Effects of Time Interval, Age and Gender on Perception and Recall Ability of Nigerian Federal Road Safety Corps (FRSC) Plate Numbering System Using Tachistoscope

**K. N. Tlhabano[1], S. K. Balogun[1*], M. Selemogwe[1]
and M. M. Pheko[1]**

[1]*Department of Psychology, University of Botswana, Botswana.*

Authors' contributions

Author KNT managed the literature searches and wrote the first draft of the manuscript. Author SKB designed the study and procedures, revised the protocol and revised the manuscript. Author MS reviewed the manuscript. Author MMP reviewed the manuscript. All authors read and approved the manuscript.

Research Article

ABSTRACT

Aims: To investigate the effects of time interval, age and gender on recall efficacy of Nigerians with the newly introduced vehicular plate numbering system using a tachistoscope.
Study Design: A repeated measure design
Place and Duration of Study: Ibadan, Nigeria, February 2013
Methodology: One Hundred and thirty one (131) students of the University of Ibadan (65 males and 66 Females) were randomly selected from a list of volunteers. Participants were then exposed to three types of vehicle plate numbers for recall purpose varying the time interval, age and gender. Participants were repeatedly exposed to the tachistoscope over three trials (one for older series – sample A, one for the old series – sample B and one for the new plate number – sample C). Measures were taken on how many information characters were verbally recalled.
Results: It was observed that, contrary to expectation and concern of the authors, there was better recall of the latest version (sample C) of the vehicle plate numbering system. There was no significant difference in recall ability by gender or age. In addition, time interval had significant influence on recall ability in that those who recalled immediately

_____

*Corresponding author: E-mail: shyngle_balogun@hotmail.com;

performed better than those who had delayed recall.

Conclusion: Overall time interval affected both plate number perception and memory recall and there was no effect of gender on perception and memory recall. The recall and recognition results confirmed findings already described in the literature.

1. INTRODUCTION

Balogun and others [1,2,3] drew attention to the vehicular numbering system operational in Nigeria. It was stated that the amount of information displayed on the number plates would not facilitate easy remembering and recall because of the large information that is being displayed on the plate. The concern was raised because the number of items on the plate is contrary to what theories suggest about human capacity to recall information in the short term memory, which is limited to 2 ± 7 items/figures [4,5,6].

In February 1988, the Federal Government of Nigeria established the Federal Road Safety Commission through Decree No. 45 of 1988 as amended by Decree 35 of 1992 referred to in the statute books as the FRSC Act cap 141 Laws of the Federation of Nigeria (LFN). This decree was passed by the National Assembly as Federal Road Safety Commission (establishment) Act 2007. According to the Federal Road Safety Commission (FRSC), this would enhance vehicular monitoring system and generate more funds for various governments.

In exercising their functions, members of the Commission shall have legal authority to arrest and prosecute persons reasonably suspected of having committed any traffic offence. This led to issuance of plate numbers to vehicle owners in Nigeria. Before this decree, Nigeria used the regional system of numbering vehicles whereby vehicles from the former western region of the country were given plate numbers such as; WD 124 for vehicles registered in Ondo town of the western region; ENC162 for vehicles registered in Enugu town of the East central region, and so on. The number plates were given specific dimensions and colors to correspond to the purpose for which the vehicles would be used, i.e. black for private or green for commercial vehicles. The alpha-numeric Fig. were written in white or silver lettering against these backgrounds as seen in Fig. 1a and 1b below.

Fig. 1a. A sample of early plate number- Plate number A

Fig. 1b. A sample of old plate number introduced after exhaustion the plate number sampled in Figure 1a - Plate number A

(Fig. 1a and 1b would henceforth be referred to as Plate number A throughout this paper). With the creation of more states and local government areas, a further improvement on the numbering system was embarked upon. A vehicle registered in Ikoroku in Lagos state was given a number such as LA1570D where LA represented Lagos state, D represented Ikorodu and 1570 was the serial number of the vehicle. A vehicle registered at Oyo in Oyo state had a number such as OY 7744 YY (YY represented Oyo town), and that of Benin formerly known as Bendel state had BD6662BB, BD for Bendel state and BB for Benin city. With the Decree of 1988, the agent saddled with the responsibility of vehicular management (FRSC) introduced a new vehicular numbering system in 1993, as shown in Fig. 2 below:

Fig. 2. A sample of the first FRSC plate numbering system replacing Plate number A – Plate number B

(Fig. 2 would henceforth be referred to as Plate number B throughout this paper). The numbering system entails a uniform color (white) for all plate numbers, a blue lettering for private vehicles, red lettering for commercial vehicles and green for government vehicles. At the top left of the plate is the Nigeria flag for all vehicles (see Fig. 2,) except government

vehicles which have the Nigeria coat of arms, instead. On the top, there is a catch phrase corresponding to the socio-cultural significance of the state where the vehicle is registered, e.g. "Centre of Excellence" for Lagos state; "Pace-Setter" for Oyo; "Sunshine State" for Ondo State; "Liberal State" for Kaduna State and "State of Living Spring" for Osun State. Government vehicles on the other hand have "Federal Republic of Nigeria" written at the bottom and the department (e.g. Custom Service) on top.

Furthermore, alphanumeric symbols were also adopted, but this time with some innovation, i.e. a vehicle has the first two letters corresponding to the first serial order alphabetically, the serial number of the vehicle, and the last letters corresponding to the local government headquarters where the vehicle is registered. For instance, with number like AA123MNY; AA indicates the first in the series of 999 vehicles to be registered in the local Government area, vehicle serial number 123, registered at MNY, meaning Moniya which is the Akinyele local Government area headquarters in Oyo state. The top of the plate will contain Oyo in writing, the phrase "Pace Setter", the Nigeria flag, "Federal Republic of Nigeria" will be written at the bottom. If the symbols are counted singularly, the total information on the plate would average forty five (45) characters.

In late 2010, the Federal Road Safety Commission of Nigeria introduced modifications in the existing plate numbers for vehicles owners in the country, in order to improve national security and increase revenue generation. The only difference between the old (plate B) and the new (plate C) is the design in the back ground, which has the Nigerian map and green color at the bottom. The corresponding alphabets were moved from left to right and the serial alphabets were move from right to left, while the numbers remain the same with an average forty seven (47) items.

Fig. 3a. A sample of the latest FRSC plate numbering system- Plate number C

Fig. 3b. Another sample of FRSC latest plate numbering system - Plate number C

(Fig. 3a and 3b would henceforth be referred to as Plate number C throughout this paper). Even though the plate and numbering system is centrally controlled (via computer), and its introduction would yield more revenue for the government as argued by the Nigeria government, there is a limit to human memory capacity, as the information contained therein is still too theoretically large for human memory to recall effectively.

2. LITERATURE REVIEW

Information processing in human beings is a complex phenomenon that is handled by an organization of complex structures involving the Sensory Register (SR), the Short Term Store (STS) (also known as short-term memory) and the Long Term Store (LTS) (also known as long-term memory) [7]. The ability to hold information and recall it depends on the task and the instructions an individual is given. However, generally speaking, the SR is a very short-lived memory store which temporarily holds in-coming sensory information while it is being initially processed and transferred to STS [8]. In visual modality for example, information will decay from the SR in a period of several milliseconds [5]. Information transferred to the STS will decay in 30 seconds if not attended to or controlled through a process called rehearsal buffer. While rehearsal is going on, a portion of the information is transferred to LTS which is of a permanent repository nature [7,9].

2.1 Memory Recall

There are two main methods of accessing memory: recognition and recall. Recognition, a largely unconscious method, is the association of an event or physical object with one previously encountered. It involves a process of comparison of stimulus information with that stored in memory, e.g. true or false statements among others. Recall on the other hand, involves remembering facts, events or objects that are not physically present at the time, and requires the direct uncovering of information from memory such as remembering the name of a recognized person and so forth [10].

Recognition, which entails only a simple familiarity decision, is generally thought to be "superior" to recall in terms of effectiveness because it entails a single rather than two processes. Full recall on the other hand entails a two-stage process, and this is usually referred to as the two-stage theory of memory. In the two-stage process the search and retrieval of candidate items is followed by familiarity based decision making where the correct information is chosen among the candidates retrieved. As such, recall involves actively recreating information and activation of all the neurons involved in the memory in question. Conversely, recognition simply entails a rather simple decision regarding whether one thing amid others has been previously encountered. Even so, while a part of an object initially activates only a part of the concerned neural network, at times recognition is enough to activate the entire network [10].

In the two-process recognition theory Mandler [11] discriminates between familiarity and retrieval as bases for recognition. A given item on a recognition test may cause a strong sense of familiarity, in which case the participant will respond positively. Alternatively, if the level of familiarity is insufficient to reach the threshold for responding, the participant may then attempt a retrieval. If that retrieval succeeds, the participant will make a positive response. Thus, recognition can occur in either of two ways. However, the familiarity route is tried first and, hence, often dominates. Mandler [11] argued that familiarity develops through progressive integration--organization within an item over repeated encounters. Familiarity is little influenced by connections between items. Naturally, less exposure to the stimulus leads to fewer opportunities to increment familiarity.

In terms of recall, information is recalled in three distinguished ways; free recall, cued recall, and serial recall. Free recall is the process in which a person is asked to recall items from a previously studied list in any order. A person may recall items presented at the beginning of the list first and more often (primacy effect); items presented at the end of the list first and more often (i.e., recency effect) [12], or recall items from neighboring positions in the list successively (i.e., contiguity effect) [10].

In cued recall a person is presented with a list of items to remember and then tested using cues or guides. Cues act as leads to what the person is supposed to remember, and can be practically anything that may act as a prompt, e.g. a tree, car, odor, etc. In contrast to free recall, the subject is prompted to remember a certain item on the list or remember the list in a certain order. Tulving, [13] elucidates this phenomenon in his work where participants were given associative cues to items not originally recall and thus thought to be lost to memory. Consequently, respondents were able to recall the item. Serial recall on the other hand refers to the ability to recall items or events in the order in which they took place [14]. These could be chronological events in our autobiographical memories, the order of the different parts of a sentence, or phonemes in a word.

2.2 Recall Ability

The human memory system i.e. the Short Term Memory (STM) and the Long Term Memory (LTM), varies in storage capacity and duration in retentive ability [2]. According to Sperling [5] because of STMs rapid decaying nature and retentive ability of 30 seconds, the best number of material for STM, should not be more than 12 items. Sperling suggests this even though man's capacity to retain and effectively recall information is limited to 7. In fact in his experiments, Sperling [5,6,15] found that subjects were able to recall on average 4 to 5 letters correctly, though this can improve with letters having meaning and arranged together [7].

Besides the STM''s decaying nature and small retentive ability, other factors have been found to influence recall ability. Such factors include; duration between stimulation and recall [5]; order of presentation of stimulus and the context [7,16,17]; similarity in letters or figure characters, and vocalization in recall [6,18]. Andrade [19] also found that the task type, whether easy (i.e. counting/recall in ones) or difficult (counting in sevens) would affect learning, retentive and recall ability, especially within easy tasks. Furthermore, the ability to retrieve information from LTS varies considerably depending on such factors as; task involved at encoding and decoding the information, how the information is to be recalled (serial, free-recall and so on), interfering materials within and without the individual, time interval, and number of materials to be learned and recalled [19,16]. Time interval and recall are the concern of the current study.

Irwin Rock of University of Illinois conducted an experiment in which a control group and an experimental group learned pairs of words. The control group studied word pairs and these words were repeated until participants learned all the word pairs. For the experimental group the learned pairs of words remained in the list at the same time as unlearned pairs were substituted with recombination of previous words. Rock believed that if learning were incremental even when word pairs are incorrectly recalled associations between two items would be strengthened [20]. He hypothesized that the correct recall probability would be higher for the control group in comparison to the experimental group. Accordingly, recurrence would augment the strength of the word pair until a threshold needed to produce an explicit response is reached. Provided learning was all or none, the rate at which the control group and the experimental group learn the word pairs should be the same. Experimentally, Rock found little disparity in learning rates between the two groups [20].

Still, Rock's [20] work did not settle the controversy that his experiment replaced word pairs that could be either easier or harder to learn than the original words in the word-digit pair were rearranged. Additional experiments seeking to address the controversy presented mixed results. Support for the incremental learning hypothesis is provided by the concept that awhile after Ai-Bi pairs are learned, recall time for Bi decreases as learning trials continue [20].

Symmetry of forward and backward recall is among theories that can be tested utilizing cued recall. In general, it is assumed that forward recall is easier than backward recall. This is by and large true when dealing with long sequences of word or letters such as the alphabet. The independent associations hypothesis views the strength of forward and backward recall as independent of each other [21]. George [21] confirmed this hypothesis when he tested participants' forward and backward recall, finding that, indeed forward and backward recalls are independent of each other. His findings indicated a .47 and .25 probability of correct word pair associations for forward and backward recall respectively.

However in another view, the associative symmetry hypothesis, the strengths of forward and backward recall are about equal and highly correlated. Asch and Ebenholtz' [22] experiment where participants learned pairs of nonsense syllables through anticipation recall found that backward association was in a greater sense weaker in comparison to forward association. In the experiment, after participants reached a certain threshold of learning they were tested by free recall to establish all pairs and single items they could remember. Nevertheless, little difference between forward and backward recall was observed when the availability of forward and backward recall was essentially the same.

Further still, a study utilizing cued recall found that learning takes place during test trials. Carrier and Pashler [23] found a 10% error difference between the group with a study-only phase and the group with a test-study phase, in favour of the latter. In the study-only phase, participants were given an English word and a Siberian Eskimo word (Ai-Bi), while in the test study phase, participants first attempted to recall Bi using Ai as a cue, following which they were shown Ai-Bi pair together. The result suggests that testing participants' memory with mental operations helps later recall of what they have learnt. The act of recalling rather than restudying creates new and long-lasting connection between Ai and Bi.

In a series of experiments Sperling [5,6,15] found that human beings are able to recall on average about 4.3 items from a code (an imagined) of a maximum of 12 items. That is, the human memory, especially the STS has a capacity to store a 12 item code, but for effective recall, the code should be limited to 7 items. Even at that, subjects were able to recall on average 4.3 items correctly due to the rapidly decaying nature of the STS, approximately 30 seconds or one minute at the most.

Balogun [2], and Balogun and Aderonmu [3] in their experiments found that across situations, gender and number of recall trials, respondents recalled on average, 3.8 items of the FRSC numbering system (Plate B) compared to an average of 6.7 items of the old numbering system (plate A) that took the human memory into consideration. In other words, Nigerians recalled on average 6.7 items when using Plate A which was phased out first, and on average 3.8 items when using the vehicle numbering system Plate B, that was recently phased out. The implication is that Nigerians are worse of in recall. Even more, the use of the new numbering system has legal implications in that police officers and victims may not be able to accurately encode and retrieve the details of a car for identification in hit and run situations. Should a letter be wiped off as is the case with wear and tear of the color it becomes an opportunity for a good lawyer to dismiss the case in favor of an apprehended person because "LAGOS" is not the same as "LAOS" in a court of law [2,3].

2.3 Time Interval

Research [24] has shown that when lists are tested immediately after study, the last couple of pairs are remembered best. After a five second delay, the recall of recently studied words is reduced. Additionally, word paired at the beginning of a list still show better recall. Moreover, in a longer list, the absolute number of word pairs recalled is smaller but in a shorter list of word pairs, the percentage of word pairs recalled is greater, i.e. If the number of items counted singularly were considered, performance was better with longer list, but if it was in terms of relative performance, the shorter list performance was better. The effect of time interval was further established by Peterson and Peterson [25] when comparing memory recall across several time intervals (3, 6, 9, 12, 15 or 18 seconds) he found that even when counting numbers backwards to prevent rehearsal, longer time intervals of retention led to significantly poorer memory recall compared to shorter intervals. Recall accuracy was about 70% for a 3 second retention interval and decreased to 10% for an 18 second retention interval. Ability of the participants to recall the letters decreased logarithmically with increased time.

2.4 Recall and Gender

Generally, females have been found to be superior to males in episodic memory activities such as recognition and delayed recall but to not differ on working, immediate and semantic

memory activities. It has been suggested that gender differences in memory performance possibly reflect how the two sexes differ in strategies used to process information and not due to anatomic differences [26]). However, Guillem and Mograss' study concerned itself with gender differences in semantic processing rather than in memory recall.

Apart from a series of studies in memory and cognitive functioning of human beings especially on recency effect in learning, carried out between 1990 and 1992 by Baddeley and Hitch, studies theorizing about STM which featured prominently in the 1960s have been scanty and limited [27]. Baddeley and Hitch [27] suggested that more studies be carried out on features of cognition and memory, and the present study to some degree is a response to that suggestion.

2.4.1 Current study

The concern of the present paper was in the fact that despite several warnings about the utility of this innovation, (as pointed out by, Balogun, [2]; Balogun, [1], Balogun & Aderonmu, [3], i.e. ability to recall effectively more than 7 items,), would Nigerians' recall ability improve with yet another variant of the numbering system as introduced by the Federal Government of Nigeria?

Specifically, the concern of this study is whether, with the variant of this numbering system, would the recall ability of Nigerians improve over the immediate past version of the Numbering systems? In other words, would there be a significant difference in recall ability on either of Numbering systems A, B, or C? Furthermore, the present study seeks to test the validity of findings of a few European and American researchers about Nigeria, regarding Nigerians' retentive capacity and ability to use FRSC numbering system even if the recall was made to be in words as proposed in the literature that "facilitative effective" of meaningful words may improve recall ability.

Conclusively, given that the current numbering system is not significantly different from the numbering system that was phased out last except for the reverse ordering of the serial number and Nigerian Map background (see Fig. 3); would it be that the Nigerian Government's new "innovation" improves the recall efficiency of Nigerians against established recall and human memory theories?

The current study thus asks:

1. Would participants' perception and recall of the Plate number A be better than Plate number B, and Plate number C based on the total items recalled?
2. Would age significantly influence perception and recall ability among students of University of Ibadan?
3. Would gender significantly influence the recall ability?
4. Would time interval be a significant variable of influence in recall ability?

3. METHODS

3.1 Design

A repeated measure design was adopted in the present study. Participants were repeatedly exposed to the tachistoscope over three trials (one for the older series - Sample A, one for

the old series - Sample B, and one for the new plate number - Sample C). Measurements were taken regarding the number of information characters were verbally recalled.

3.2 Participants

One Hundred and thirty one (131) students at the University of Ibadan were randomly selected from a list of volunteers. These comprised 65 males and 66 females. The participants were divided into two age groups, the young and the old. . A questionnaire was designed to collect the demographic variables of participants at the experimental laboratory. The demographic information was the used to allocate participants into groups (young and old). After computation of the participants' demographic variables, the mean age came to be twenty-two (22) years. Consequently, ages that fell below the mean age were classified as young, while ages above the mean were classified as old.

3.3 Materials

The two-field tachistoscope was used in this study. The tachistoscope consists of a light-proof box with a viewing aperture at one end and a blot on the opposite end on which the object to be seen is placed. As determined by the experiment, the interior of the box can be briefly illuminated by a flash of light. Special light under electronic control is used and it allows the flash duration to be controlled to within fractions of 300milliseconds (3seconds). By the use of special partially silvered mirrors which allow some light hitting them to pass through and reflect to the rest, it is possible to present several objects for viewing in rapid succession. This is accomplished by illuminating the appropriate sequence of "fields" in the tachistoscope. The tachistoscope is specially designed for testing the information that the visual field memory can retain within the time predetermined by the experimenter. The argument of this instrument is that, the background of what we see affects the ability of recalling.

Other materials that was included in this study were specimens; one new Federal Road Safety corps numbers plates (Sample C), one old plate numbers series of 1993 to 2010 (Sample B), and one older plate numbers series of 1976-1992 (Sample A). Further, a stop watch for timing during recall and a record sheet was used.

3.4 Procedures

The researcher explained necessary experiment-related information to the potential participants. Following this individual consent was sought and only individuals who consented participated in the experiment. Participants were subsequently led to the laboratory and given briefed about the experiment where they were informed that they were required to recall what they saw in the window view of the tachistoscope. Participants were given a demonstration of what the expected response behavior was by using an assistant as "participant". Thereafter, each participant was taken to the experimental room and seated properly in front of the tachistoscope where he or she was exposed to the experimental conditions. Recall in Plate number B and Plate number C was minimally altered in terms of counting. That is, words written and recalled were counted as one, for example LAGOS, STATE, CENTRE, NIGERIA and REPUBLIC e.t.c. This approach to counting was adopted because of the facilitating effects of letters placed together to form a pronounceable and understandable word (7) aiding recall. This was in line with comments from the generality of

the government officials that with time Nigerians would adapt to the new plate numbers (Sample B) even when there was a great uproar against "tasking" new plate numbers.

Participants were exposed to the older plate numbering – Sample A (Treatment 1), then followed by the old plate numbering – Sample B (Treatment 2), and then the new plate numbering – Sample C (Treatment 3.) Recall was done immediately and at two minutes after exposure to each plate number. The participants were later debriefed and thanked for their participation in the experiment.

4. RESULTS AND DISCUSSION

Table 1. Summary of t-test showing the effect of plate types on perception and memory recall of federal road safety plate numbers using tachistoscope

	Plate	N	Mean	Std.	Df	T	P
Items Recalled	A	131	6.82	1.39	130	-4.13	<.05
	B	131	7.73	2.38			
Items Recalled	A	131	6.82	1.39	130	-6.83	<.05
	C	131	8.24	2.43			

Results from table 1 shows that there is a significant difference in the participants' memory recall between A and B plate at [t (130) =-4.127; p<.05.] Results from the table indicate that participants recalled more items on the Plate number B with a mean of 7.73 than the recall of items on the Plate number A with a mean of 6.82. Furthermore, the table reveals that there is a significant difference in the participants' memory recall between Plate number A and Plate number C at t (130) =-6.83; p<.05. This implies that the participants recalled less items on Plate number A with a mean of 6.82 than on the Plate number B with mean of 7.73 and on Plate number C with a mean of 8.24.

Table 2. Summaries of t-test showing the effect of age on perception and memory recall of federal road safety plate numbers using tachistoscope

Age	N	Mean	Sd.	Df	T	P
Young	66	8.33	1.75			
Old	65	8.23	1.93	129	1.30	>.05

Results from Table 2 showed that gender did not have any significant effect on perception and memory recall of the plate numbers at t(129)=1.303; p> .05. The results suggest that being male or female did not have an effect on the process of perception and memory recall.

Table 3. Summaries of t-test showing the effect of gender on perception and memory recall of federal road safety plate numbers using tachistoscope

Gender	N	Mean	Sd.	Df	T	P
Female	66	8.61	1.29			
Male	65	8.97	2.40	129	-.43	>.05

Results from Table 3 show that gender did not have a significant relationship with the process of perception and memory recall of plate numbers using tachistoscope at (t=-.43;p>.05)

Table 4. Summaries of t-test showing the effect of time interval on perception and memory recall of federal road safety plate numbers using tachistoscope

Time Interval	N	Mean	Sd.	Df	T	P
Immediate	131	8.79	2.86			
2-minutes	131	8.11	3.11	129	53.70	<.05

Results from table 4 show that time interval had a significant effect on perception and memory recall of federal road safety plate numbers using tachistoscope at [t(129)=53.702; p<.05.] The results suggest that when participants were asked to recall immediately after exposure to the experimental treatment, they were able to recall more of the plate number items with a mean of 8.79 than when they were given 2 minutes time intervals to recall (with a mean of 8.11.)

4.1 Discussions

In accordance with one of the assumptions that time interval will have a significant effect on the process of perception and memory recall of federal road safety plate numbers using tachistoscope, results showed that time interval had a significant effect on perception and memory recall of federal road safety plate numbers using tachistoscope. The results suggest that participants who were given longer time intervals between perception and memory recall (expecting buffering effect to have taken place as suggested in the literature) were able to recall lesser items from the plates than their counterparts who were given short time intervals between perception and memory recall. This implies that contrary to what the literature says, in the current study, short term memory was more effective than long term memory.

There are studies in the literature with similar outcomes. For instance Peterson and Peterson [25] when comparing memory recall across several time intervals (3, 6, 9, 12, 15 or 18 seconds) found that even when rehearsal was prevented (through counting backwards of the numbers) longer time intervals of retention led to significantly better memory recall compared to shorter intervals. Recall accuracy was about 70% for a 3 second retention interval and decreased to 10% for an 18 second retention interval.

However, results from the study negated the assertion that there will be age differences in the process of perception and memory recall of federal road safety plate numbers using tachistoscope due to age variations by indicating that age did not have any significant effect on memory recall. This means that the young and old participants' rate of memory recall did not significantly differ from each other. An explanation for this outcome could lie in the range of ages of the participants. Most of the participants in the study were of similar age groups, thus there was not much disparity between older and younger participants. Another possible explanation for the outcomes of this study could be that the cognitive stimuli included in the current study were not stressful enough to produce raised cortisol that would affect memory (28,29). A very low criterion for tasks to be considered stressful was utilized and it is certainly possible that the tasks were not anxiety producing enough to raise cortisol levels. These results may have been affected by the influences of other environmental (nurture)

factors on age thus disrupting the natural relationships of biological composition and memory processes.

Findings also negated assumptions that gender will have a significant effect on the process of perception and memory recall of federal road safety plate numbers using tachistoscope. Consequently, being male or female did not have an effect on the process of perception and memory recall. The results on gender and memory recall of other studies in the literature have been inconsistent. A possible explanation for the results of the current study could be that unlike some other activities, memory processes, especially with the recall of the numbering system, are not gender specific and can be influenced by other environmental factors besides the genetic and biological make-up of individuals.

Besides, three interesting findings emanated from the present study: (1) that culturally and by extension, retentive ability of Nigerians is better than that of the Europeans, going by Sperling's [5,6] findings. Sperling reported that the average recall ability of individuals is 4.3 items. In the present study the recall ability, at least with the new numbering system was 8.24, and if we were to discount the facilitating effects of certain vowels and consonants, many of the recalled words showed that Nigerians have larger memory and retentive span contrary to theoretical expectation [2,3] and possibly in support of the view of some who said that with more time for adaptation, Nigerians would get more familiar with the numbering system. However, caution should be exercised in accepting this conclusion as the sample size is too small, and should be seen in relative term to this particular study. More studies would have to be conducted across different situations and context. Also, a comparative study should be done between European and Nigerian samples, especially on FRSC numbering system for the conclusion to stand.;; (2) too many information coming into the memory span, did not interfere with recall ability as demonstrated with the average items recalled in the new numbering system, (3) time or duration of recall affects the number of items recalled, because when the participants were asked to recall immediately they recalled better compared to when participants were asked to recall after 2 minutes as reported by Balogun's (2) that time interval does not have influence recall.

The fact that there was a better recall with the new numbering system (Plate number C) could be as a result of the observation of Wolford and Hollignsworth [18]; Sperling [6] that if more information come in and recall was vocalized, there could be complimentary effect which increases the number of recalled items. The STM has been implicated in retention of information that is of limited span even though it is possible to register more information than the ones actually reported (Sperling, [5]). For example, while Sperling [6]) reported that error made could be a result of auditory confusion when letters or words sound alike thereby bringing about interference in recall process, Wolford and Hollingsworth [18] argued that the confusion is in the number of visual information presented. In the current study, more items were recalled when they were vocalized, thereby suggesting that there was no confusion with vocalization during recall.

Evidence in support of the introduction of the new numbering system in term of number of information presented might be found in Sperlings [5] work where it was observed that as the information presented increases, the number of items recalled increase as well. Problems here however are; (1) that of the task involved (i.e. whether participants were to recall whole or partial reporting) and (2) the reported recalled items were based on estimation and not actual reporting. In fact Sperling himself agreed that his estimation were in contrast with the observed average recall 4.3 items and though his estimation was also based on short time interval between stimulation and recall, he still went ahead to conclude that it is possible that

there exists a memory store of larger capacity. This is equally possible with the new numbering system if we take into consideration the fact that the words recalled could possibly have more than 3 or 4 items. Therefore, "Lagos" and "centre of excellence" including Nigeria map against the background, Nigeria flag, and the green color up to 26 items which were treated as four words and three pictures thus making seven items in the present study. This could mean that the memory store is as large as having 26 or more items registered.

Generally speaking, recall performance was low; even though participants recalled more items immediately, performance was low compared to the number of items provided. So what happens if an accident victim was to recall the identification number of the vehicle involved after say 2 or 3 days due to possibly a total blank which could be enhanced by the shock of the accident itself? However, the numbering system should not be condemned in it's entirety because with repeated exposure (trails) to the plate numbers participants showed ability to recall more items. In other words, with familiarity, it is possible that Nigerians would be able to demonstrate higher recall ability, and this has support in Turvey's [17] study. Turvey reported that when he presented information to participants through the tachistocope 54 times, there was familiarity effect but no cumulative effect in term of percentage of recall.

It is possible that intentional recollection could intrude into the nominally implicit process of recall of the plate numbers. Participants may notice some studied images in the plate numbers and begin conscious attempts to recover items from the stimulus. This is a potential problem with all implicit tests; Richardson-Klavehn and Bjork [30] pointed out that "parallel effects will remain difficult to interpret (without criticisms) until we know more about the contribution of intentional memory to performance of recall on implicit tests." However, this criticism is more difficult to sustain in the face of the current results. The pattern differed for the direct tests, in which intentional memory was necessarily involved.

A plausible explanation for our results, and many other results, is provided by Mandler's [11] two-process recognition theory, which argued that familiarity develops through progressive integration--organization within an item over repeated encounters. This theory has the virtue of having already been applied to explain the time interval effect [11] and to account for performance of recall on direct versus indirect tests of memory (e.g., [31,32]). It can be assumed that because Plate number C is more elaborate than Plates number A and B, items on Plate number C were more retrievable

5. CONCLUSION

Overall time interval affected both plate number perception and memory recall. The results indicated that there was no effect of gender and age on perception and memory recall. The recall and recognition results confirmed findings already described in the literature. The critical finding is that recall of item from a tachistoscope showed that longer time intervals had a more positive effect on recall of plate numbers than shorter intervals. The novel idea of the Nigeria FRSC is commendable as there is no static society. The society is always dynamic. However, just because one form of act or behavior operates in a particular society does not make such behaviour/act to be universally applicable. The import of this conclusion is that if such an innovation is desirable and appropriate in a society, the cost and other psychological implication of it on the adopting country should be considered along, not just copying the idea because you (the agent) want to be seeing as doing something.

6. LIMITATIONS

In relation to the population of the study, sample size was not large, as such, there are two concerns. First, small sample sizes generate low statistical power, that is, one is more likely to conclude (falsely) that no relationship exists when, one truly does. Secondly, results from small samples are less likely to replicate because of second-order sample error [33]. On this front, however, because most of the results were pooled within-individual relationships, the degree of second-order sampling error may be reduced.

7. RECOMMENDATIONS

It is recommended that on the basis of the research findings, the FRSC needs to seek better ways of improving the quality of the plate numbers in terms of presenting all the necessary information without overcrowding it. Psychologists may be invited to help in designing a better and a recall friendly system for use in Nigeria. The psychologists may also assist with assessing the impact of factors such as motivation, attitude, learning styles, economic situation and social background in the process of perception and memory recall. To better understand the effect of gender and age on memory processes factors investigated in this study should be reinvestigated with a larger sample size and using a sample beyond the university population..

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

CONSENT

Participants were volunteer students who willingly agreed to be partakers of this "novel" idea.

ETHICAL APPROVAL

Not applicable as the experiment was made open and conducted during the course of teaching experimentation in class.

REFERENCES

1. Balogun SK. Dancing in the Social Jungle. An Inaugural Lecture, University of Ibadan, Nigeria. Ibadan: Ibadan University Press; 2001.
2. Balogun SK. Retention and recall in short term memory (STM) the   Federal Road Safety Commission (FRSC) Vehicular numbering system. Journal of Transport Studies. 1995;1(1):29-34.

3. Balogun SK, Aderonmu A. The Influence of Sex, Time Interval and Plate Type on Recall Ability with Federal Road Safety Corps Numbering Systems. Ife Psychologia: An International Journal. 1995;3(2):68-78.

4. Yoloye TW. That we may learn better. Professorial Inaugural Lecture, University of Ibadan: Institute of Education; 2004.

5. Sperling G. The information available in Brief Visual Presentation. Psychological Monograph, 74, whole No. 498; 1960.

6. Sperling G. A Model for Visual Memory Tasks. Human Factors. 1963;5:19–31.

7. Atkinson RC, Shiffrin RM. Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation. New York: Academic Press. 1968;2:89–195.

8. Baddeley A. Working memory. Science. 1992;255:556 -559.

9. Shiffrin RM, Atkinson RC. Storage and retrieval Process in long term memory. Psychological Review. 1969;76:179–193.

10. Mastin L. The Human Memory: What it is, How it works and How it can go wrong; 2010.
    Available: www.human-memory.net/brain_neurons.html. Retrieved on January 17 ; 2013.

11. Mandler F. The efficient assessment of need for cognition. Journal of Personality Assessment. 1980;48:306-307.

12. Bower GH. A Brief History of Memory Research. The Oxford Handbook of Memory; 2000.

13. Tulving J. Memory for socially relevant material. Journal of Abnormal and Social Psychology. 2001;47:25-37.

14. Henson R. Short-term memory for serial order. Dissertation for PhD of Philosophy. St. John's College, University of Cambridge; 1996.

15. Sperling G. Successive approximation to a model for short term memory" Acta Psychological. 1967;27:285–292.

16. Scheerer E. Order of report and order of scanning in tachistocopic recognition" Canadian Journal of Psychology. 1972;26:382–390.

17. Turvey MT. Repetition and the Perceptual information store" Journal of Experimental Psychology. 1967;74:289–293.

18. Wolford G, Wollingsworth S. Lateral masking in visual information processing" Perception and Psychophysics. 1974;6:315–320.

19. Andrade JM. The effect of teacher training for master teaching/essential elements of instruction on student time on task".. Dissertation Abstracts International. 1987

20. Rock B. The human visual system averages speed information. Vision Research. 1959;32(5):931–941.

21. George W. Direction perception in complex dynamic displays: the integration of direction information. Vision Research. 2004;29(1):47–59.

22. Asch W, Ebenholtz G. A detection theory account of change detection. Journal of Vision. 1962;4:1120–1135.

23. Carrier M, Pashler H. The Influence of Retrieval on Retention. Memory and Cognition. Psychonomic Society; 1992.

24. Wikipedia, retrieved on February 22 2013.
    Available: http://en.wikipedia.org/iki/Recall_%28memory%29.

25. Peterson D, Peterson V. Personal involvement as a determinant of perception and memory recall. Journal of Personality and Social Psychology. 1959;41:847-855.

26. Guillem F, Mograss M. Gender differences in memory processing: Evidence from event-related potentials to faces. Brain and Cognition. 2005;57(1):84-92.

27. Baddeley A, Hitch GJ. The recency effect: Implicit learning with implicit retrieval? Memory and Cognition. 1993;21(2):146-155.

28. Belanoff JK, Flores BH, Kalezhan M, Sund B, Schatzberg AF. Rapid reversal of psychotic depression using mifepristone. Journal of Clinical Psychopharmacology. 2001;21(5); 516 – 521.

29. Lupien SJ, Wilkinson CW, Briere S, Menard C, Ng Ying Kin NMK, Nair NPV. The modulatory effects of corticosteroids on cognition: studies in young human populations. Psychoneuro endocrinology. 2002;27:401-416

30. Richardson-Klavehn J, Bjork W. The influence of attitude on the recall of controversial material: A failure to confirm. Journal of Experimental Social Psychology. 1988;5:240-243.

31. Graf S, Mandler F. Heuristic versus systematic information processing and the use of source versus message cues in persuasion. Journal of Personality and Social Psychology. 1984;39:752-766.

32. Graf S, Ryan E. Measuring the affective and cognitive properties of attitudes: Conceptual and methodological issues. Personality and Social Psychology Bulletin. 1990;20:619-634.

33. Hunter JE, Schmidt FL. Methods of Meta-Analysis: Correcting Error and Bias in Research Findings (2nd ed.). Thousand Oaks, CA: Sage; 2004.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=176&id=22&aid=1653