienation', 'anomie', and 'existential despair'" (Darley and Latané 1968).

The many suggestions for the lack of aid to Kitty Genovese are "commonsense explanations" not based on any evidence or theory, while experimental psychology is different to that (table 3.1). Legge (1975) made the distinction between formal ("professional", scientific) and informal ("amateur", non-scientific) psychology.

Psychology has often been criticised for being no more than "glorified commonsense". Gross (1992) wryly observed:

² Manning et al (2007) argued that there is no evidence for three key features of the Kitty Genovese that commonly appear in social psychology textbooks: that there were 38 witnesses, that the witnesses all watched the attack, and that the witnesses did not intervene.

COMMONSENSE EXPLANATIONS	EXPERIMENTAL PSYCHOLOGY
<ul style="list-style-type: none"> - Unsystematic set of ideas. - Hard to check because ideas change suddenly or are inconsistent. - Many commonsense explanations contradict themselves. For example, the proverb, "many hands make light work" is contradicted by the saying, "too many cooks spoil the broth". - Usually based on personal experiences and observations. - Subjective and bias based on an individual's prejudices and distortions. - Can be hard to change and individuals will hold beliefs despite contrary evidence. - Tends to support the norms and values of the time. 	<ul style="list-style-type: none"> - Organised theories of behaviour. - Theories can be tested by experiments and so is evidence-based. - Theories that contradict can be compared by experiments to establish which is correct. If this cannot be established, then experiments can show in what situation each theory holds true. - Uses data from many sources/methods and individuals as one individual's experiences are limited. - Experiments attempt to remove subjectivity and bias with rigorous controls to gain objective results. - Theories that are falsified are adapted or disregarded. - Can be counter-intuitive and produce contrary findings to

Table 3.1 - Key differences between commonsense explanations of behaviour and experimental psychology.

A common reaction among psychology students, when discussing the findings of some piece of research, is to say "But we knew that already" implying that "It's only common sense". Alternatively, they might say "But that's not what we normally understand by such-and-such", implying that the research is in some way wrong. So it seems that psychology is often in a "Catch-22" position - either it merely confirms common sense or it contradicts it, in which case psychology seems to be the less credible (p19).

3.2. DARLEY AND LATANÉ (1968)

Darley and Latané (1968), after reading of the murder of Kitty Genovese, set up an experiment to test the diffusion of responsibility.

They used fifty-nine female and thirteen male psychology students at New York University. The participants were placed individually in a small room with a microphone and a pair of headphones. They were led to believe that other individuals were in similar rooms

only in contact by the microphone. The task was to discuss the experiences of adjusting to New York city and university life. In fact, the participant was listening to a pre-recording of others talking.

Darley and Latané created an emergency by the speaker in another room apparently seeming to have an epileptic seizure. The researchers varied the number of people that the participant believed also heard the fit as either two (victim and participant), three or six. The make-up of the supposed groups was varied as female or male. The decision to help by the participants was recorded as to whether they left their room in search of other people within six minutes of the fit.

Significantly more participants responded to help, and quicker, in the two-group condition than the other conditions (table 3.2).

The make-up of the supposed group did not influence the decision to help (ie: no gender differences).

CONDITION	PARTICIPANTS RESPONDING TO HELP (%)	MEAN RESPONSE TIME (secs)
2 person	85	52
3 person	62	93
6 person	31	166

(After Darley and Latané 1968)

Table 3.2 - Summary of results from Darley and Latané (1968).

Darley and Latané explained the behaviour of helping or not in terms of an avoidance-avoidance conflict. A conflict between concern "not to make fools of themselves by overreacting, not to ruin the ongoing experiment by leaving their intercom, and not to destroy the anonymous nature of the situation which the experimenter had earlier stressed as important" and "the guilt and shame they would feel if they did not help the person in distress". In the two-person condition, the latter aspect is more important and individuals help. In the larger group conditions, the cost of not helping is less, and the conflict remains which inhibits the motivation to help.

3.2.1. Evaluation

1. Ethics of the study

All but two of the participants were surprised to find out after the experiment that the epileptic seizure was simulated. The responses of the participants were

recorded on the microphone and showed genuine concern, like "My God, he's having a fit" or "Oh God, what should I do?". Participants whether they helped or not showed signs of nervousness including trembling hands and sweating palms.

This study, then, caused the participants distress as well as deceiving them. In a post-experimental questionnaire, participants were positive about their experiences of the experiment.

2. Situational basis to bystander intervention and apathy

This study along with others by Latané and Darley (eg: 1970) showed that the decision to help in an emergency is influenced by situational factors, like the presence of other people. It challenged the "commonsense explanations" for the failure to help Kitty Genovese that included "moral decay", "depersonalised by living in the cold society" or personality variables like "psychopaths".

Darley and Latané (1968) concluded:

The explanation of bystander apathy may lie more in the bystander's response to other observers than in presumed personality deficiencies of "apathetic" individuals. Although this realisation may force use to face the guilt-provoking possibility that we too might fail to intervene, it also suggests that individuals are not, of necessity, "non-interveners" because of their personalities (p383).

3. Experimental situation

Studying bystander intervention and apathy in a laboratory experiment has both advantages and disadvantages. The advantages include control of incident variables that may "contaminate" the results, and the ability to establish cause and effect. But the main disadvantage is that the study is artificial and it is not a real-life event.

In particular, Cherry (1995) argued that this research in relation to Kitty Genovese's murder was "stripped of its original gendered parts, that is, an attack on a woman was no longer an essential component in the laboratory exploration of what the event meant". In other words, Kitty Genovese was attacked in a society at a time when little was done to stop violence against women. In fact, one of the onlookers admitted not wanting to get involved because they thought it was a "lover's quarrel" (Rosenberg 2004). Laboratory experiments cannot capture this "social embeddedness".

The experiment with its concern with "a dispassionate detachment from the research material and from individual participants; instead of producing 'objectivity' it is argued that scientific language and experimental procedure serves only to mask the values and assumptive world of the researcher" (Burr 2007 p186).

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4. A DIARY STUDY OF FACE RECOGNITION: YOUNG ET AL (1985)

- 4.1. Introduction
- 4.2. Method
- 4.3. Results
- 4.4. Discussion
- 4.5. Evaluation
- 4.6. References

4.1. INTRODUCTION

Young et al (1985) were interested in collecting data about face/person recognition in real-life. Face or person recognition involves the feeling of recognition or familiarity about a person or face, and the retrieval of information about the person/face including their name. Failure during either part produces a recognition error or difficulty.

4.2. METHOD

Twenty-two participants were recruited at Lancaster University, of which half were male and half female. They were recruited by advertisement for the eight-week study. The participants were asked to record, as soon as possible after it happened, details of any errors or difficulties in recognising/identifying another person under the following headings:

- Type of incident;
- Source - Information, like facial features, available at the time of the incident;
- General details - eg: person in mass media, state of participant at the time of the incident;
- Person involved - How well the person known on a scale of 1 (unknown) to 5 (very well known);
- Way incident ended - ie: able to recognise person eventually or not;
- Person details available - Information that could not be recalled about the person.

The first week of the study was treated as training and the 140 records collected were not analysed.

4.3. RESULTS

Over the seven-week period of the study, 922 completed records of errors and difficulties in face/person recognition were collected. These incidents were divided into seven principal types (with 23 incidents as "other"). A set of 86 records of "resemblance only" were treated separately.

1. Person unrecognised

Failure to recognise a familiar person (114 incidents); eg: "I was going through the doors to B floor of the library when a friend said 'Hello', I at first ignored him, thinking that he must have been talking to the person behind me" (p500).

Most of these incidents were in good viewing conditions (82%), and lasted a short time (58% over ten seconds before recognition). Many were highly familiar people (42% of cases), often seen (38%), and expected to see (28%). Only 31% of these incidents related to the mass media.

2. Person misidentified

One person mistook for another (314 incidents). This category was divided into two subtypes:

a) Unfamiliar person misidentified as a familiar person

For example, "I was waiting for the phone. A lot of people were walking past. I thought one of them was my boyfriend" (p505). This type of mistake was most associated with poor viewing conditions (55% of cases), but were corrected quickly (69% in ten seconds or less).

b) One familiar person misidentified as another

For example, "I was looking for Dennis Hay. I went into computer room 1 and started speaking to a person sitting with his back to me. He turned round and I saw it was not Dennis, but one of the technicians" (p505).

This type of mistake was not due to poor viewing conditions, and it was more often related to people known through the mass media.

3. Person seemed familiar only

The person's appearance, name, voice, or other characteristics seemed familiar, but not able to recall any other information about the person (233 incidents). This situation ended in three ways:

a) Familiar person successfully identified;

b) Incident not ended when record made; eg: "I didn't recognise her till she spoke; then I recognised the voice as familiar. I've no idea who she was" (p507).

c) Person found to be unfamiliar; eg: "I just thought the person looked familiar, as she waved, and I thought it was at me. I waved back, then realised I didn't know her. She was waving at someone else" (p508).

4. Difficulty in retrieving full details of person

Able to remember more information that type no.3 but not full recognition (ie: person's name)(190 incidents). This was either successfully resolved or not. In both cases, participants were able to recall details of occupation and where last seen, but with the successfully resolved cases, the participants were able to recall the voice and more details of the appearance.

5. Not sure if it was a particular person or not

Participants were unable to decide if they had correctly identified a person (35 incidents). This was divided into:

a) Not sure if a particular familiar person, or unfamiliar;

b) Not sure which of two familiar people it was.

6. Thought it wasn't the person it was

Four incidents were recorded where participants encountered an unfamiliar person who seemed to resemble a person they knew, but it was actually the familiar person; eg: "I was going into the paper shop in Alexandra Square. A person in shop looked very like a friend who I know very well. I was sure it wasn't him because I thought he was abroad. After a minute in the shop I realised it

was him and not just a lookalike. I was very surprised" (p511).

7. Wrong name given to person (9 incidents).

Table 4.1 summarises the most common characteristics of each of the main types of face/person recognition error/difficulty.

1. Person unrecognised - 21 of 22 participants reported a case; occurred with highly familiar people in 42% of cases; had to be told who it was in 40% of cases.
2. Person misidentification - all participants reported a case.
 - a. Unfamiliar person misidentified as a familiar person - occurred in poor viewing conditions in 55% of cases; quick resolution (69% in less than ten seconds).
 - b. One familiar person misidentified as another - high certainty about identification despite being wrong in 62% of cases.
3. Person seemed familiar only - all participants recorded a case.
 - a. Familiar person successfully identified - 87% of cases involved people not highly familiar and 83% not seen often; information retrieved without help in 64% of cases.
 - c. Person found to be unfamiliar - quick resolution in 71% of cases; information retrieved without help in 65% of cases.
4. Difficulty in retrieving full details of person - most participants (19) reported a case with 47% related to the mass media. Where successfully resolved, it involved individuals seen often in 34% of cases.

Table 4.1 - Characteristics of main types of face/person recognition errors/difficulties.

4.4. DISCUSSION

The results showed that different types of errors and difficulties occur in recognising people, and "tend to emphasise the point that different kinds of information are used to form a highly integrated person identification system.." (Young et al 1985 p515).

Young et al (1985) used this data in their model of person recognition which involves (figure 4.1):

- Recognition units (RU)(or face recognition units) whose function is to indicate how closely a characteristic of the person observed resembles someone familiar. These units are aided by the other two elements of the model.
- Person identity nodes (PIN) - Each known person has a PIN which contains specific information about him (eg: face, hair, voice).

- Additional information stores - Separate stores containing details of the person's name, and additional information about them like occupation.

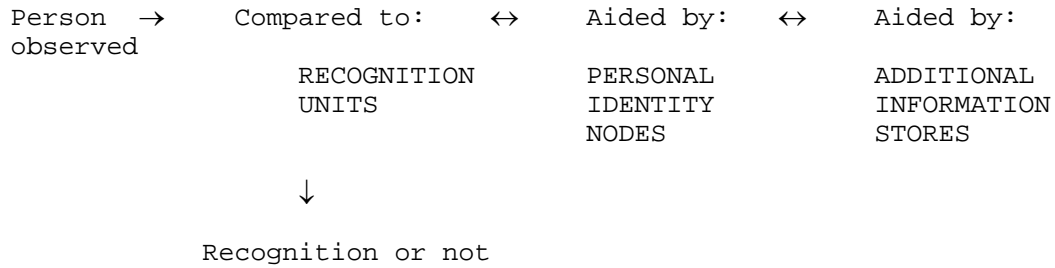


Figure 4.1 - Main details of Young et al's (1985) model of person recognition.

Young et al (1985) applied their model to the errors and difficulties in recognition from participants' diaries to explain how they happened (table 4.2).

4.5. EVALUATION

The Young et al (1985) study used the diary method. Table 4.3 lists the specific and general advantages and disadvantages of this diary study.

TYPE OF ERROR/DIFFICULTY	WHERE PROBLEM OCCURS IN MODEL
1. Person unrecognised	Failure to trigger RU/FRUs
2a. Person misidentified: Unfamiliar person misidentified as familiar	Triggers RU/FRUs and accepts as that person because poor viewing conditions or high resemblance
2b. Person misidentified: One familiar person misidentified as another	RU/FRUs triggered and information from wrong PIN accessed
3a. Person seemed familiar only: Familiar person successfully identified	"Block" in link between RU/FRUs and PINS; "block" resolved
3b. Person seemed familiar only: Incident not ended when record made	"Block" in link between RU/FRUs and PINS; "block" unresolved
3c. Person seemed familiar only: Person found to be unfamiliar	Similar to 2a above
4a. Difficulty in retrieving full details of person: resolved	Difficulty retrieving from Additional information stores, but overcome
4b. Difficulty in retrieving full details of person: unresolved	Difficulty retrieving from Additional information stores, but not overcome
5a. Not sure if it was a particular person or not: Not sure if particular familiar person, or unfamiliar	Conflicting PIN or not because person seen in different context to usual
5b. Not sure if it was a particular person or not: Not sure which of two familiar people it was	Conflict between PINS
6. Thought it wasn't the person it was	Correct PIN "over-ruled" inappropriately
7. Wrong name given to person	Errors in retrieval from Additional information stores

Table 4.2 - Types of face/person recognition errors/difficulties and where problem occurs in Young et al (1985) model.

ADVANTAGES

1. Many studies of face recognition tend not to use real-life cases, but are artificial laboratory experiments.
2. This study looked at person recognition rather than just face recognition because "the use of facial and non-facial cues is so thoroughly integrated in everyday person recognition that it is not advisable to try to study them in isolation" (Young et al 1985 p496).
3. Collected both quantitative and qualitative data.
4. Took place over reasonable length of time - two months.
5. Allowed participants to describe their experiences in their own words.
6. Participants were asked to record details of the incident immediately afterwards to overcome memory problems of recording the information much later.
7. Used standardised categories for recording qualitative data.
8. This study attempted to find real-life data to support a experiment-based model of face recognition by Hay and Young (1982).

DISADVANTAGES

1. Volunteer bias (Reason and Lucas 1984) - People volunteer for the study who think they are "particularly prone to the cognitive failure being investigated" (Young et al 1985).
2. Selection bias (Reason and Lucas 1984) - "not all the errors made will come to subjects' attention, and they are also more likely to record those they think noteworthy" (Young et al 1985). Recording bias may occur as "what is recorded is influenced by the record-keeper's own theory as to why it occurred" (Young et al 1985).
3. The diary study does not have the rigour of the laboratory experiment.
4. Not a particularly large sample used (n = 22), and most of them were students. All were aged between 20-40 years.
5. Qualitative data can be difficult to compare between diarists.
6. Participants know that someone will read their diary and this may influence how/what they write; eg; failure to recognise a very famous celebrity producing embarrassment not recorded. Thus an under-reporting of socially unacceptable behaviours and an over-reporting of socially acceptable ones (Breakwell and Wood 2000).
7. Replication difficult.
8. No independent record of what participants reported.

Table 4.3 - Advantages and disadvantages of the diary study by Young et al (1985).

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5. USING VIRTUAL REALITY WITH INDIVIDUALS WITH MENTAL DISORDERS

- 5.1. Introduction
- 5.2. Uses of VR
- 5.3. References

5.1. INTRODUCTION

"Virtual reality" (VR) describes an "interactive computer environment": "A computer generated an image; a display system presented the sensory information; and a tracker fed back the user's position or orientation in order to update the image. The elements combined to substitute sense data from the natural world with sense data about an imaginary world that changed in response to the user's actions" (Freeman 2008 p605).

5.2. USES OF VR

Studies have started to appear in recent years using VR with individuals with mental disorders. VR can be used in a number of ways with this group of people and in this area of psychology and psychiatry (Freeman 2008).

1. Symptom assessment

Usually symptom assessment is based upon an interview between a psychiatrist, for example, and the patient, or a self-reported questionnaire completed by the patient. Both of these methods have weaknesses like the honesty or lack of insight in replies to questions.

VR can be used by presenting a neutral social situation and observing how the person responds. The avatars (characters in the VR environment) will be programmed to act in a neutral way.

For example, Freeman et al (2008) have developed a virtual London Underground train ride to assess persecutory/paranoid thoughts. Two hundred participants from the general population used the five-minute virtual journey on a train populated by avatars of different people behaving in different ways. Individuals were asked afterwards to comment on the experience.

A neutral comment about the "people" on the train was, for example, "Didn't think anyone thought anything about me. All getting on with own business. Nobody seemed to notice me". Positive comments included, "One guy was checking me out - flattering", while negative was, "Thought a couple of the men were stuck up and nasty. Lady sitting down laughed at me when I walked past"

(Freeman 2008 p607).

2. Establishing symptom correlates

Physiological measures can be taken during the VR experience. For example, eye tracking can monitor what the individual is looking at in a particular VR social situation, and heart rate can be measured in response to a virtual precipice. These measures can be related to symptom occurrence.

3. Identification of predictive variables

Individuals fill in a series of tests beforehand and then their behaviour in a VR social situation is assessed. This allows the identification of differences in behaviour based on test scores. For example, Freeman (2007) found that paranoid thoughts in VR were linked to pre-VR higher scores of anxiety and cognitive inflexibility.

4. Identification of differential predictors

VR can also be used to show the differential symptoms between mental disorders. For example, anxiety, worry and depression were associated with both social anxiety and paranoid thoughts in VR, but only perceptual anomalies (as measured beforehand) was associated with paranoid reactions in VR (Freeman et al 2005).

5. Identifying environmental predictors

The VR can be altered to assess the environmental factors involved in mental disorders. This is a great strength of VR, and is something that cannot be done very easily in real-life. Factors include the size of the room, number and distance of other people, eye contact and facial expressions of others, and amount of background noise (Freeman 2008).

For example, Pertaub et al (2002) varied the response of an eight-avatar audience to the participant giving a public speech from signs of interest to those of boredom.

6. Establishing causal factors

Building on the previous point, experiments can be designed with various VR conditions to test the effects. It allows the manipulation of variables and control of an

experiment, as well as the choice of independent or related designs. For example, an individual with psychosis can take the virtual London Underground train ride with and without medication. There are no risks as there might be in such a real-life event.

7. Developing treatment

This is the area where VR has developed most and probably will do so in the future. VR environments can be created for individuals with particular fears and phobias; in some cases, that are not possible in real-life.

Studies are showing the usefulness of VR compared to traditional methods of therapy. In one study, Emmelkamp et al (2002) used exposure to heights in VR with individuals with that fear (acrophobia). Even though the participants knew the VR heights were not real, they still showed anxiety responses. Three sessions with VR were found to be as effective in reducing fear of heights as in-vivo (real-life) exposure.

While Rothbaum et al (2000) used VR in anxiety management training of fear of flying (FOF). It was as effective after six months as standard exposure therapy.

They described their VR apparatus:

The computer system used in the current study consisted of a 300 MHz Pentium II processor with 128MB memory, a SCSI disk drive, and a Fire GL 1000 video card. A Virtual Research VR6 (Virtual Research Systems, Santa Clara, CA) head-mounted display with stereo earphones transmitted the VR image to the participant. The participant was seated in a Thunderseat ® (Thunderseat, Los Angeles, CA), a specially designed seat with an embedded 100-watt subwoofer and an attached airplane seatbelt. The virtual airplane software for FOF was created by Virtually Better, Inc. (Atlanta, GA; www.virtuallybetter.com). VR-generated scenes placed participants in a passenger seat by the window on a commercial airplane. As they moved their heads to the left, they were able to see out the left-hand window. As they moved their heads to the right, the empty seats to the right side of the airplane and the right side window came into view (p1021).

Overall there are a number of strengths and weaknesses of using VR with individuals with mental disorders (table 5.1).

STRENGTHS

1. Overcome problems of traditional symptom assessment like interaction variables in interviews.
2. A neutral social situation can be created.
3. VR can be combined with physiological measures to assess how the person is responding to the VR scenario.
4. It is possible to change the environment within VR to assess environmental triggers to behaviour. Allows for the manipulation and control of variables in experiments.
5. Can create environments in VR that are not possible in real-life, for example, in relation to fears and phobias.
6. Experiments using VR technology will become more acceptable as VR is more common in everyday life (eg: "virtual bank cashier").

WEAKNESSES

1. Requires individuals to take the VR environment seriously and "believe" that it is like a real situation. Despite technological development, virtual humans are 2-D images and not real people.
2. Side effects of "simulator sickness" including dizziness, nausea, headache and eyestrain, as well as the risk with individuals prone to seizures when watching television (Freeman 2008).
3. it is expensive and difficult to carry out VR experiments requiring complex equipment in a VR laboratory.
4. The ethics of making the VR environment unpleasant, aversive or challenging for the individual.
5. Still need to ask participants about their experiences in VR which limits the use with non or low verbal individuals.
6. Some studies still dependent upon paper-and-pencil tests in order to find associations with behaviour in the VR.

Table 5.1 - Strengths and weaknesses of using VR with individuals with mental disorders.

5.3. REFERENCES

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