RUNNING HEAD: Memory Beliefs

The 'Common Sense' Memory Belief System and Its Implications

Shazia Akhtar[1], Lucy V. Justice[2], Lauren Knott[1], Fraenze Kibowski[2] & Martin A. Conway[1]

[1]Department of Psychology, City, University London, England
[2]Department of Psychology, Nottingham Trent University, Nottingham, England

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Address for correspondence:

Professor Martin A. Conway
Department of Psychology
City, University Of London
The Rhind Building
Northampton Square,
London, EC1V 0HB
Email: Martin.Conway.1@city.ac.uk

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Abstract

Memory experts, the police, and the public, completed a memory questionnaire containing a series of statements about autobiographical memory. The statements covered issues such as the nature of memory, determinants of accuracy, the relation of emotion and trauma to memory, and respondents indicated their agreement/disagreement with each of the statements. The police and public were found to share a 'common sense' memory belief system (CSMBS) in which memories were like videos/photographs, and accuracy was determined by the number of details recalled and also by their vividness. In direct contrast the scientific memory belief system, held by memory researchers, largely based on scientific evidence, was the opposite of the CSMBS and memories were judged to be fragmentary, number of details and their nature did not predict accuracy, and memories and their details could be in error and even false. The problematic nature of the CSBMS, which is pervasive in society, in raising the probability of flawed judgments of memory evidence is considered and, by way of illustration, applied to the (very high) attrition rate in complaints of rape.

Keywords: memory; belief; courts; police; rape.

In many legal cases and other formal proceedings, for example. medical investigations, insurance cases, political asylum judgments, slavery investigations, etc., the only evidence or the evidence-in-chief, are accounts of memories. But how do professionals and the general public judge such memory evidence? As scientific knowledge about human memory is largely limited to memory researchers the only basis for judging the reliability of memories, for a non-expert, is a person's beliefs about memory. Beliefs that are most likely based on their experience of their own memory, what others have told them about their memories, and cultural beliefs about memory. But what if these beliefs are wrong? To the extent that these publically held non-scientifically informed memory beliefs are incorrect, it necessarily follows that the quality of decision-making about memory evidence will be low, often flawed, and very often plain wrong. Indeed, probably the most widely held belief, that memory is like a video (Conway, Justice, & Morrison, 2014; Simons & Chabris, 2011) is flatly contradicted by scientific findings of the study of human memory. Yet, such erroneous beliefs are tenaciously held (see Campbell & Friesen 2017/2018 for a more general review of tenaciously held erroneous beliefs). In British courts, for example, the judiciary hold to the belief that because jurors have memories of their own then they already know all they need to know to make informed decisions on the reliability of memory evidence, without consulting memory experts. Indeed, the law has a generally dismissive view of the science of memory, perhaps most clearly expressed in the following comment from a judge in Tennessee:

> "Eyewitness testimony has no scientific or technical underpinnings which would be outside the common understanding of the jury; therefore, expert testimony is not necessary to help jurors 'understand' the eyewitness' testimony" (*State v. Coley*; 32 S.W.3d 831; Tenn. 2000, cited in Lindsay, Ross, Read, J.D., & Toglia, M.P. 2007).

There are then two beliefs that support this dismissive attitude to the science of memory, one is that the science of memory has nothing to tell us that is not already

encompassed by ‘common sense’ and, second, common sense therefore provides an adequate basis for judging the reliability of memories. However, and contrary to the beliefs of British and US courts, evaluating memory evidence is in fact difficult, and requires, as a minimum, knowledge of the nature and fallibility of autobiographical memory and, at an optimum, a comprehensive understanding of the factors that influence and shape memories and that can give rise to memory distortion, memory errors, and to wholly false memories (Magnussen & Melinder, 2012).

Memory researchers have investigated ‘common sense’ beliefs about memory through a series of recent surveys, (e.g., Benton, Ross, Bradshaw, Thomas, & Bradshaw, 2006; Conway, et al., 2014; Magnussen et al., 2006; Magnussen & Melinder, 2012; Patihis, Ho, Tingen, Lilenfield & Loftus, 2014; Simons & Chabris, 2011; Wise & Safer, 2004; Wise, Safer, & Maro, 2011). These surveys examined the extent to which ‘common sense’ knowledge is consistent with knowledge from the scientific study of human memory. Of considerable concern are the findings that, not only do discrepancies exist between common sense beliefs and scientific understanding, these discrepancies are very often large. Indeed, jurors, as well as judges and law enforcement professionals, exhibit important limitations in their knowledge of factors that affect memory accuracy. For example, Benton, et al., (2006) examined mock jurors’ knowledge of factors that affected eyewitness memory. They compared the responses of expert witnesses with jurors, judges, and police officers on 30 statements relating to eyewitness issues. The statements referred to known biases in line-up procedures, confidence-accuracy tradeoffs, and effects of post-event information. Participant responses differed significantly from responses of eyewitness experts. Jurors disagreed with the experts on 87% of the issues, while judges and law enforcement agents disagreed with the experts on 60% of the issues. Further, Simons and Chabris (2011) found that 63% of the US public agreed that memory works like a video camera, in the UK this figure was 70%

(Conway, et al., 2014), 48% agreed that memory is permanent and 55% believed that memory can be enhanced through hypnosis. Additionally, in a survey conducted by Patihis, et al., (2014), over 70% of US public and 68% of UK public believed that repressed memories can be retrieved accurately in therapy. These beliefs are particularly naive given the large body of scientific evidence showing the distortive nature of therapeutic memory recovery techniques and the lack of existence of a special repressed memory mechanism (see Howe & Knott, 2016, and Howe, Knott, & Conway 2018, for reviews).

Other findings also reveal large errors in what mock jurors (the public), professionals from the legal field, and clinicians, believe to be true about memory in general. For example, a prominent naive belief about memory accuracy is that accounts of events that are rich in detail are more accurate than accounts that are less detailed. When asked, "A witness's ability to recall minor details about a crime is a good indicator of the accuracy of the witness's identification of the perpetrator of the crime" (Melinder & Magnussen, 2015, p. 56), it was found that only 33% of clinicians, 16% of laypersons, and 31% of judges disagreed – which is, of course the correct answer. It is well established in the scientific literature that false memories can be accompanied by such rich details (for a review, see Arndt, 2012), and accurate memories can be vague and lacking in detail. Individuals may recall the meaning or 'gist' of past experience rather than many or any episodic details (Brainerd & Reyna, 2002). Indeed there is probably a preferred level of memory detail at which most people operate to achieve optimum accuracy (Koriat & Goldsmith, 1996). Outside this level error increases (Koriat, Goldsmith, & Pansky, 2000).

In the vast majority of studies, comparisons from a number of different population types have been made to the original survey responses of the eyewitness memory experts derived from Kassin, Tubb, Hosch and Memon, (2001). These studies have collectively highlighted that knowledge about eyewitness issues is far from common sense beliefs for jury

eligible members of the public, but also for a number of populations within the legal field and clinical professions. Simons and Chabris (2011) conducted one of the first large scale surveys to specifically examine misconceptions associated with general memory properties. They sampled a large group of the general public and used a small sample of memory experts to validate mistaken beliefs. Whilst there were only six items that focused on memory properties, the results overwhelmingly demonstrated fundamental misunderstandings associated with the way memory works. Disappointingly many of these beliefs, for example, the belief in the permanence of memory and accuracy of hypnosis, are contradicted by scientific findings that have been established within memory literature for a number of years. Simons and Chabris (2011) concluded that for basic concepts of memory at least, commonsense is more likely to be wrong than right.

In the present study, conducted in collaboration with two regional police forces in the UK, we designed a questionnaire that specifically examined a range of known features of autobiographical memory (other studies have not focused on autobiographical memory but rather on eyewitness memory or memory generally), features that had been determined by previous scientific research or which were contradicted by scientific research. Three groups of participants took part: serving police officers, memory experts, and the general public. The memory experts were delegates at the Sixth International Conference on Memory (ICOM-6) held in Budapest, Hungary, July 2016. The general public were recruited in a web-based survey and were either eligible for jury service or, in a few instances, had been jurors.

Method

Participants. There were 853 participants sampled across the police, memory experts and the general public. Of these 531 (62.3%) were police officers of all ranks, recruited from

two regional police forces[1] in England, 240 (28.1%) were memory experts attending the ICOM-6, and 81 (9.5%) were members of the general public.

The Questionnaire. An initial pilot questionnaire was first constructed The pilot questionnaire contained 56 statements designed to correspond to the following eight areas: models of memory, memory details, emotion and memory, trauma, time, age, false memories, and child memory. Each area had 5 statements two supported by scientific findings, two contradicted by them, and one for which there was no evidence. The remaining 11 questions were on aspects of police interviewing practice, designed for follow up investigation with the police officers only. Each question was accompanied by a 4-point scale: strongly disagree, disagree, agree, and strongly agree. A "neither agree nor disagree" option was not included in the questionnaire to prevent respondents defaulting to a neutral position since such a position usually cannot be taken in a legal setting. Respondents chose one of these options to reflect their agreement/disagreement with the statement. For each statement there was also a second question: Was this statement hard to understand? Respondents checked a box to indicate yes or no. A small group of police officers and members of the general public completed the pilot questionnaire. They were given the following written instructions: "In this questionnaire you will see statements about memory and you are asked to indicate, in your OWN opinion, the extent you agree/disagree with the statement. You are also asked to judge how difficult the statement was to understand. This is a 'pilot' study, one in which we are developing this questionnaire for wide use in the police force. So knowing which statements are difficult to understand will help us weed out those statements that are not easily understood. Note also that the statements often state very similar things but in slightly different ways. Please do not be concerned about this, at this early stage in creating a questionnaire asking the same

[1] In order to maintain confidentiality we do not name these police forces here but as together they are representative of the British police then the findings will generalise to this group as a whole.

question in different ways can be useful in finding the right question." They were also encouraged to provide written feedback on any of the statements and the questionnaire as a whole on a blank sheet following the statements. The responses from the pilot study were used to eliminate questions that were difficult to understand and also questions that duplicated each other. Because they are provisional the data from this phase of the study are not reported further here, nor do they feature in any of the analyses below, and the respondents from this stage did not take part in the main study.

The final questionnaire contained 36 non-duplicating easily comprehended statements, each accompanied by the 4-point agreement/disagreement scale (see the Appendix for the full questionnaire). The question about comprehension was not included and no feedback was requested. The questionnaire was preceded by similar instructions to those of the pilot study but edited to remove any mention of the questionnaire being a pilot. Demographic information about gender, age, highest educational attainment was also collected. Information about expertise in memory was collected: in the case of the police, years in service, and in the case of memory experts, number of years studying memory. This demographic data is shown in **Error! Reference source not found.**. The general public were not asked about their expertise with memory.

Table 1 about here

The questionnaire was in the form of a web-link on the survey package Qualtrics. Each statement appeared on its own page in bold font. Each respondent received a unique random order of presentation of statements. Respondents indicated the degree of their agreement with each statement about memory, by checking one of the response categories. After responding, they clicked the 'next' button to proceed to the next statement, and they could not return to a previous page once they had advanced. Following the statements, respondents provided their demographic information. Officers were invited to take part in the

study by their overall commanding officer. They were provided with the web link, and completed the survey in their own time. Memory experts were invited to take part in the study at ICOM-6. They were provided with the web link and they completed the survey in their own time. The general public responded to a poster advertising the study. They also were provided with the web link and completed the survey in their own time.

Results

The data are analysed in two ways. The first is an items analysis, examining the factor structure of the data-set, the second is a group-wise analysis.

Factor structure of beliefs about memory. An exploratory factor analysis was performed to investigate what latent constructs of memory beliefs underpinned responses to the 36 statements (Ost, Easton, Hope, French & Wright, 2016). Principal axis factoring was employed and only eigenvalues over one were extracted. A direct oblimin rotation was used to account for the non-orthogonality of the items. The initial solution revealed three items which loaded at less than 0.3 on any factor (questions 11, 31 and 28), these were therefore removed from the dataset and the analysis repeated. Inspection of the correlation matrix did not reveal any multicollinearity (all correlations were less than 0.8) and the determinant was 0.0005. Kaiser-Meyer-Olkin measure was greater than 0.5 at 0.89 and Bartlett's test of sphericity was significant, indicating that the data were suitable for factor analysis. An 8-factor solution was extracted, explaining a total variance of 54.2%. Cronbach's Alpha was computed for each factor, see Table 2. Results revealed that item 14 and item 29 should be removed to generate acceptable Alpha scores and hence these were omitted from the analysis. Table 2 shows the final component loadings of the final 31 items.

Table 2 about here

The 8-factor solution shown in Table 2 is, of course, over all three groups, but as will become apparent not all three groups endorsed these factors equally. Nonetheless the factors do reflect common beliefs about memory – several of them erroneous. For instance, that memory is generally accurate (factor 1), the more details the more likely the memory is to be accurate (factor 2), and memory is like a video/photographs (factor 4).

Figure 1 about here

*Memory Beliefs in the three groups: Police, public, and exper*ts. To provide a visual overview of answering patterns amongst the three groups, a principal component analysis (PCA) was conducted. The score plot, shown in Figure 1, details all responses given to all items, identified as a function of respondent group. This figure shows that, broadly, the responses given by the police and public show considerable overlap, whereas the responses given by the experts cluster separately. These differences were then tested by factor and Table 3 shows the percentages of agreement with the factors for each of the three groups. To test for differences across groups, items were stacked by factor and analysed using the Ordinal package (Christensen, 2015) in RStudio (RStudio Team, 2015). An ordinal logistic multilevel regression with factor entered as dependent variable, group as fixed effect and respondents as a random effect was employed. All generated models were compared with a null model (a model with a constant in place of fixed effects) and *p*-values were obtained using likelihood ratio tests. This analysis was used to account for the hierarchy of responses within respondents. Multiple comparisons were run with a Tukey correction.

Table 3 about here

It was found that groups differed reliably on all factors with the exception of factor 5 "emotional intensity and accuracy". In particular, factor 1, 2, 4, 6 and 7 showed experts scored reliably lower than the public and the police, i.e. disagreed with more statements, and in factor 3, experts scored reliably higher than the police and the public, i.e. agreed more with the statements defining this factor, see Table 4.

Table 4 about here

Although we recruited respondents from across three groups (police, memory experts and public) we wanted to understand the response patterns of these groups that is whether particular groups, or particular members of groups answered in similar or dissimilar ways. For example, do police with more years' service answer similarly to the memory experts? Do younger memory experts answer similarly to the public? To begin to answer these questions, a latent class analysis (LCA) was conducted, this was employed since it is a statistical tool used to identify unobservable group structures. Further, the LCA produces a profile plot detailing probability of endorsement of items by each of the identified groups. This allows an understanding of the 'profile' of such identified groups, in our case, the probability that an identified group is likely to answer in line with scientific understanding of memory by endorsing or failing to endorse particular items. These identified groups can then be used as an outcome variable in a regression model, allowing variables such as respondent group, education level and age to be predictors and so to understand whether the identified groups vary as a function of these predictors.

LCA is similar to the approach of factor analysis in that it seeks to examine whether shared variability in the responses is explained by an underlying factor, (see Williams & Kibowski, 2016). In order to decide on the best fitting number of classes in the data, fit indices for eight models (one-class through to an eight-class model) were considered. The fit

indices used were the information criteria: Akaike (AIC), Bayesian (BIC) and sample-size adjusted BIC (ssaBIC). For these an elbow point, the smallest value, indicated the best fitting class solution. Also used were the Lo-Mendell-Rubin's adjusted likelihood ratio test (LRT) and the bootstrapped likelihood ratio test (BLRT). Once the LRT and/or the BLRT become non-significant, it indicates the previous model with one fewer class should be chosen based on parsimony. Lastly, entropy was used which is a standardised measure ranging from zero to one, with a higher value indicating that participants can be reliably sorted into the classes. Out of these, the BIC and the BLRT have been highlighted as the most robust (Nylund, Asparouhov, & Muthén, 2007). As there is continuing debate regarding the performance of fit indices, it is recommended to report all of the usual fit indices as well as taking previous theory and practical concerns (e.g. small class sizes) into account (Nylund, et al., 2007). The fit indices for a one-class through to eight-class model for responses to the 31 remaining statements are shown in Table 5.

Table 5 about here

Neither the AIC nor the ssaBIC had an elbow point. Both a two-class and a five-class solution were indicated by the LRT and BIC respectively. Examination of the profile plots for both solutions indicated that the two-class solution was the most parsimonious despite the slight decrease in entropy for this solution - 0.80 compared to 0.82 for the five-class solution. The profile plot of the two-class solution is shown in Figure 2.

Figure 2 about here

The larger class of the two, with 54.4% of the sample, was characterised by the highest likelihoods of endorsement for almost all items compared to class two, see Table 5, with the exception of items from factor 3 and one item from factor 7 (statement 18 – children's memories are less accurate). Items such as 'the details in memories of specific

events are usually accurate' (F1: statement 24) and 'a memory that is recalled with a lot of vivid and specific details is highly likely to be accurate' (F2: statement 6) are endorsed at a much greater likelihood than in class two. Accordingly class one was termed *The Common Sense Memory Belief System (CSMBS)* and class two *The Scientific Memory Belief System (SMBS)* Interestingly, when concentrating on the items of each factor, the profile plots of class one and class two show mostly quantitative changes (differences in endorsement probability but similar increase and decrease for each of the items), rather than qualitative changes (differences in the shape of responses rather than simply higher or lower probability of endorsing). The biggest differences in endorsement probability overall were for items in factor two and factor four, where some items did not follow the general pattern laid out by class one and two. Most notably, statement 19 'the more detailed the description of a memory the more accurate the recollection' (F2) demonstrates a small decline in endorsement rate for class two, versus a sharp increase for class one. Also, statement 13 "memory of childhood sexual abuse usually has at least some truth to it" (sharp decrease in class two versus small increase in class one) and statement 32 "memories of traumatic experiences can be kept out of mind" (sharp decrease in class one), both items from factor six, see Table 6 for the ten items with the highest disparity between classes. Of particular interest in Table 6 are the beliefs of class 1 which are centred on memory detail and the assumption that the more details and the more vivid they are the more likely a memory is to be accurate (top 3 rows of Table 6). Also noteworthy is the strongly held belief in class 1 that recall of childhood sexual abuse is virtually always true (Table 5 row 5). See Table 6 for details of the ten items with highest endorsement disparity between groups.

Table 6 about here

Finally, as noted above, a binomial logistic regression was used to predict the likelihood that the two classes revealed by the LCA were comprised of the different

respondent groups. Further binomial regressions, run in each group separately, were used to identify intra-group differences, such as whether age, education and/or gender were likely to change latent class membership. Results showed that the probability that the police, public and experts would be placed in class two, the SMBS, was 35% ($p<0.001$), 30% ($p <0.001$) and 73% ($p < 0.001$) respectively. In contrast, the probability that police, public and experts would be placed in class one, the CSMBS, was 65% ($p <0.001$), 70% ($p <0.001$) and 27% ($p <0.001$) respectively. Thus, the majority, but not all of the experts held the SMBS and, conversely, the majority, but not all, of the police and public held the CSMBS.

Next, data were split by respondent group and demographic variables were included in the model to examine if they changed the probability of group membership. For police, individuals with a postgraduate qualification were more likely to be placed in class two than those with a vocational qualification ($p=0.037$) or secondary level education ($p=0.030$). Years' service, age and gender were not found to be reliable predictors of class membership for police. For the public, results showed reliable differences in probability of class membership, such that members of the public holding doctorates were more likely to be placed in class two than those holding postgraduate (Masters level) ($p=0.037$) and vocational qualifications ($p=0.030$). However, since there were very low numbers of individuals in these groups (see **Error! Reference source not found.**), these findings, although reliable, are suggestive rather than definitive. Similarly, results showed that males were reliably more likely to be placed in class two than females ($p <0.001$), however, only 17 males were sampled from the public and therefore these findings must be interpreted with caution. No differences in probability of class membership were found due to respondent age. For memory experts, results showed that respondents aged 25 or younger were more likely to be placed in class one than respondents aged 36-45 ($p=0.013$) and 46-55 ($p=0.038$), who were more likely to be placed in class two. Further, male memory experts were also more likely to

be placed in class two than class one as compared to females (p=0.017). No other reliable results were found.

Overall, the findings show conclusively that the police and public answer similarly and less strongly in line with science and that experts answer more strongly in line with science. Number of years' service was not related to the likelihood of police being placed in either class, and similarly, the number of years memory had been studied was not found to relate to the likelihood of class membership for the memory experts, although age was. Thus, most of the memory experts had beliefs consistent with the science of memory and these beliefs become more consistent as age increases, and a minority of the police and public also had at least some beliefs consistent with the science of memory.

Discussion

The present findings identify two memory belief systems. One, the *common sense memory belief system* (CSMBS) held predominantly by non-experts (the police and general public in this study) and the other the *scientific memory belief system* (SMBS) held predominantly by memory researchers. The two systems are characterised by a constellation of beliefs and although there is some overlap, discussed below, they are in the main opposites of each other.

The Common Sense Memory Belief System

The CSMBS has a number of central beliefs largely reflected in Factors 1, 2, 4, 5, 6, and 8 (see Tables 1 and 5 and Figure 2). There is a belief in the general accuracy of memory and specifically in the accuracy of memories of childhood sexual abuse. We will term this, general accuracy of memory, the GAM belief, and note that the past 50 or so years of memory research contradict it: memory is not generally accurate, (see, for example, Schacter, 2001, Brainerd & Reyna, 2005, Howe, et al, 2018). A belief that was identified in the present

study and which emerged in other studies (Conway, et al., 2014; Simons and Chabris, 2011) is that memory is a type of literal recording device like a video or set of photographs. We will term this the video-photograph-model of memory (VPM). The VPM is, of course, mistaken, memories are time-compressed, fragmentary, contain amnesic gaps, and do not preserve fine-grain temporal order, often they can be out of temporal order or maintain no temporal order at all, moreover they are accompanied by affect and are highly selective in what is retained. In short they are *psychological* representations and in this respect they are unlike other recording media. Possibly the only feature of memories that they share with videos and photographs is that they frequently contain visual mental images (Brewer, 1988; Conway 2009). However, visual mental imagery hardly parallels visual images in videos and photographs that are literal records of the scenes they record. Mental images are difficult to maintain in consciousness and details constantly fade and have to be refreshed while they are effortfully maintained in mind (Kossylyn, 1983). Visual mental imagery may also be accompanied by imagery in other modes such as sound, smell, or touch, further rendering it very different from videos and photographs. In addition to these differences specific autobiographical memories have both episodic components (often in the form of visual mental images) *and* conceptual knowledge (Conway, 2005, 2009; Conway & Pleydell-Pearce, 2000) the latter is not present in videos or photographs. The VPM belief is then almost entirely inaccurate despite being a pervasive belief of the CSMBS.

Another central belief of the CSMBS is that the more detail that an account of a memory contains, and the more vivid these details, the more likely the memory is to be accurate. We will term this, the 'memory accuracy = details', or the MAD belief (Conway, et al., 2014). Again memory research shows that specific details, especially peripheral details (Bell & Loftus, 1989) are particularly error prone and relatively few details are in any case usually recalled (Wells, Morison, & Conway, 2013). A related belief of the CSMBS is that

accounts of memories with vivid details are likely to be accurate. In other words memory accuracy = vividness, or the VAM belief. Finally there is a constellation of beliefs centred on the notion that emotionally intense experiences, especially those that are traumatic, give rise to accurate memories. Moreover these are memories that are more accurate than memories of less emotionally intense experiences. In this case then, 'emotional intensity = accuracy', or the EIA belief. However, the relationship between memory accuracy and emotional experiences has long been known to be a complex one (see for example, Christianson, 1992, or the papers in Reisberg & Hertel, 2004) and memories of emotional experiences can be as prone or even more prone to memory errors and falsity than memories of other types of types of experience, and this applies to memories of traumatic events too (MacNally, 2003). Overall, the present findings identify a CSMBS that consists of the five core domains of GAM, VPM, MAD, VAD, and EIM beliefs. By this belief system an account purporting to be of a memory that contained a number of specific details, vividly recalled, perhaps in the form of visual images, and of an emotional experience, particularly a negative or abusive one, would be judged (incorrectly) as highly likely to be accurate.

The Scientific Memory Belief System

The SMBS consists of core beliefs that are the opposite of those in the CSMBS (see Table 5 and especially Figure 2). It can be seen in Figure 2 that the experts endorsed the MAD belief less than police and public (Factors 1 and 2) and generally disagreed or strongly disagreed with questionnaire statements based on this belief. So, for the experts more details, more specific and more vivid details, were not equated with memory accuracy. The experts did not endorse statements in which memories were likened to video, photographs, or records in a filing cabinet. They did, however, strongly endorse statements about memory inaccuracy, e.g. that memories of trauma may contain false details, that memories can be wholly false, and that specific details can be incorrect. Interestingly, and in contradiction to their other

beliefs, those who held the CSMBS also endorsed these beliefs about memory inaccuracy, but not as strongly as the memory experts (see Figure 1). One area in which the experts agreed to at least some degree with the police and general public was on statements relating to memory for early traumatic experiences (Factor 6 in Table 2). Memory experts endorsed statements that traumatic memories can be repressed and then retrieved later, memories can be forgotten over long periods of time and then recovered later, traumatic memories can be kept out mind, and when there are multiple allegations a memory is more likely to be accurate.

Perhaps it is not so surprising that the memory experts agreed, at least partly, with those who held the CSMBS on features of memory and trauma. Relatively few of the memory researchers attending ICOM-6 were themselves experts on trauma and memory and although they may have generally been more informed than the police and the public, without specific specialist knowledge they may have held more 'common sense' beliefs about the relation of memory and trauma. One implication here is that not all memory researchers would necessarily make expert witnesses in judging memories of traumatic experiences. Overall, the pattern of responding to the questionnaire statements by memory researchers was clearly much more consistent with the science of memory, much more rejecting of statements relating to accuracy and details (the MAD belief) and statements relating to memory being like a video or photographs (the VPM belief). The only area where the SMBS overlapped with CSMBS and endorsed statements for which there was no clear evidence or for which the evidence was controversial, was on statements relating to memory and trauma, for which many of the memory experts may have had little expertise. In sum the SMBS viewed memories and details in memories as likely to be much more unreliable than did the non-experts, in the SMBS memories were considered to be fragmentary, rather than fluid video-like representations, and emotional experiences were not considered to necessarily give rise

to accurate memories but rather could contain erroneous details. Finally, the SMBS contained the belief that memories could be false, even for emotional and traumatic events.

Conclusion: Implications of the Common Sense Memory Belief System

The CSMBS we have identified here, a belief system held by the majority of police and public but not by the majority of memory researchers, is almost certainly held by very many non-experts. It is a memory belief system that permeates society and culture and influences all those who have to judge memory or even to work with it, from judges and jurors to writers and artists. The most concerning aspect of the CSMBS is when it is used, most probably quite implicitly and non-consciously, as a way of evaluating memory evidence. When this occurs the probability of error will be greatly raised. This is because the beliefs that make up the CSMBS are either wrong, in that they are contradicted by scientific evidence or there is no evidence and therefore their status is unknown i.e. they could be right or wrong. Because of this system of faulty beliefs major errors can be made when judging memory evidence.

By way of example consider the attrition rate in complaints of rape, complaints largely by adult females (see Hohl & Conway, 2016, for a recent memory-based model of the attrition rate). In the UK the attrition rate is astonishingly high and 93% of complaints of rape reported to the police do not result in a conviction and 82% do not even go to court (Ministry of Justice, et al., 2013). Of course there are many reasons for this but a major and completely overlooked reason is that the various agencies, e.g. police, Crown Prosecution Service (CPS), etc., use the CSMBS to judge allegations of rape - complaints that are always based on the complainant's memory of the alleged assault. According to the beliefs of the CSBMS memories that are accurate should have video-like qualities with many specific and some vivid details and should be presented in a fluent and complete way. Clearly many complaints

of rape do not consist of memories like this. Instead they tend to be fragmentary, contain amnesic gaps, and miss 'important' details (that a person holding the CSMBS might 'expect' the memory to feature). The various agencies that determine whether or not a complaint passes further along the judicial process tend to triage accounts of memories that do not fit the CSMBS. This is because they are judged as unreliable and, therefore, could be (successfully) challenged in court, or they are judged as false. Regrettably the judgment of how well an allegation of rape would stand up in court is also based on the CSMBS of the referring agencies and of the courts themselves.

Counter-intuitively, however, it is the accounts of rape that fit the CSMBS[2] that are the questionable ones and that is because these accounts do not fit the scientific evidence on the nature of human memory, as reflected in the SMBS[3]. Accounts more in line with SMBS that are not recalled fluently, that are fragmentary, that have missing details, etc. are the very ones that are triaged and do not progress through the legal system contributing, we have argued, to the unusually high attrition rate for complaints of rape (Hohl & Conway, 2016). The situation is most probably far worse than just a chronically high attrition rate for allegations of rape. The CSMBS underlies judgments of memory evidence in courts, by judges and jurors, and is also used by lawyers to question the reliability of accounts of rape and many other crimes where memory too may be the chief or only evidence. In court this is often achieved, under cross-examination, by showing that that an account of a memory does

[2] Such highly detailed and vivid accounts have almost certainly been, at the very least, highly embellished, making it difficult to determine what details are remembered and what details have been added.

[3] Note that it does not follow from this that if a memory description has the features expected on the basis of the SMBS that it is accurate or true. Rather, and more prosaically, it simply indicates that a memory description has the features expected on the basis of scientific research rather than those expected on the basis of CSMBS or 'common sense'. Given that the CSMBS is largely wrong knowing that a memory description conforms to the SMBS may, however, be useful in informing judgements of memory evidence.

not fit or even violates core beliefs of CSMBS – but then, of course, so does the scientific evidence. The bottom line would seem to be that if all there is to go on is “common sense” then judgments of memory evidence will often be flawed.

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Table 1. Respondent demographic information

	Age group (years) %					Sex			Highest Educational Achievement %					
Respondent Group	< 25	26-35	36-45	46-55	>56	% Female	Refuse to Say	Primary	Secondary	Further Education	Vocational	Undergraduate	Postgraduate	Doctorate
Experts	11.2	49.2	19.2	12.1	8.3	67.3	0.4	0	0	0	1.2	5.4	30.0	62.9
Police	2.3	18.2	37.2	35.1	7.3	47.7	0.2	0	16.4	24.3	18.5	30.9	7.2	0.4
Public	25.0	15.0	17.5	25.0	17.5	76.7	0	1.2	3.7	14.8	13.6	35.8	23.5	7.4

	Years studied human memory				
Experts	<5	6-10	11-15	16-20	>20
	29.3	37.2	15.9	5.0	12.6
	Years in Service				
Police	<1	1-2	3-5	6-10	>10
	0.2	3.6	4.2	13.4	78.5

Table 2. Factors with corresponding item loading (and factor scores)

Factor	**Cronbach's Alpha**	**Items (and loading scores)**
1 Memory is generally accurate	**0.63**	10 People often accurately remember emotions and feelings (0.40) 15 People generally remember what happened even though some details may be forgotten and some remembered inaccurately (0.42) 21 People often remember the thoughts they had during a specific experience (0.38) 22 Despite some forgetting and occasional errors memory is generally accurate (0.59) 24 The details in memories of specific events are usually accurate (0.45)
2 The more memory details the more accurate the memory	**0.79**	4 A memory that has few details is likely to be inaccurate (0.45) 5 A memory that is recalled fluently is likely to be accurate (0.58) 6 A memory that is recalled with a lot of vivid and specific details is highly likely to be accurate (0.67) 7 Highly specific details are more likely to be accurate than details that are less specific (0.68) 8 A memory that is recalled hesitantly, with lots of going back and double takes, is likely to be inaccurate 19 The more detailed the description of a memory the more accurate the recollection (0.64) 20 Memories containing peripheral information e.g. surroundings and background details, are more likely to be accurate (0.42)
3 Memories can be false	**0.71**	23 People can come to remember events that never occurred (0.65) 30 Over time memories deteriorate and can become less accurate (0.42) 34 Memories of traumatic experiences may contain details that are false (0.65) 35 It is possible for a highly vivid, very specific, detail in an account of a memory to be wholly false (0.83)
4 Memory is like a video	**0.82**	1 Memories are like photographs or videos (0.88) 2 Memory is like a movie of one's experiences (0.85) 3 Memory is like a filing cabinet in which each document records a specific memory (0.50)
5 Emotional intensity and accuracy	**0.59**	25 Experiences that feature very strong emotions are more accurately remembered than experiences in which emotions were moderate or weak (-0.79) 26 Memories of emotionally negative experiences are more accurately remembered than memories of neutral and positive experiences (-0.51)
6 Trauma and Memory	**0.64**	12 Traumatic experiences can be repressed for many years and then recovered (-0.51) 13 When someone recalls a memory of childhood sexual abuse, or perhaps a series of such memories, it will usually be the case that there is at least some truth to their recall (-0.32) 27 Memories can be forgotten over many years, even decades, but later remembered again (-0.45) 32 Memories of traumatic experiences can be kept out of mind (-0.51) 36 When a number of people all recall being abused by an individual or group, the likelihood that the abuse occurred is greatly increased (-0.39)
7 Childhood memory	**0.88**	9 Memories from childhood are as accurate as memories from other ages (-0.46) 18 Children's memories are less accurate than adult's memories (0.46)
8 Durability and reliving trauma.	**0.55**	16 Memories of intense emotional experiences are "burnt in the brain" and are therefore remembered in detail for long periods of time (-0.40) 17 Traumatic memories come to mind in the form of 'flashbacks' (-0.64) 33 A 'flashback' of a traumatic memory causes a re-living of the remembered event (-0.44)

Table 3. Percentage agreement with factors and items as a function of respondent group

	Strongly Disagree %			Disagree %			Agree %			Strongly Agree %		
	Experts	**Police**	**Public**	**Experts**	**Police**	**Public**	**Experts**	**Police**	**Public**	**Experts**	**Police**	**Public**
F1	7	1	2	35	23	25	50	66	61	9	9	12
F2	19	8	5	49	54	53	30	35	33	3	3	8
F3	0.5	1	2	5	16	22	49	70	65	46	13	11
F4	47	8	5	32	30	30	19	53	53	2	9	12
F5	8	4	1	47	53	45	38	37	45	8	6	9
F6	11	2	2	29	13	12	52	67	63	7	18	23
F7	23	12	11	47	59	53	26	27	30	4	3	6
F8	11	3	2	25	36	28	52	53	54	12	8	16

Table 4. Means (standard errors), X^2 and p values for likelihood ratio tests for groups within each factor. Means that do not share a letter are reliably different.

	Mean (SE)				
Factor	**Experts**	**Police**	**Public**	X^2	*p*
1 What we remember	2.60 (0.03) a	2.84 (0.02) b	2.84 (0.04) b	57.87	<0.001
2 Signs of accuracy	2.17 (0.03) a	2.34 (0.02) b	2.45 (0.05) b	32.87	<0.001
3 Emotive memory and accuracy	3.39 (0.03) a	2.94 (0.02) b	2.86 (0.05) b	207.93	<0.001
4 Memory as a literal record	1.77 (0.05) a	2.64 (0.03) b	2.73 (0.06) b	280.83	<0.001
5 What we remember about emotive events	2.44 (0.04) a	2.46 (0.02) a	2.61 (0.06) a	5.95	0.051
6 Memory for trauma and abuse	2.59 (0.03) a	3.01 (0.02) b	3.07 (0.04) b	164.23	<0.001
7 Childhood memory	2.12 (0.03) a	2.21 (0.02) b	2.31 (0.05) b	10.24	0.006
8 Durability and reliving of trauma	2.65 (0.04) a	2.67 (0.02) a	2.85 (0.06) b	9.26	0.01

Table 5. Fit indices for the LCA of 31 autobiographical memory items

	Log	#	LRχ^2	AIC	BIC	SSABIC	LRT (*p*)	BLRT (*p*)	Entropy
1	-15252	31		30567	30714	30616	-	-	-
2	- 14405	63	+	28937	29237	29036	685 (<0.001)	-15252 (<0.001)	0.795
3	-14089	95	+	28333	28784	28482	665 (0.075)	-14405 (<0.001)	0.800
4	-13906	127	+	28066	28669	28266	329 (0.18)	-14071 (<0.001)	0.804
5	- 13798	159	+	27914	28668	28163	215 (0.062)	-13906 (<0.001)	0.827
6	-13698	191	+	27778	28685	28078	198 (0.25)	-13798 (<0.001)	0.820
7	-13629	223	+	27705	28763	28055	136 (0.22)	-13698 (<0.001)	0.837
8	-13565	255	+	27640	28850	28040	128 (0.64)	-13629 (<0.001)	0.843

Note: Log - Log likelihood; # – number of parameters; AIC – Akaike information criterion; BIC - Bayesian information criterion; ssaBIC - sample-size adjusted BIC; LRT - Lo-Mendell-Rubin Adjusted likelihood ratio test; BLRT – bootstrap likelihood ratio test; + The Chi-Square test could not be computed because the frequency table for the latent class indicator model part was too large.

Table 6. Ten items with largest disparity in probability endorsement between groups

Factor	Item	Probability of Endorsement	
		Class 1	Class 2
1	24 The details in memories of specific events are usually accurate	0.80	0.25
2	6 A memory that is recalled with a lot of vivid and specific details is highly likely to be accurate	0.75	0.25
2	19 The more detailed the description of a memory the more accurate the recollection	0.65	0.15
2	5 A memory that is recalled fluently is likely to be accurate	0.55	0.10
6	13 When someone recalls a memory of childhood sexual abuse, or perhaps a series of such memories, it will usually be the case that there is at least some truth to their recall	0.90	0.45
2	7 Highly specific details are more likely to be accurate than details that are less specific	0.60	0.20
4	1 Memories are like photographs or videos	0.70	0.30
4	2 Memory is like a movie of one's experiences	0.70	0.30
8	16 Memories of intense emotional experiences are "burnt in the brain" and are therefore remembered in detail for long periods of time	0.70	0.30
2	20 Memories containing peripheral information e.g. surroundings and background details, are more likely to be accurate	0.70	0.35

Figure 1. Principal components score plot of all responses as a function of respondent group

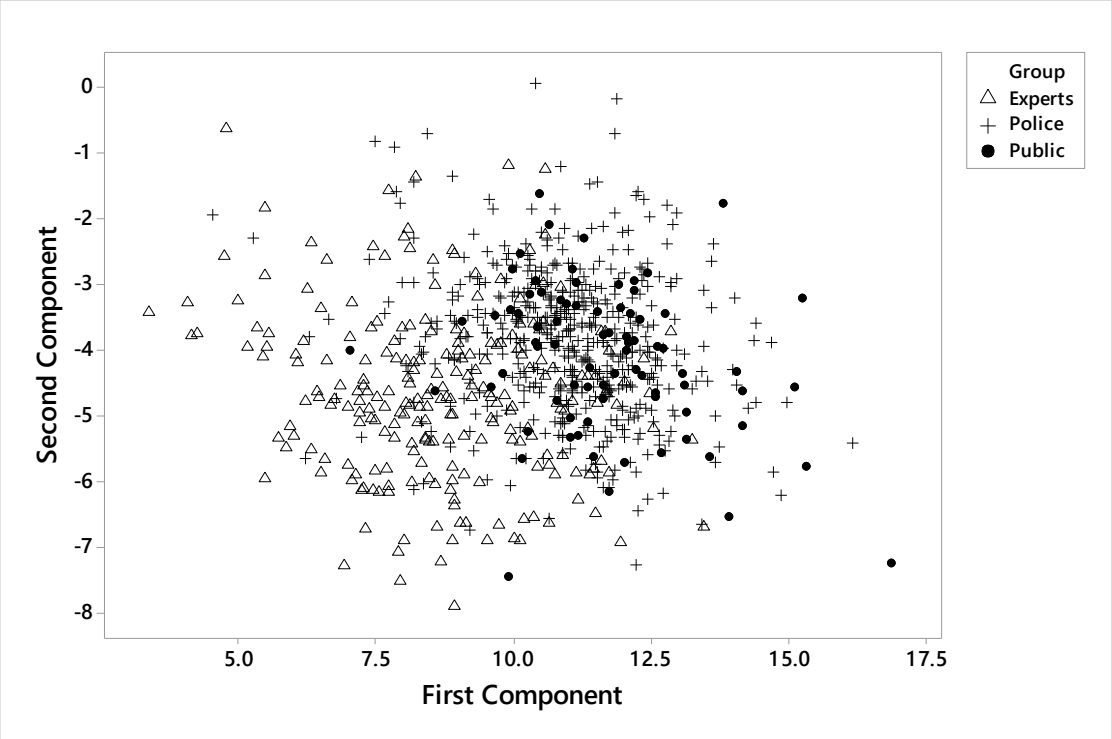
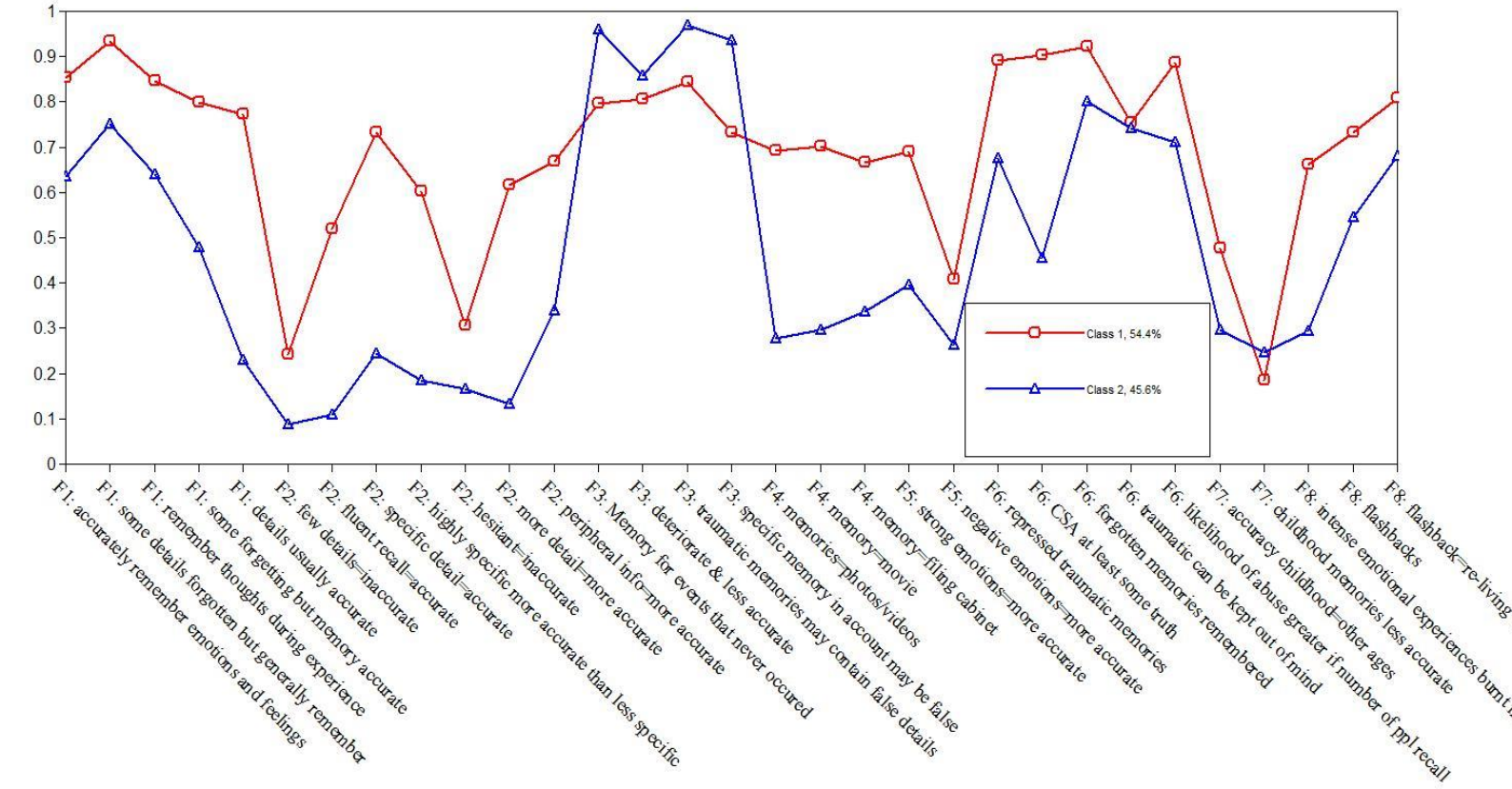


Figure 2. Latent class profile plot of beliefs about memory



Appendix

The Memory Questionnaire

Instructions

In this questionnaire you will see statements about memory and you are asked to indicate, in your OWN opinion, the extent you agree with the statement. So you will see statements of the form:

When an account of a memory has a quality 'X', it is likely to be accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

You simply circle ONE of the four choices, Strongly Disagree, Disagree, Agree, Strongly Agree to indicate the extent that you agree/disagree with the statement.

IMPORTANT NOTE: There are no right or wrong answers! Nor are there any 'trick' statements. We are simply interested in YOUR views.

Also note that some of the statements are very similar. This is because it is often useful to tackle the same issue from slightly different angles. Please do not read back or look ahead simply answer the question in front of you - that is the best way for us to get your views.

1. Memories are like photographs or videos
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

2. Memory is like a movie of one's experiences.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

3. Memory is like a filing cabinet in which each document records a specific memory
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

4. A memory that has few details is likely to be inaccurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

5. A memory that is recalled fluently is likely to be accurate.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

6 A memory that is recalled with a lot of vivid and specific details is highly likely to be accurate.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

7. Highly specific details are more likely to be accurate than details that are less specific.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

8. A memory that is recalled hesitantly, with lots of going back and double takes, is likely to be inaccurate.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

9. Memories from childhood are as accurate as memories from other ages
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

10. People often accurately remember emotions and feelings
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

11. Memories of traumatic events contain only a few vividly remembered details
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

12. Traumatic experiences can be repressed for many years and then recovered
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

13. When someone recalls a memory of childhood sexual abuse, or perhaps a series of such memories, it will usually be the case that there is at least some truth to their recall
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

14. Memories of traumatic experiences can never be wholly false
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

15. People generally remember what happened even though some details may be forgotten and some remembered inaccurately
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

16. Memories of intense emotional experiences are "burnt in the brain" and are, therefore, remembered in detail for long periods of time
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

17. Traumatic memories come to mind in the form of 'flashbacks'
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

18. Children's memories are less accurate than adult's memories.
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

19. The more detailed the description of a memory the more accurate the recollection
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

20. Memories containing peripheral information e.g. surroundings and background details, are more likely to be accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

21. People often remember the thoughts they had during a specific experience
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

22. Despite some forgetting and occasional errors memory is generally accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

23. People can come to remember events that never occurred
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

24. The details in memories of specific events are usually accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

25. Experiences that feature very strong emotions are more accurately remembered than experiences in which emotions were moderate or weak
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

26. Memories of emotionally negative experiences are more accurately remembered than memories of neutral and positive experiences
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

27. Memories can be forgotten over many years, even decades, but later remembered again
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

28. Memories of emotionally negative events from childhood often contain specific details that are accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

29. Some people can recall detailed memories from very early childhood, e.g. aged 3 years and below
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

30. Over time memories deteriorate and can become less accurate
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

31. Over time memories consolidate and can become fixed in memory
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

32. Memories of traumatic experiences can be kept out of mind
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

33. A 'flashback' of a traumatic memory causes a re-living of the remembered event
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

34. Memories of traumatic memories may contain details that are false
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

35. It is possible for a highly vivid, very specific, detail in an account of a memory to be wholly false
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)

36. When a number of people all recall being (separately) abused by a particular individual or group of individuals, the likelihood that the abuse occurred is greatly increased
Strongly Disagree Disagree Agree Strongly Agree (please circle your choice)