



UNIVERSITI PUTRA MALAYSIA
SELF RECOGNITION IN A YOUNG CHIMPANZEE

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FACULTY OF VETERINARY MEDICINE

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SELF-RECOGNITION IN A YOUNG CHIMPANZEE

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CERTIFICATION

It is hereby declared that we have read this project paper entitled “self-recognition in an infant chimpanzee”, by Azim Salahuddin bin Muhamad and in our opinion, it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of requirement for the course VPD4999 – Final Year Project

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My family, friends, and all that has been motivating me since the first step toward the journey of Doctor Veterinary Medicine students, I thank you.

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD4999 – Project.

SELF-RECOGNITION IN A YOUNG CHIMPANZEE

by

Azim Salahuddin Muhamad**March, 2016****Supervisor: Dr. Hafandi Ahmad****Co-Supervisor: Dr. Tengku Rinalfi Tengku Azizan**

Animal cognition refers to the mental capabilities and the memory of an animal. The cognitive function also provides the evidence of self-awareness, which describe as to distinct of oneself as an individual separate from the environment and other individuals. The mirror self-recognition (MSR) test or mark test is a behavioural technique introduced by psychologist, Gallup, G. in 1970s which to determine whether non-human possess the ability of self-recognition. Therefore, the objective of this study is to measure and analyse the self-recognition of a young chimpanzee. Animal was selected (n=1; *Pan troglodytes*) from Zoo Negara Malaysia and the acrylic mirror (60x84cm: A1 size) was placed outside of the cage. The animal also was marked with odourless non-toxic white paint for MSR test. Open mirror and mark test behaviour were recorded using a video camera for a week and all data were analysed using the ethogram procedure. Theoretically, animal that are considered to be able to recognize

themselves in a mirror typically through four stages of behaviour such as social responses, physical inspection, repetitive behaviour and realization of seeing themselves. Result showed that the animal has positive MSR in an open mirror test. However, the animal does not show self-recognition towards the mark, which indicates to negative MSR. Several factors such as bar cage, insufficient lighting, and reduce in mark colour may cause the animal not to act towards the mark. Therefore, further research is needed to understand the real capability of the chimpanzee in recognising itself. The understanding of cognitive ability as an effort to help the animals such as management and in program to re-establish populations of endangered or threatened species.

Keyword: mirror self-recognition, chimpanzee (*Pan troglodytes*), mark test

ABSTRAK

Abstrak daripada kertas projek dikemukakan kepada Fakulti Perubatan Veterinar bagi memenuhi sebahagian daripada keperluan kursus VPD 4999 – Projek

PENGENALPASTIAN DIRI BAGI SEEKOR CHIMPANZEE MUDA

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Kognisi haiwan merujuk kepada kemampuan mental dan memori seekor haiwan. Fungsi kognitif juga memberikan bukti kepada kesedaran diri, di mana ia menggambarkan perbezaan seseorang sebagai seorang individu lain dari persekitaran dan individu yang lain. Ujian pengenalan diri pada cermin (MSR) atau ujian tanda ialah teknik kelakuan yang diperkenalkan oleh Gallup, G. Pada tahun 1970an untuk menentukan samada seekor haiwan memilliki keupayaan untuk mengenali diri sendiri. Oleh itu, objektif kajian ini adalah untuk mengira dan menganalisa kesedaran diri dan seekor chimpanzee muda. Seekor cimpanzi telah dipilih ($n=1$, *Pan troglodytes*) dari Zoo Negara, Malaysia dan sebuah cermin akrilik telah di letakkan di luar sangkar. Haiwan tersebut juga telah ditanda menggunakan cat putih yang tidak berbau dan tanpa toksin. Tingkah laku terhadap ujian cermin dan ujian tanda telah direkod menggunakan kamera video selama seminggu dan kesemua data telah dianalisa menggunakan prosedur etogram. Secara teori, haiwan yang mengenali dirinya sendiri mestilah

menjalani empat tahap tingkah laku iaitu respon sosial, pemeriksaan fizikal, tingkah laku yang berulang-ulang dan sedar mereka melihat dirinya sendiri. Keputusan menunjukkan haiwan cimpanzi tersebut mempunyai kesedaran diri yang positif terhadap cermin di dalam ujian cermin tetapi haiwan tersebut tidak menunjukkan kesedaran diri terhadap ujian bertanda. Beberapa faktor yang menyebabkan haiwan berikut tidak menunjukkan tingkah laku terhadap ujian bertanda antaranya ialah palang pada sangkar, kekurangan pencahayaan, dan warna penandaan yang pudar. Oleh itu, kajian yang lebih mendalam perlu difahami untuk memahami kemampuan sebenar seekor cimpanzi di dalam kesedaran diri. Kefahaman dan kesedaran terhadap kebolehan kognitif haiwan adalah usaha untuk menolong haiwan dalam pengurusan dan memantapkan kedudukan populasi spesis haiwan yang terancam.

Kata kunci: pengenalan diri terhadap cermin, cimpanzi (*Pan troglodytes*), ujian bertanda

CONTENTS

TITLE	i
CERTIFICATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
ABSTRAK	vi
1.0 INTRODUCTION	1
2.0 LITERATURE REVIEW	3
2.1 Cognitive function	3
2.2 Animal self-recognition	4
2.3 Animal that have passed self-recognition	5
2.4 Animal that have failed self-recognition	6
2.5 Mirror test	6
2.6 Mark test	7
3.0 Methods and Materials	8
3.1 Animal	8
3.2 Experiment set up and equipment	9
3.3 Ethogram, mirror test and sampling	9
3.4 Data Analysis	11
4.0 RESULTS	13
4.1 Pre-test in front of the mirror (baseline mirror-directed behaviour)	13
4.2 Pre-test (baseline self-directed behaviour) in front of mirror	14
4.3 Open-Mirror Test (Mirror-Directed Behaviour)	15
4.4 Open-Mirror Test (Self-Directed Behaviour)	16
4.5 Mark test (mirror-directed behaviour)	17
4.6 Mark test (Self-Recognition Behaviour)	18
4.7 Comparison of mirror test and mark test behaviour	19
5.0 Discussion	21
5.1 <i>Open-mirror test</i>	21
5.2 <i>Mark test results</i>	21
6.0 Conclusion	23
7.0 Recommendations	23
APPENDICES	28

LIST OF TABLES

	Page
Table 1: Mirror-directed behaviour	10
Table 2: Pretest on open mirror test	13
Table 3: Pretest in front of the mirror (self-recognition behaviour)	15
Table 4: Open-Mirror Test (Mirror-Directed Behaviour)	15
Table 5: Open-Mirror Test (Self-Directed Behaviour)	16
Table 6: Mark test (mirror-directed behaviour)	17
Table 7: Mark test (Self-Recognition Behaviour)	18

LIST OF FIGURES

Figure 1: Pretest on open mirror test	14
Figure 2: Pretest in front of the mirror (self-recognition behaviour)	15
Figure 3: Open-Mirror Test (Mirror-Directed Behaviour)	16
Figure 4: Open-Mirror Test (Self-Directed Behaviour)	17
Figure 5: Mark test (mirror-directed behaviour)	18
Figure 6: Mark test (Self-Recognition Behaviour)	19
Figure 7: Cumulative mirror-test behaviour	19
Figure 8: Cumulative mark-test behaviour	20
Figure 9: location of the mirror	28
Figure 10: Julie the female chimpanzee	28
Figure 11: Preparation of the site	29
Figure 12: Paint used for mark test	29

1.0 INTRODUCTION

The traditional explanation of organisms' ability to distinguish their own body in a mirror is that they have an essential cognitive capacity for processing mirrored information about the self (Gallup, 1982). It is divided into three categories that are cognitive, memory and learning.

The cognitive is where the process where the knowledge and understanding is developed in the brain. In addition, the memory is where the capacity to recall previously experience sensation, information, data and ideas whereas the learning is an activity or process of gaining knowledge or skill by studying, practicing, being taught, or experiencing something.

The justification of this study is to contribute to help the animal in re-establishing the population. Around the world, chimpanzee become one of endangered animal as listed in the International Union for Conservation of Nature (IUCN). This may due to high levels of exploitations, loss of habitat and habitat quality due to expanding human activities. Secondly, the awareness to the complexity of the social life of the chimpanzee as chimpanzee lives in a group. The hierarchy and ranking of each of the animal is different and this may result in different of self-awareness. Thirdly, the emergence of self-awareness of a young chimpanzee and to see the development of behaviour of the animal in captive environment. The development of the chimpanzee is different from the age itself.

The chimpanzee or in scientific term known as *Pan troglodytes* is a great ape that live in the rain forest of Africa from Sudan and Tanzania in the East of Senegal

and Angola in the West. Their height is approximately three to five feet and weighing up to 200 pounds.

Considering the number of inadequate research in Malaysia, regarding the physiological status of wild animals and their conservation, the objectives of this study are to measure the ability of a young chimpanzee (*pan troglodytes*) in self-recognition for better understanding in program to re-establish the populations of endangered or threatened species.

2.0 LITERATURE REVIEW

2.1 Cognitive function

According to Blomberg, 2011, in cognitive psychology and cognitive engineering, cognition is typically presumed to be information processing in an individual mind or brain. In addition, memory for specific episodes from the past requires the ability to recall previous experiences, and to recall them even after long periods of time have passed (Carver, 1999)

Indeed, declarative memory (or, explicit memory) affords the capacity for conscious recollections about facts and events. This is the kind of memory that is usually referred to when the terms "memory" or "remembering" are used in ordinary language. Declarative memory can be contrasted with non-declarative (or implicit) memory, a heterogeneous collection of nonconscious abilities that includes the learning of skills and habits, priming, and some forms of classical conditioning. (Zola-Morgan & Squire, 1993).

Furthermore, according to Joshi *et al.*, (2014), learning is acquiring new, or modifying and reinforcing, existing knowledge, behaviours, skills, values, or preferences and may involve synthesizing different types of information. The ability to learn is possessed by humans, animals and some machines. Progress over time tends to follow learning curves. Learning is not compulsory however it is contextual. It does not happen all at once, but builds upon and is shaped by what we already know (Joshi *et al.*, 2014). To that end, learning may be viewed as a process, rather than a collection of factual and procedural knowledge. Indeed, learning produces changes in the organism and the changes produced are relatively permanent. It is divided into 3 parts of learning, which are:

1. **Visual learning:**

Using visual object and seeing information, reading body language well and have good perception of aesthetics, able to memorize and recall various information, and learns better in lectures by watching them.

2. **Auditory learning:**

Recollects information through hearing and talking, prefer to be told how to do things and summarize the main points out loud with help of memorization, and noticing the different aspects of speaking

3. **Kinaesthetic learning:**

Likes to use the hands-on approach to learn new material, rather demonstrate how to do rather than verbally explain, and prefers group work more than others

2.2 Animal self-recognition

Self-awareness or self-recognition is referred to the capacity of an animal to become the object of one's own attention, is a trait believed in the past to be uniquely human and, furthermore, unconfirmed to scientific investigation in other species (Gallup 1977, 1980). However, developmental studies have been concerned with individual differences and developmental milestones, such as the age at which infants pass the test, whereas comparative studies have asked whether chimpanzees (or rhesus macaques, etc.), as a species, possess a self-concept (Bard *et al.*, 2006).

If visual-recognition of the body segment which is visible to oneself and matching it through resemblance to the mirror-image were all that was needed for mirror-self recognition, one would expect most primates and a few other mammals to recognize themselves in mirrors, as they are capable of visual-visual matching and can

form a partial visual self-image. The sorts of visual partial-self-images which might be possessed by organisms are explored by Parker (1980).

The frontal cortex (particularly the right prefrontal cortex) appears to be involved in self-recognition, self-evaluation, episodic (autobiographical) memory, introspection, humour, and mental state attribution. Furthermore, deficits in mirror self-recognition and mental state attribution are characteristic of a number of psychiatric disorders (Gallup *et al.*, 2003). To strengthen the evidence, Happe *et al.*, (1999), stated that the patient that has incidence of right hemisphere damage were diminished in their ability to interpret mental state attribution narratives, and failing in understanding in humour of different characters in different mental state (Happe *et al.*, 1999).

2.3 Animal that have passed self-recognition

Of primates and non-primates species tested, only humans (*Homo sapiens*), chimpanzees (*Pan troglodytes*), and orangutans (*Pongo pygmaeus*) commonly recognize their own body in a mirror (Gallup, 1985; Gallup & Suarez, 1986; Lethmate and Ducker, 1973). Not only that, marine mammals such as bottlenose dolphin, *Tursiops truncatus*, killer whale, *Orcinus orca*, shows positive self-recognition in mark test (Delfour & Marten, 2001). One problem is that an animal may engage in such behaviour without actually using the mirror image to guide the action (i.e. the orientation towards the mirror may be incidental). Thus, using self-directed behaviour as evidence of mirror self-recognition has been criticized (e.g. Povinelli *et al.*, 1993). Between monkeys and great apes on the phylogenetic tree are four genera of lesser apes, or gibbons, of whose cognitive abilities little is known (Takacs *et al.*, 2005).

2.4 Animal that have failed self-recognition

The mirror self-recognition (MSR) tests have been negative for white-handed, *Hylobates lar* (Lethmate & Du"cker, 1973), and dark-handed, *H. agilis*, gibbons and several Old and New World monkey species (Anderson & Roeder, 1989) for capuchin monkeys, *Cebus apella*; (Gallup, 1970) for stump tailed macaques, *Macaca arctoides*, rhesus macaques, *M. mulatta*, longtailed macaques, *M. fascicularis*; (Lethmate & Du"cker 1973) for capuchin monkeys, spider monkeys, *Ateles spp.*, baboons, *Papio hamadryas*, mandrills, *Mandrillus sphinx*, and lion tailed macaques, *Macaca silenus*; (Mitchell & Anderson 1993) for long tailed macaques; (Suarez & Gallup 1986) for rhesus macaques.

2.5 Mirror test

The procedure using a mirror and a mark on the face to assess self-recognition was developed more than 30 years ago (Bard *et al.*, 2006). The mirror-self-recognition generates interest precisely because of this presumed relation to self-awareness. Gallup and his associates claim that organisms which recognize their own body in a mirror can do so because they are self-aware, whereas other organisms are not (Gallup, 1977a, Gallup *et al.*, 1971; Suarez & Gallup, 1981).

In comparative studies, mirror-guided self-explorations are important indexes of self-recognition, but are insufficient evidence of MSR (Bard *et al.*, 2006). Gallup (1970) concluded that self-recognition was present in chimpanzees when there was a convergence of behavioural changes in social behaviour, self-directed behaviour, and time looking at the mirror image.

Many primate species have been tested with versions of the basic task, but only members of the great ape species react as 24-month old children do (Gallup 1970; Povinelli *et al.* 1997; Posada & Colell 2007).

2.6 Mark test

Mark test is an assessment where it is appropriate for a nonverbal or preverbal organism because of the objective target is the behaviour. The mark test is defined as reference to the mark on the face after the mark is discovered by looking in the mirror of the MSR test (Bard *et al.*, 2006). In most studies, mark-directed behaviour is required to conclude self-recognition (Bard *et al.*, 2006). To validate the impression of self-recognition that arose from observing the animals engaging in self-exploratory behaviours, Gallup, 1970 has designed a test where a mark has been placed on the right eyebrow ridge and the upper left ear while the animal is in sedation.

Gallup (1970) stated isolating the chimpanzee would maximize the motivation which they will only interact with only the mirror and testing unfamiliar things. Initially, chimpanzees are inexperienced with mirrors of reflective object. So, all the learning experience will be recorded and known. Isolation during testing continues to be advocated because it controls for how the mark is discovered; that is, isolation prevents others informing about the mark (Povinelli *et al.*, 1993). Touching the mark is a necessary requirement in comparative studies but in developmental studies, it is not. The MSR is concluded for human infants based on a variety of verbal and nonverbal behaviours, but for chimpanzees touching the mark is often the minimal requirement (de Veer *et al.*, 2003; Povinelli *et al.*, 1993). A single touch is sufficient for classifying human infants as self-recognizers, but many touches are required for

chimpanzees to be similarly classified. In the developmental tradition, reference is assumed if the infant has previously observed the mark in the mirror, whereas in the comparative tradition, reference is required for each touch (Swartz et al., 1999).

In comparative studies, reference is operationally defined in two ways: mirror-guided mark touches, defined as the co-occurrence of mark touching and looking at mirror image; and reference is incorporated into the experimental design by testing initially when the mirror is absent, and then in the second phase, the mirror is presented. Touches to the marked areas of the face are tallied, and those made when the mirror is present are compared empirically to those made when the mirror is absent (de Veer et al., 2003; Gallup, 1970; Patterson & Cohn, 1994; Povinelli *et al.*, 1993; Suarez & Gallup, 1981; Swartz & Evans, 1991). Even the standard mark test is vulnerable to errors; in particular, it is vulnerable to false negatives (Heschel & Burkart 2006). It presupposes that subjects are motivated to examine novel marks on their bodies. Lesser apes engage in little self-grooming behaviour and this may hence explain their failure to touch a mark on their head in the mirror test (Ujhelyi *et al.* 2000).

3.0 Methods and Materials

3.1 Animal

A chimpanzee (n=1; *Pan troglodytes*) named Julie was selected in Zoo Negara, MALAYSIA. The location of the chimpanzee, which were isolated with other chimpanzees and with contact with human only. The chimpanzee cannot be mixed with the other chimpanzee because of bullying and causing stress to the animal. This experiment was conducted in the cage where the animal was kept to the public.

However, the preparation takes place at the right side of the cage from the viewing area which will not disturbing the outcome of the data.

3.2 Experiment set up and equipment

An acrylic mirror (60cm x 84 cm; A1 paper size) was used in this experiment. An acrylic mirror is a lightweight and shatter proof mirror and it is covered with frame. The mirror was placed outside the cage for easy access and avoid contact with the mirror. The mirror is placed approximately 5cm to 20cm away from the animal because of the curved cage bar as shown in Figure 9.

A video recorder was used (GoPro Hero 3; action camera from USA) to record all the activities and behaviours in front of the mirror. The resolution is in 720p and in 170° wide angle in 60FPS. A tripod was used with the camera to be as same level as the mirror and the camera is placed beside the mirror. The video is then left for recording for each trial and the researcher should not in the area to minimise the anxiety and attraction.

A non-toxic and white paint odourless (food colouring) was used as a mark during the mark test (appendix). The zookeeper, En. Firdaus was performed the marks in front of the head area. The mark is about 2cm x 3cm on the forehead of chimpanzee where it is big enough for the animal to see and detect the mark. The mark is applied without anaesthetic to reduce of prevent any self-mutilation or abnormal behaviour of the animal as the animal is not usually manipulated.

3.3 Ethogram, mirror test and sampling

Two categories of behaviour were recorded in this experiment. One of the categories is mirror-directed behaviour and self-directed behaviour. Mirror-directed

behaviour is when the behaviour is towards the mirror. Some of mirror-directed behaviour were modified from the original table of behaviour according from the previous study in Table 1(Xiaozaan *et al.*, 2008).

Behaviour	Definition
Viewing	Eyes targeting the mirror for two or more seconds
Investigating	Attempting to touch the mirror
Aggressive	Attacking: Rushing toward the front of mirror from within the indoor cage
	Threatening: Vocalising
Playing	Attempting to interact with the mirror in an amicable manner

Table 1: Mirror-directed behaviour

As for self-directed behaviour, we modified some of the behaviours according previous study by Povinelli et al, (1993) using table of behaviour such as;

- Using hands of feet to groom/pick/ inspect any part of the teeth repetitively
- Grooming neck, shoulder or back repetitively
- Manipulating urogenital region
- Observing food or liquid in open mouth
- Touching urogenital region
- Manipulating chewed food
- Manipulating nipples
- Manipulating lips

Self- directed behaviour or self-exploratory behaviour was used to determine whether the animal really recognise itself in front of the mirror or not. There is an ongoing debate about whether self-directed behaviour in front of mirrors is sufficient evidence for self-recognition or not (Bard *et al.*, 2006).

The mirror test was done for 16 trials in 4 days. From 20th January 2016 to 24th January 2015. Each trials was done for 15 minutes. There are rest between each trials for about 15 minutes.

Mark test was done for 8 trial in past 2 days from 27th January 2015 to 28th January 2015. The reason of gap between mirror test and mark test is because the approval to mark from the Zoo Negara Malaysia itself need to be authorised. Mark test was done and the list of behaviour towards the mirror was observed. Touch mark (assumed in all definitions but not always stated)

- Touch the region of the mark
- Touch nose
- Look at mark or nose
- Exaggerated facial expressions

3.4 Data Analysis

The behaviour data was recorded using the ethogram procedure. An animal that showing five or more convincing instances of self-exploratory behaviour of self-exploratory behaviour at least for 30 seconds is categorised as positive self-recognition (Povinelli *et al.*, 1993). However, other animals that showing self-exploratory one to four times in an instances less than 30 seconds were classified as inconclusive self-

recognition. Those animals do not show any behaviour is classified as negative self-recognition. The frequency of all behaviour is taken and using a bar chart data in Microsoft Excel and the data were analysed and interpreted (mean \pm standard deviation; SD).



4.0 RESULTS

The pre-test or baseline data (behaviour in front of the mirror) is shown in Figure 4.1.

The pre-test or a baseline data is which the data that will use to confirm either the animal is reacting toward its image or not. This behaviour cannot be used as a data for mirror self-recognition data because it acts as the familiarisation of animal toward the mirror according previous studies by Shillito, Gallup and Beck, (1999). In this result, there are numerous behaviour that showing self-recognition such as mouth manipulation in self-directed behaviour and the most common mirror induced was viewing which was in high frequency on every trial.

4.1 Pre-test in front of the mirror (baseline mirror-directed behaviour)

Behaviour	First Observation	Second Observation	Total	Percentage
Viewing	20	22	42	38%
Investigating	1	4	5	4%
Aggressive Behaviour	17	15	32	29%
Playing	21	12	33	29%
			112	100%

Table 2: Pretest on open mirror test

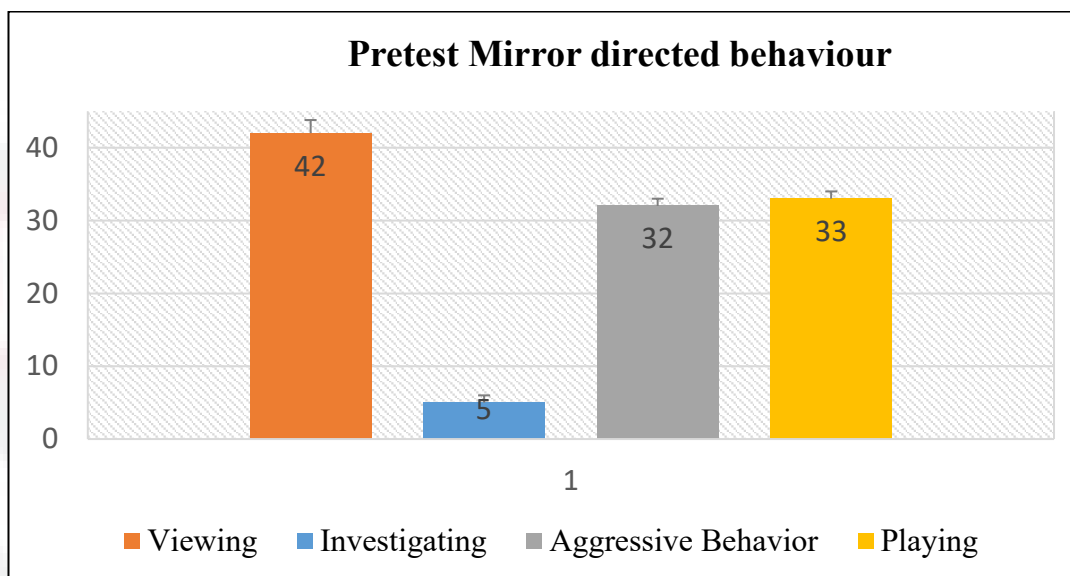


Figure 1: Pretest on open mirror test

In mirror-directed behaviour for the pre-test, the most behaviour that can be seen is viewing with the frequency of 42. However, the least behaviour that can be seen is investigating behavior with the frequency of 5.

4.2 Pre-test (baseline self-directed behaviour) in front of mirror

Self-recognition behaviour	First Observation	Second Observation	Total	Percentage
Using hands to pick/inspect and part of the face, teeth and ears	1	4	5	10%
Grooming neck, shoulder and back	0	0	0	0%
Manipulating urogenital region	0	0	0	0%
Observing food or liquid in mouth	2	1	3	6%
Manipulating mouth	12	20	32	63%
Manipulating nipples	0	0	0	0%
Pulling hairs	0	0	0	0%
Rubbing or wiping face	0	0	0	0%
Touching urogenital region	0	0	0	0%

Manipulating chewed food	5	6	11	22%
				51
				100%

Table 3: Pretest in front of the mirror (self-recognition behaviour)

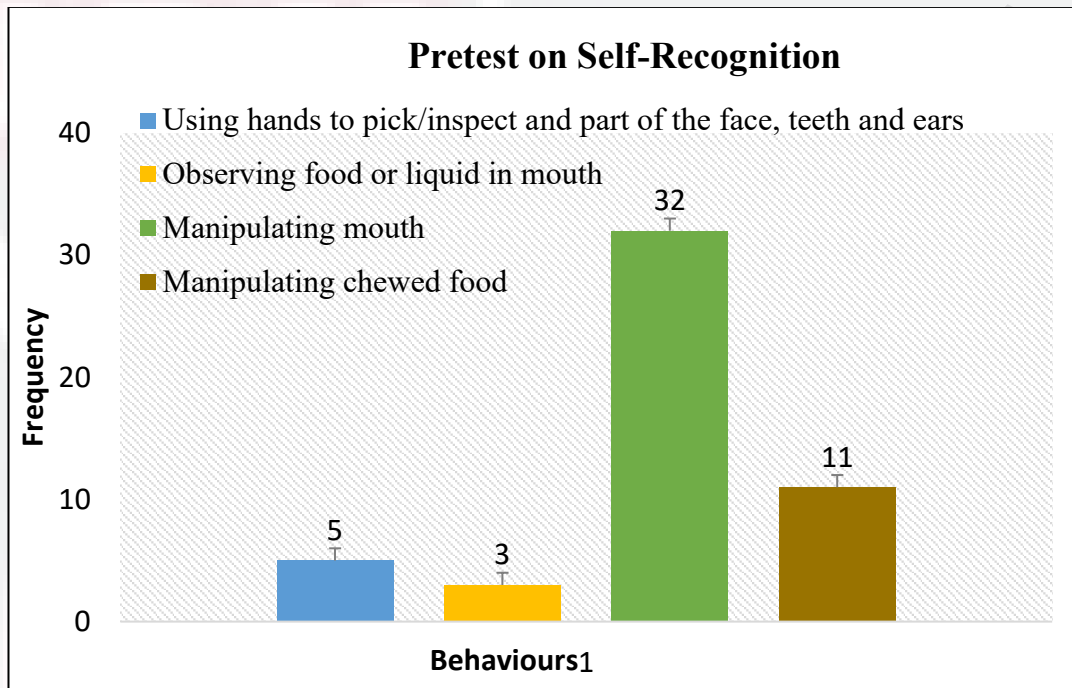


Figure 2: Pretest in front of the mirror (self-recognition behaviour)

The Figure 2 showed, the total of manipulating mouth behaviour is the most higher compared the frequency of the manipulating chewed food.

4.3 Open-Mirror Test (Mirror-Directed Behaviour)

Behaviour	Number of Observation								Total	Percentage
	1	2	3	4	5	6	7	8		
Viewing	11	11	9	7	8	7	5	3	61	61%
Investigating	0	5	0	0	0	0	0	0	5	5%
Aggressive Behaviour	0	0	0	0	1	1	0	0	2	2%
Playing	7	1	7	4	4	3	5	1	32	32%
									100	100%

Table 4: Open-Mirror Test (Mirror-Directed Behaviour)

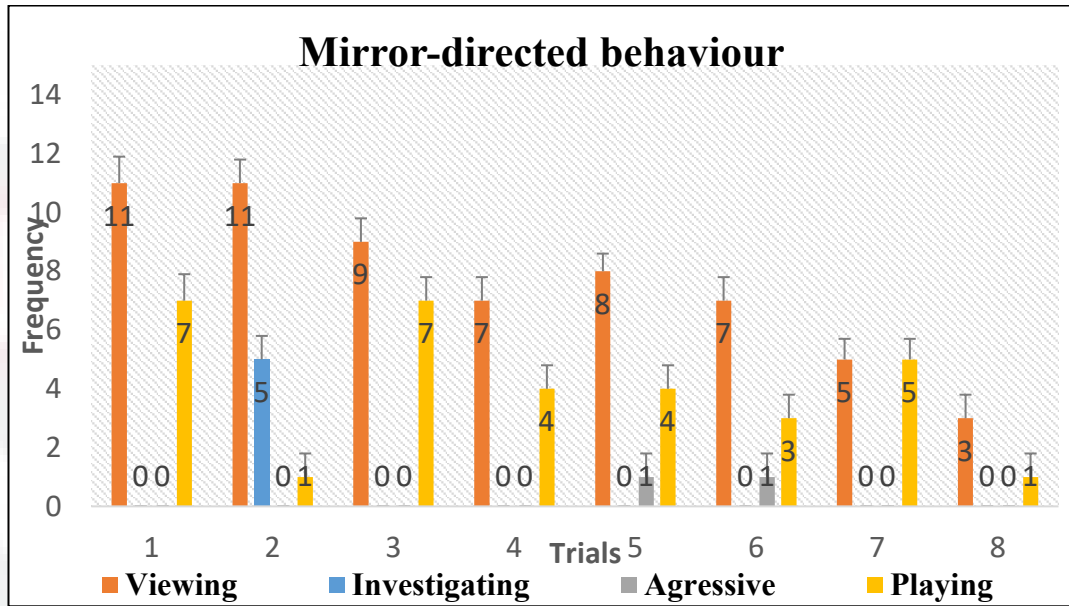


Figure 3: Open-Mirror Test (Mirror-Directed Behaviour)

4.4 Open-Mirror Test (Self-Directed Behaviour)

Self-recognition behaviour	Number of Observation								Total	Percentage
	1	2	3	4	5	6	7	8		
Using hands to inspect face, teeth and ears	0	0	0	0	5	0	0	0	5	13%
Grooming neck, shoulder and back	0	0	0	0	1	0	0	0	1	3%
Manipulating urogenital region	0	0	0	0	0	0	0	0	0	0%
Observing food or liquid in mouth	0	0	0	0	0	0	0	0	0	0%
Manipulating mouth	4	5	4	5	5	5	4	0	32	80%
Manipulating nipples	0	0	0	0	0	0	0	0	0	0%
Pulling hairs	0	0	0	0	0	0	0	0	0	0%
Rubbing or wiping face	0	0	0	0	0	0	0	0	0	0%
Touching urogenital region	0	0	0	0	0	0	0	0	0	0%
Manipulating chewed food	0	0	2	0	0	0	0	0	2	5%
									40	100%

Table 5: Open-Mirror Test (Self-Directed Behaviour)

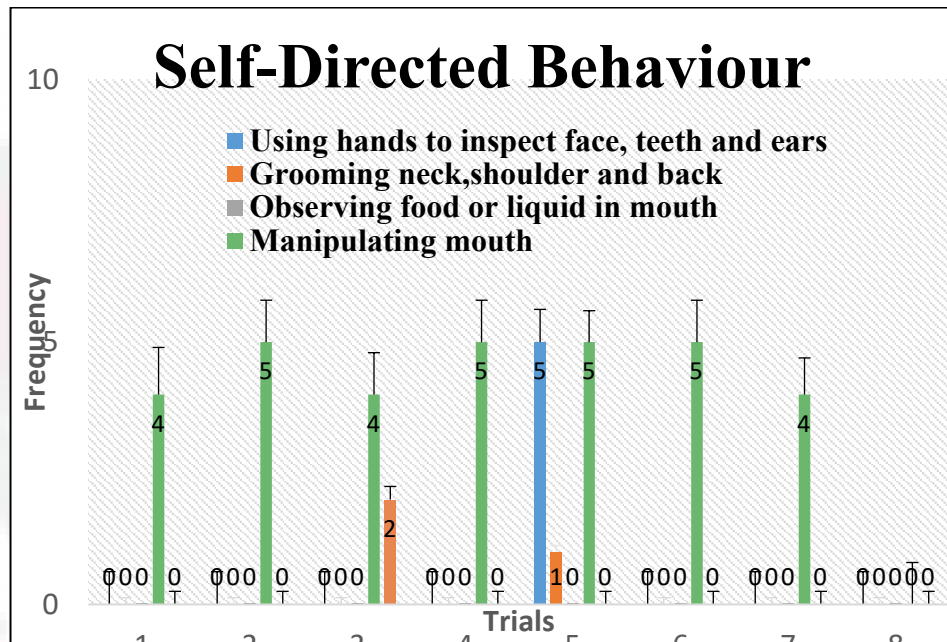


Figure 4: Open-Mirror Test (Self-Directed Behaviour)

The number of manipulation mouth is constantly in each trial. There is other behaviour that is no repetitive such as manipulating chewed food.

4.5 Mark test (mirror-directed behaviour)

Behaviour	Number of Observation								Total	Percentage
	1	2	3	4	5	6	7	8		
Viewing	8	2	2	2	1	1	4	0	20	63%
Investigating	0	1	0	0	0	0	1	0	2	6%
Aggressive	1	0	0	0	0	0	0	0	1	3%
Playing	4	0	1	0	1	0	3	0	9	28%
									32	100%

Table 6: Mark test (mirror-directed behaviour)

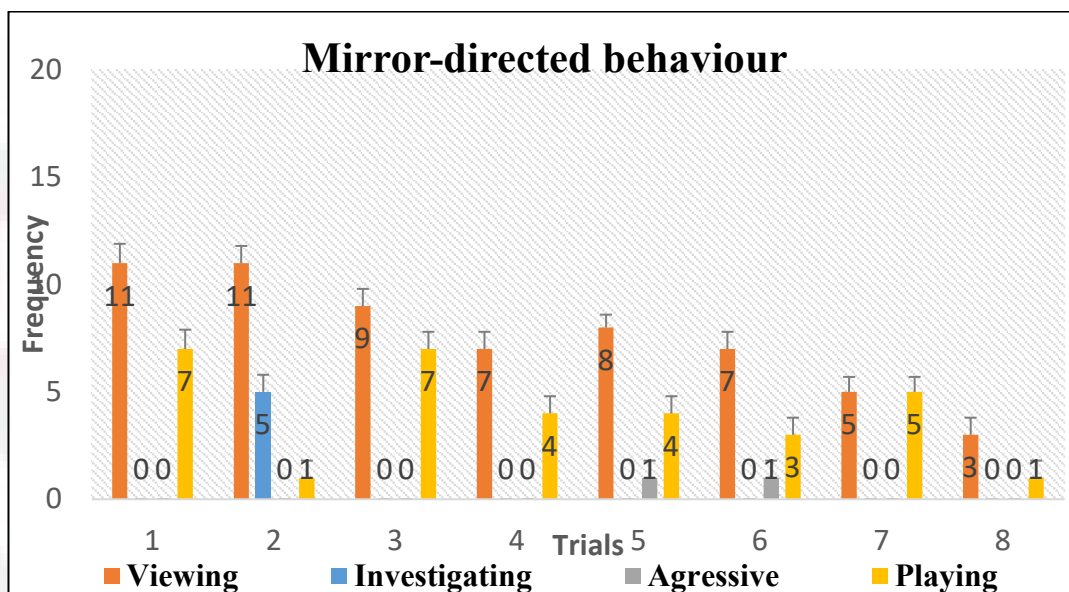


Figure 5: Mark test (mirror-directed behaviour)

The number of viewing decrease of each trial. However, most of the behaviour are viewing and playing in each trial. There are small numbers and non-repetitive behaviour such as investigating and aggressiveness.

4.6 Mark test (Self-Recognition Behaviour)

Self-recognition behaviour	Number of Observation								Total	Percentage
	1	2	3	4	5	6	7	8		
Using hands to inspect face, teeth and ears	9	0	0	0	0	0	0	0	9	27%
Grooming neck, shoulder and back	2	2	0	0	0	0	0	0	4	12%
Manipulating urogenital region	0	0	0	0	0	0	0	0	0	0%
Observing food or liquid in mouth	1	2	0	0	0	0	0	0	3	9%
Manipulating mouth	11	0	2	1	0	0	1	0	15	45%
Manipulating nipples	0	0	0	0	0	0	0	0	0	0%
Pulling hairs	0	0	0	0	0	0	0	0	0	0%
Rubbing or wiping face	1	0	0	0	0	0	0	0	1	3%
Touching urogenital region	0	0	0	0	0	0	0	0	0	0%
Manipulating chewed food	1	0	0	0	0	0	0	0	1	3%
									33	100%

Table 7: Mark test (Self-Recognition Behaviour)

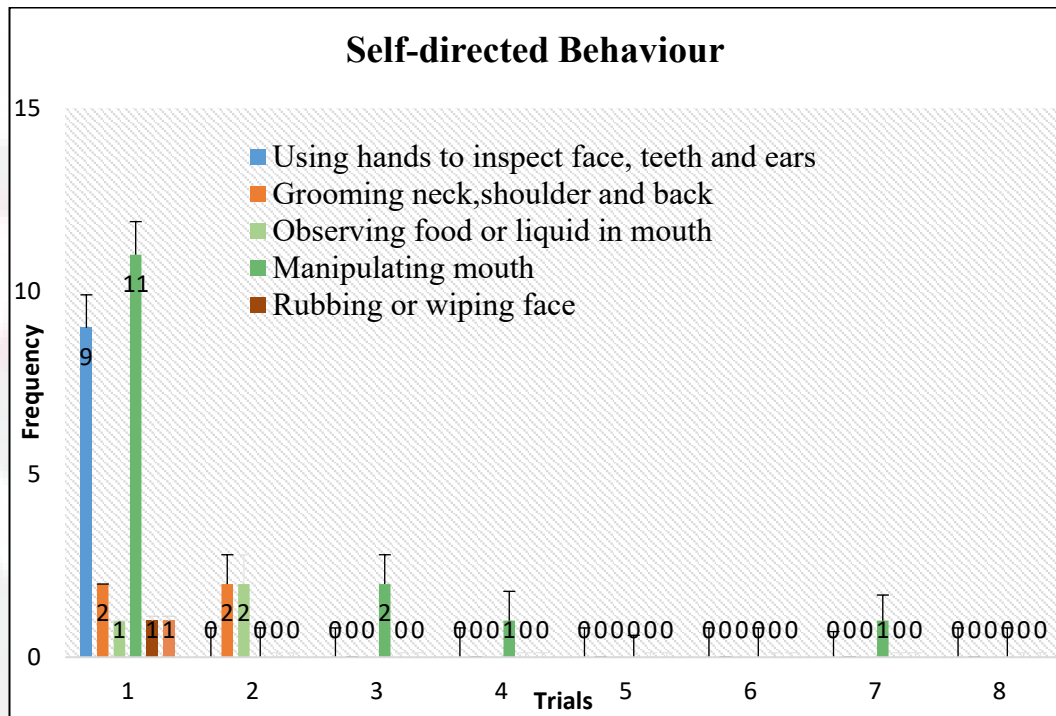


Figure 6: Mark test (Self-Recognition Behaviour)

4.7 Comparison of mirror test and mark test behaviour

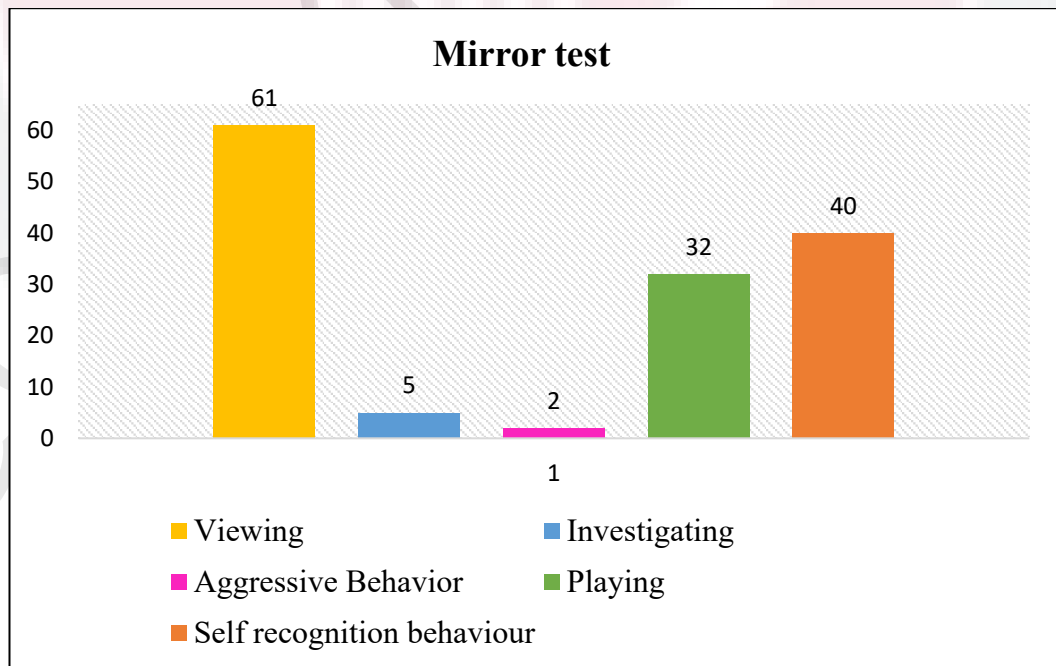


Figure 7: Cumulative mirror-test behaviour

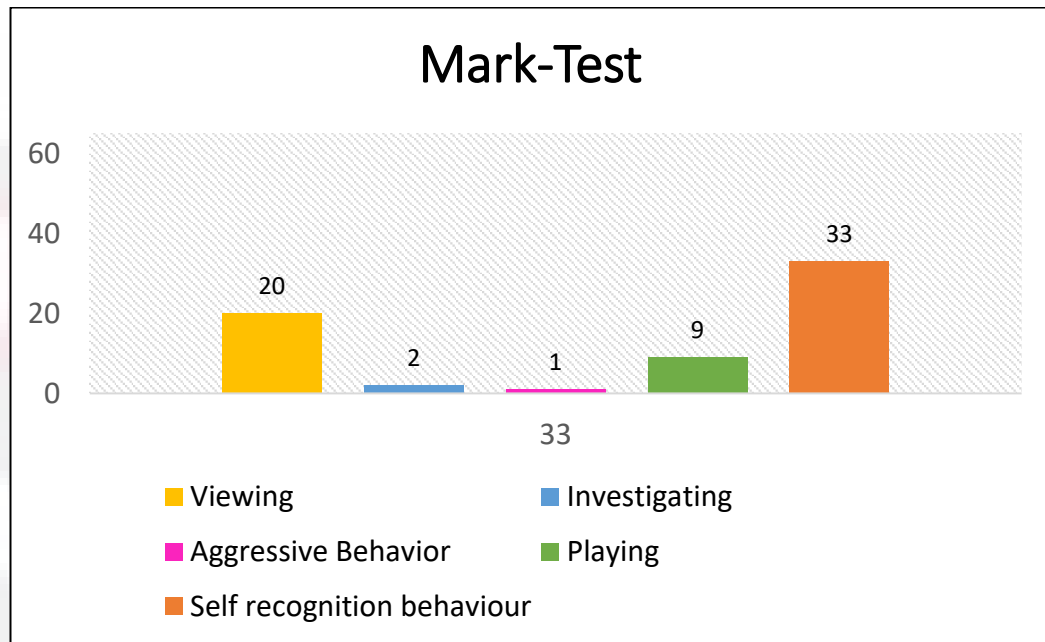


Figure 8: Cumulative mark-test behaviour

In this comparison, we can see the differences in all the behaviour between the mark test and the mirror test. The number of viewing in the mark test is significantly higher compare to the mark test, whereas the investigating behaviour is the least at both test. The total of self-recognition behaviour is decrease by the time of the mark test was done.

5.0 Discussion

5.1 *Open-mirror test*

In open mirror test, repetitive manipulating of mouth and tongue means the animal does recognize itself in the mirror. As for manipulating of the tongue in front of the mirror, the chimpanzee showing about 4-5 times in each trial bringing the animal to the positive the MSR. This was suggested by Povinelli et al., (1993) who reported that animals that showing five or more convincing instances of self-exploratory behaviour of self-exploratory behaviour in front of the mirror at least for 30 seconds is categorised as positive self-recognition. In addition, the age of chimpanzee does affect the recognition itself. This chimpanzee aging about 4 years old and the self-recognition in chimpanzee appeared to be deferred rather than human where human usually recognized themselves about 18 to 24 months old (Amsterdam, 1972) and the acceleration of loss of self- recognition in later life may be earlier than human. In fact, a single touch used in the developmental criteria showed that the self- recognition exists a young chimpanzee about 28 months old (Bard et al., 2006).

5.2 *Mark test results*

The chimpanzee does not show any of mark-directed behaviour as it may due to some factors causing the animal not showing any interest on the mark. According to Suarez and Gallup, (1980) who reported that gorillas, orang-utans and chimpanzee may prevented them from adequately seeing their reflection thus failure in self-recognition for example, inadequate lighting, small mirror size and cage bars blocking the view. The size of the mark also might the cause of the animal not showing interest on the mark. This was in line by Suarez and Gallup (1980), who reported that

undetermined factor such the mark size maybe the cause of the animal not seeing their painted brows.

Moreover, the gorillas, chimpanzees and orangutans were tested similarly the same setting on the mark test (Suarez and Gallup, 1980). It is doubtful some variables such as inadequate lighting, insufficient mirror size, or cage bars blocking the view may have prevented the gorillas from adequately seeing their reflection which responsible for their failure to show a self-directed orientation (Suarez and Gallup, 1980). Typically, chimpanzees initially react to their mirror image as if it were another chimpanzee, but after a period ranging from a few minutes to several days (Povinelli *et al.*, 1997). For instance, our results in the pre-test indicates that the chimpanzee react to the image of herself. The total of mirror-directed behaviour (e.g viewing, threatening, and self-directed behaviour) is higher than the total of the test itself.

The number of manipulating chewed food is not repetitive and may due to some of factors in the cage. The number of time that the chimpanzee that have been fed is twice per day. Animals was fed in the morning approximately 9.00am in the cage after transferring from night stable to the viewing cage. The second time of feeding is in the night stable in 4.30pm. This is inconclusive as the animal may or may not show any behaviour. In fact, the chimpanzees in Africa which have been held in captive cages, failed to identify their image in the mirror after prolonged interaction with mirrors (Swartz, 1991) indicates that mirror-self-recognition is variable even within species whose members commonly exhibit it (Mitchell, 1993).

Previous studies reported that about 92 chimpanzees have been involved in self-recognition has been emerge in young adolescence; about less than 8 years of age by displaying self-exploratory behaviours (Povinelli et al, 1993). The surprising fact from

Povinelli et al, (1993) showed only 26% chimpanzees are showing self-exploratory behaviours at the age of 16-39 years old (n=35). In fact, some studies showed that 43% of chimpanzee passed the MSR task (Swartz et al., 1999). Our study showed that chimpanzee is 4 years old and she may or may not show self-recognition. This is still debatable in terms of age involved as this animal showing self-recognition in mirror test and not in the mark test.

6.0 Conclusion

It can be concluded that in the open mirror test, chimpanzee successfully show mirror self-recognition (MSR), however in mark test, this animal unsuccessfully show mirror self-recognition. It is still questionable whether this animal show self-recognition or not because due to some factors as mentioned in the discussion section

7.0 Recommendations

For further research, some of the points that can take into consideration such as the age of the animal. The age does affect the MSR because chimpanzee has the self-recognition after the age of 24 months, and the acceleration of losing self-recognition is also earlier than human. In addition, the validity of the mark test can be confirmed by putting the mirror in the cage itself as the animal can be contact with the mirror. By doing this study, we can reduce some of the factor that affecting the viewing of the chimpanzee such not by looking at its images only, it can do many behaviours that cannot be interpreted when the cage is outside such as the threatening behaviour which is still in confused whether it is either playing or pure threatening. In terms of

the colour and the size of the mark, it would be suggested that the size of the mark can vary from 2-5cm in diameter and the colour of the mark either can be red, yellow and white. However, fluorescent colour and can be detected easily by chimpanzees (Povinelli *et al.*, 1997).



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APPENDICES

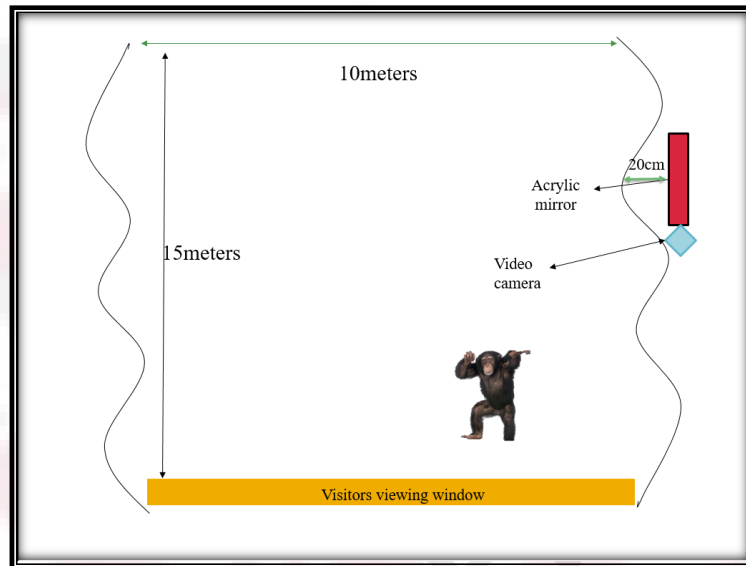


Figure 9: location of the mirror



Figure 10: Julie the female chimpanzee



Figure 11: Preparation of the site



Figure 12: Paint used for mark test