

Impact of Eyes on Waste Diversion Research
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PSYC 321
April 28, 2015

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Impact of Eyes On Waste Diversion

Research

— ‘Every Move You Make, I’ll Be Watching You’

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April 12, 2015

ABSTRACT

Many studies have looked at how people react based on their assumption that they are being watched. Some studies have looked at this issue with respect to sorting behaviours, but findings have been inconsistent. The purpose of this study is to explore whether the presence of cartoon eyes with the slogan "Are you the type of person that recycles?" will affect peoples' sorting behaviour. The study included 706 participants (N = 706). Each participant was watched while disposing their waste into bins with stickers on the top of the bins, on the front of bins, or without stickers on the bins. Our results suggested that placing of stickers on tops of sorting stations might positively affect sorting behaviour.

Keywords: Sorting behaviour, cartoon eyes, slogan, bins.

INTRODUCTION

Recycling is an important part of the solution to the problem arising from current solid waste practices. However, only about 52% of Canadians sort all of their waste (Munro, 2007). A key element of recycling is sorting behaviours. Watching another person while she or he is sorting their waste appears to be an important factor in the amount of effort a person puts into sorting. The effects of someone watching another person while they are throwing away their garbage has been the subject of numerous studies. However, findings have been controversial as there has not been a clear consensus on how the impact of watching someone sorting their garbage impacts their behaviour. Some studies have found a positive correlation between watching an individual's behaviour and their attempt to sort waste, while other studies have shown that the presence of eyes, or physically watching an individual does not affect their sorting behaviour and accuracy of waste disposal. Nevertheless, research has shown that people tend to be kind and act in a more socially acceptable way towards other people if they think that they will not meet the other individual again (Fehr & Fischbacher 2003; Gintis et al., 2003), which may be applicable to sorting habits. If people perceive it as a socially acceptable practice as well, they may be more inclined to increase their sorting behaviours. A possible explanation as to why strangers act kindly towards one another is because individuals who do not know each other often attempt to maintain a pro-social reputation (Roberts, 1998). Bateson, Nettle and Roberts examined the effect of an image of a pair of eyes on an honesty box that held donations for drinks at a university (2006). Although the subjects were not aware that they were being watched while they were preparing their drinks, they were expected to make a donation for their drinks through the honesty box. The researchers reported that correct payment for drinks put into the honesty box increased 2.76 times during the weeks in which the images of eyes were present but decreased in the condition where an image of flowers was present. The image of eyes varied between genders, but all the chosen images of eyes were looking directly at the observer. The major finding of this study was that a pair of eyes has the power to change people's cooperative behaviours. Another study by Carbon and Hesslinger found that as participants noticed that the more they were being observed the more they felt frightened (2011). They found that the presence of eyes did not significantly impact participants in the hand washing condition or the free will condition. Although they did not find any direct relationship between the presence of eyes and the participants' behaviour, they did find that personality was a significant predictor of a participant's behaviour. One of the strong points of this paper is that confounding variables such as personalities have large effects on a participant's behaviour. The effect of social cues, such as a pair of eyes, should not be fully rejected based on this study, but rather there should be more extensive research on this issue. A study by Xiao and McCright tested the gender difference between women and men on pro-environmental attitudes and behaviours (2014). They believed that there is a gender difference in environmental behaviours and in private behaviours (e.g, household, consumer, recycling) and public behaviour (e.g., political, activist, protests). They concluded that women perform more private environmental behaviours than men do. In light of these inconsistent findings, the purpose of this study is to further explore the effects that the presence of cartoon eyes along with a slogan has on peoples' behaviours. This study will focus on how the presence of cartoon eyes, along with a slogan, impacts sorting behaviour when sorting stations are present. The study will look at whether the feeling of being watched and reminded of their behaviour elicits people to re-evaluate their sorting behaviour and act in a way in which they believe is more socially acceptable. Our hypothesis is that the presence of cartoon eyes, along with a slogan that states "**Are you the type of person that recycles?**" on the tops of sorting stations will have a positive effect on people trying to correctly sort their waste into the appropriate bins, as compared to when no stickers are present or when stickers are only present on the front of bins. We also expect that there will be a gender difference, with females being more likely to sort waste.

METHOD

Materials

In order to collect data regarding whether cartoon eyes with a slogan embedded placed on sorting stations influences sorting behaviour, we selected an observational study design. We needed a few material for the study, most of which were provided by the stakeholder, Ivana. The cartoon eyes stickers were provided by the stakeholder, and the stickers were previously used for another project. As the original purpose of the stickers was for the use of another project they had a non-relevant slogan embedded on them, which had to be changed in order to make them applicable to the current study. The stickers were modified to say, "ARE YOU THE TYPE OF PERSON THAT RECYCLES?" Our new slogan was written in capital letters and they were bolded in order to stand out and be legible (Picture 1). After preparing the stickers, we chose the proper sorting stations. In Buchanan A, three sets of identical sorting stations were chosen: 1 on the main floor and 2 on the second floor (Picture 2). Each sorting station contained a compost bin, a paper recycle bin, a plastics and metals recycle bin, and a garbage bin. The order of all the bins was the same at each station, and the signage around each station was identical. However, because we chose three different stations, there were confounding variables that could be related to the data collected. Finally, each observer recorded their data on a paper as they observed.

Participants

The study included 706 participants ($N = 706$), 237 of which were male, and 469 of which were female. Participants were obtained using a convenience sample method. Therefore, the participants in this study were selected based only on their use of one of the sorting stations that were part of our study in Buchanan A when observation took place (naturally occurring). Moreover, the subjects were not pre-selected. As the study was conducted on UBC campus, it is likely that most participants fell into the following groups: students, faculty, UBC employees, visitors, and other members of the UBC community. Consent was not obtained from participants as it was not needed as our study took place in public space (observational study).

Conditions

The study was set up using three conditions. In condition one (C1), stickers were placed on the tops of the bins. Placement of the stickers on the top was such that participants would see the eyes and slogan as they were about to toss away their waste. The C1 stickers were all placed beside the lid of the garbage bins such that the subjects could see the cartoon eyes when they wanted to open the lid. In condition 2 (C2) the stickers were placed on the front of the bins in order to make people see the stickers as they approached the bins and could make a decision before actually reaching the sorting stations as to whether or not they would sort their waste. For conditions C1 and C2, the stickers were taken off after each session and then placed back on again just before the start of an observation. Pictures were taken after the first run in order to ensure that each time the stickers were placed back on the bins they were in the same place where they were before. The purpose of this was to control for any confounding variables. In the control condition (CC) no stickers were placed on the sorting bins. The purpose of the control condition was to measure a baseline and see whether the presence of cartoon eyes and the slogan had any effect on sorting behaviour. All conditions were assigned to a different station in Buchanan A at UBC: C1 used the sorting station in the cafe, C2 used the sorting station by the stairs on the main level, and CC used the sorting station at the top of the stairs on the second level. All stations had bins in the same order and had identical signage.

Measures

The same measures were used for all three conditions. Participants were measured based on whether or not they made an effort to sort their waste. Correctness of sorting was not measured in this study. After discussing how to measure the effectiveness of the cartoon eyes with Ivana, the stakeholder, it was suspected that the correctness of sorting would be too hard to measure for several reasons. First, it would be very difficult to observe exactly what materials participants were trying to sort without eliciting the awareness that they are being observed. The suspicion of participants that they were being watched could impact their behaviour, thereby making it unclear as to whether the presence of our stickers had any effect on sorting behaviour. Second, many materials could be mistaken to be. The only way to ensure that some materials really can be recycled is to check whether they have the required symbols imprinted on them, which poses a huge obstacle for observers trying to be discrete. The purpose of the study was to see whether the cartoon eyes and slogan affected sorting behaviour, not whether people were able to sort waste properly. Consequently, the stakeholder suggested that we do not measure the correct sorting behaviour. The participants who threw everything into the garbage bin without attempting to sort their waste were grouped under the 'did not sort' category. Those who threw out their garbage in one or more of the recycle/compost bins were grouped under the 'did sort' category. Finally, those who threw some items out in the recycle/compost bins and some items into the garbage bins were also grouped under the 'did sort' category. Not only was sorting behaviour measured, but also the sex of the participants was recorded. Moreover, since participants were not asked about their sex, it was up to the observer to make the best possible judgement. The data in regards to sex differences in sorting behaviour was affected by the limitation arising from the fact that the observers did not correctly identify the correct or best-suited sex for each participant.

Procedure

Data was collected for two consecutive weekdays. There were a total of 10 days in which data was collected. The study was conducted for 15 minutes every day, from 11:45 AM to 12 PM. This time slot was selected based on several factors. During this time students moved from one class to the next. This is also a time which corresponds to the end of a meal break for most students who have a class after 12PM. Just before 11:45 AM the stickers for C1 and C2 were placed on the bins at the appropriate sorting stations in Buchanan A. At 11:45 AM observations began and data was recorded. The observer sat close enough to the station where they were able to record whether or not participants attempted to sort, but far enough away that participants should not have suspected that they were being watched (see picture in appendix). For all conditions, during the 15 minutes when the study ran, observers recorded the behaviour of every person who used the bins. Right at 12pm data collection stopped and the stickers were immediately taken off the bins by the observers. Although many did not ask, anyone questioning the observers regarding the stickers were told that we were conducting a research project for Psychology 321. Instead, they were told that should they have any concern about the experiment they could contact Dr. Zhao. After all data was collected we used SPSS to organize the data. Through SPSS we ran Univariate tests to see if the data collected was significant.

RESULTS

The study included 706 participants ($N = 706$) with 469 females and 237 males (as assumed by observers). The baseline included 250 participants ($n = 250$), with 151 females and 99 males (Table 1, Figure 2). Participants in the baseline condition had a mean of 0.53. In addition, C1 had a mean of 0.23, and C2 had a mean of 0.5, which is displayed in Table 3. Table 2 and table 4 display the same information, but results are separated by sex. As Table 6,7 and 8 indicates there was not a significant difference between Males and Females who attempted sorting behaviour in C1, C2 and CC (Figure 1).

By reviewing Table 11, the significant main effect of condition for females is $(2,700)=26.24$, $p=8.6506E-12$, $n^2=0.069$, $np^2=0.070$. The main effect of conditions for male is $(1,700)=1.19$ $p=0.276436$ $n^2=0.002$ $np^2=0.02$ (Table 11). Moreover, the interaction between conditions and sex is, $F(2,700)=1.45$ $P=0.234963$, $n^2=3.81$ $np^2=0.004$ (Table 11).

The tests between subjects are seen in Figure 3. The results present a significant main effect of conditions for the result of the female participants, $F(2,249)=16.69$ $p=9.9934E-8$ $n^2=0.04$ $np^2=0.067$ (Table 9). There is an indication that the sorting for females in CC and C1 vary significantly ($p=2.7536E-7$) (Table 10). Moreover, the sorting score for women in CC and C2 do not vary significantly ($p=0.520460$), while the sorting behaviour of women in C1 and C2 do vary significantly ($p=0.000058$) (Table 10).

The results present a significant main effect of conditions for males, $F(2,234)=12.49$ $p=0.000007$ $n^2=0.051$ $np^2=0.096$ (Table 9, Figure 4). The results indicate that sorting habits for males in CC and C2 vary significantly ($p=0.000140$) (Table 10). The recycling score of males in the CC and C2 does not vary significantly ($p=0.669$), and the sorting behaviour for males C1 and C2 vary significantly as well ($p=0.000014$).

DISCUSSION

The purpose of this study was to establish whether the presence of cartoon eyes embedded within the slogan would have a positive effect on subjects' sorting behaviours. Our study supports a previous study by Bateson, Nettle and Roberts who suggest that a pair of eyes has the power to change people's cooperative behaviours (2006). The results of our study indicate that the presence of cartoon eyes with a slogan on the tops of bins do have a significant positive effect on sorting behaviour. Participants who were exposed to CC and C2 were less likely to engage in sorting behaviour than participants who were exposed to C1. The results show that the group, which was exposed to C1, had the lowest mean (23%), compared to the group C2 (53%), and C3 (51%) with average difference of (30%). The means of these results were negatively associated with the attempted sorting behaviour, and positively associated with a lack of sorting behaviour. The results found no significant effects in sorting behaviour between sexes, but found significant main effects of conditions C1, C2 and C3 within sex. Consequently, the first part of our hypothesis was significantly supported by our results, while the data did not significantly support the second part of the hypothesis.

Our results show that cartoon eyes embedded with a slogan do have a positive effect on sorting behaviour when placed on the tops of bins. One of the possible reasons that more participants in C1 sorted is that the stickers were seen as catalysts in their decision-making patterns. The placement of stickers in C2 may not have had such an impact due to how small the stickers were.

The strength of our study is evident in that fact that with the limited time allotted we were able to collect data from 706 participants. Being able to run 3 different conditions as opposed to just 2 allowed us to see if placement of the stickers made a difference in sorting behaviour. Moreover, being able to monitor behaviour and collect data in subtle manner ensured that participants did not change their behaviour because they suspected that people were watching them, thereby being influenced by the stickers.

The limitations of our study involved the time constraint in our experiment. Our study was only able to run for 2 weeks, which posed several challenges. It would be beneficial to run the study at different locations (i.e. different sorting stations in different buildings at UBC). Because of time constraint and the need to collect as much data as possible our study used three separate sorting stations at the same time. This might have affected the data we collected. The locations themselves may have

had an effect on how people sorted. Therefore, the locations in the study were probably a confounding variable, which does not allow us to conclude that the stickers were the only influence on participants behaviour. It would be beneficial to run each condition at the same sorting station with a large sample size, and then repeat this process at other locations at UBC.

It would also be interesting to use different sets of eyes, other than the ones given to us by our stakeholder, Ivana. Participants might react differently to eyes of different sexes and age groups, or eyes that demonstrate specific emotions. It is possible that other types of eyes may have a greater impact on sorting behaviour. In addition to changing the configuration of the eyes, it would also be useful to change the size of the eyes. Since the stickers used in our study were very small, many participants probably missed the stickers. The eyes in our study pointed towards the openings of our bin, but it could be useful to run the study with eyes that are directed at the participants. The use of the stickers in a previous project might have caused participants to be aware of the existence of the stickers.

Another limitation could have been the slogan that was used on the sticker. Different slogans used with the eyes could elicit better sorting behaviour than observed in this study. In addition to changing the slogan, future studies should run all conditions with the cartoon eyes alone, run the study with slogan alone, and compare the two differences. Since we only ran our study with eyes and slogan together we do not know what variables affected the participants the most.

Due to the large number of female participants it would be good in future studies to have more male participants in the study, so that there is no bias based on sex. It would be possible then to analyze whether or not there is a significant difference between male and female sorting behaviour.

This finding is important as it can be used by UBC to implement further sorting behaviour by members of the community. It is known that UBC is very conscious about being environmentally friendly and this study might help them to continue to push members of its community to also take part in the conscious movement. Our research can be adapted into the UBC environmental sustainability program for future implementation. UBC could become a model for other organizations that wish to improve their recycling habits by using our methods. Our research could influence people on an individual level on UBC campus. It will also encourage them to maintain sustainable waste sorting habits throughout their lives. Sorting practices require the integration of environmental, economic and social priorities into action at all levels in order to increase the standard of living for everyone for present and future generations.

In conclusion, waste-sorting behaviour was found to be significantly effected by cartoon eyes with the slogan "Are you the type of person that recycles?" The stickers had a significant effect on sorting behaviour when placed on the tops of sorting stations, as compared to the front or the baseline condition. As suggested in the paper, there are many modifications that can be made for future studies, such as including equal numbers of each sex in order to develop the best possible stickers, thereby having a more significant effect on the subjects' sorting behaviours. Future studies can be used by UBC to help make the community more conscious about the environment through better sorting habits.

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APPENDIX

Table 1.

Between-Subjects Factors. Numbers of Participants for each conditions

		Value Label	N
Conditions	1	Baseline	250
	2	Eyes on Top	228
	3	Eyes on Front	228

Table 2.

Between-Subjects Factors. Number of female or male participants for each condition (baseline, eyes on top, and eyes on front).

			Value Label	N
Female	Conditions	1	Baseline	151
		2	Eyes on Top	167
		3	Eyes on Front	151
	Female/Male	0	Female	469
Male	Conditions	1	Baseline	99
		2	Eyes on Top	61
		3	Eyes on Front	77
	Female/Male	1	Male	237

Table 3.

Descriptive Statistics (Dependent variable: Sorting behaviour). Number of participants for each condition (baseline, eyes on top, and eyes on front). The Eyes on top condition is significant (mean=0.23, S.D. =0.421).

	Mean	Std. Deviation	N
Baseline	.53	.500	250
Eyes on the top	.23	.421	228

Eyes on the front	.51	.501	228
Total	.42	.495	706

Table 4.

Descriptive Statistics (Dependent Variable: Sorting behaviour). Number of female or male participants for each condition (baseline, eyes on top, and eyes on front). The Eyes on top condition for female is significant (mean=0.23, S.D. =0.424). The eyes on top condition for male is significant (mean=0.21, S.D. =0.413).

Female/Male	Conditions	Mean	Std.	
			Deviation	N
Female	Baseline	.52	.501	151
	Eyes on Top	.23	.424	167
	Eyes on Front	.46	.500	151
	Total	.40	.491	469
Male	Baseline	.54	.501	99
	Eyes on Top	.21	.413	61
	Eyes on Front	.60	.494	77
	Total	.47	.500	237

Table 5.

Tests of Between-Subjects (Dependent Variable: Sorting behaviour), Tests of Between-Subjects Effects for females and males

Female/Male	Source	Type III Sum		Mean	F	Sig.	Partial Eta Squared
		of Squares	df				
Female	Corrected Model	7.529 ^a	2	3.764	16.689	.000	.067
	Intercept	77.424	1	77.424	343.254	.000	.424
	Conditions	7.529	2	3.764	16.689	.000	.067
	Error	105.111	466	.226			
	Total	188.000	469				
	Corrected Total	112.640	468				
Male	Corrected Model	5.696 ^b	2	2.848	12.487	.000	.096
	Intercept	45.879	1	45.879	201.136	.000	.462
	Conditions	5.696	2	2.848	12.487	.000	.096
	Error	53.375	234	.228			
	Total	112.000	237				

Table 6.

Tests of Between-Subjects Effects^a (Dependent Variable: Sorting behaviour), Tests of Between-Subjects Effects for the baseline condition

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.009 ^b	1	.009	.035	.851	.000
Intercept	67.001	1	67.001	266.734	.000	.518
Gender	.009	1	.009	.035	.851	.000
Error	62.295	248	.251			
Total	132.000	250				
Corrected Total	62.304	249				

a. Conditions = baseline

b. R Squared = .000 (Adjusted R Squared = -.004)

Corrected Total	59.072	236
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a. R Squared = .067 (Adjusted R Squared = .063)

b. R Squared = .096 (Adjusted R Squared = .089)

Table 7.

Tests of Between-Subjects Effects^a (Dependent Variable: Sorting behaviour), Tests of Between-Subjects Effects for the eyes on top condition.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.019 ^b	1	.019	.105	.746	.000
Intercept	8.913	1	8.913	50.208	.000	.182
Gender	.019	1	.019	.105	.746	.000
Error	40.122	226	.178			
Total	52.000	228				
Corrected Total	40.140	227				

a. Conditions = eyes on top

b. R Squared = .000 (Adjusted R Squared = -.004)

Table 8.

Tests of Between-Subjects Effects^a (Dependent Variable: Sorting behaviour). Tests of Between-Subjects Effects for the eyes on front condition.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.913 ^b	1	.913	3.681	.056	.016
Intercept	57.405	1	57.405	231.383	.000	.506
Gender	.913	1	.913	3.681	.056	.016
Error	56.069	226	.248			
Total	116.000	228				
Corrected Total	56.982	227				

a. Conditions = eyes on front

b. R Squared = .016 (Adjusted R Squared = .012)

Table 9.

Tests of Between-Subjects Effects (Dependent Variable: Sorting behaviour). Multiple Comparisons for female and male

Female/Male	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Female	Corrected Model	7.529 ^a	2	3.764	16.689	.000	.067
	Intercept	77.424	1	77.424	343.254	.000	.424
	Conditions	7.529	2	3.764	16.689	.000	.067
	Error	105.111	466	.226			
	Total	188.000	469				
	Corrected Total	112.640	468				
Male	Corrected Model	5.696 ^b	2	2.848	12.487	.000	.096
	Intercept	45.879	1	45.879	201.136	.000	.462
	Conditions	5.696	2	2.848	12.487	.000	.096
	Error	53.375	234	.228			
	Total	112.000	237				
	Corrected Total	59.072	236				

a. R Squared = .067 (Adjusted R Squared = .063)

b. R Squared = .096 (Adjusted R Squared = .089)

Table 10.

Multiple Comparison(Dependent Variable: Sorting behaviour). Tukey HSD. Multiple Comparisons for female and male. For either female or male, eyes on top, compared with baseline or eyes on front, is significant

Female/Male	(I) Conditions	(J) Conditions	Mean	Std. Error	Sig.	99% Confidence Interval	
			Difference (I-J)			Lower Bound	Upper Bound
Female	Baseline	Eyes on Top	.29*	.053	.000	.13	.45
		Eyes on Front	.06	.055	.520	-.10	.22
	Eyes on Top	Baseline	-.29*	.053	.000	-.45	-.13
		Eyes on Front	-.23*	.053	.000	-.39	-.07
	Eyes on Front	Baseline	-.06	.055	.520	-.22	.10
		Eyes on Top	.23*	.053	.000	.07	.39
Male	Baseline	Eyes on Top	.32*	.078	.000	.09	.55
		Eyes on Front	-.06	.073	.669	-.28	.15
	Eyes on Top	Baseline	-.32*	.078	.000	-.55	-.09
		Eyes on Front	-.38*	.082	.000	-.63	-.14
	Eyes on Front	Baseline	.06	.073	.669	-.15	.28
		Eyes on Top	.38*	.082	.000	.14	.63

Based on observed means.

The error term is Mean Square (Error) = .228.

*. The mean difference is significant at the

Table 11.

Test of Between-Subjects Effects (Dependent Variable: Sorting behaviour). The overall statistics for each condition (baseline, eyes on top, eyes on front).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	14.035 ^a	5	2.807	12.398	.000	.081
Intercept	112.156	1	112.156	495.369	.000	.414
Conditions	11.965	2	5.982	26.423	.000	.070
Gender	.269	1	.269	1.186	.276	.002
Conditions * Gender	.657	2	.329	1.451	.235	.004
Error	158.486	700	.226			
Total	300.000	706				
Corrected Total	172.521	705				

a. R Squared = .081 (Adjusted R Squared = .075)

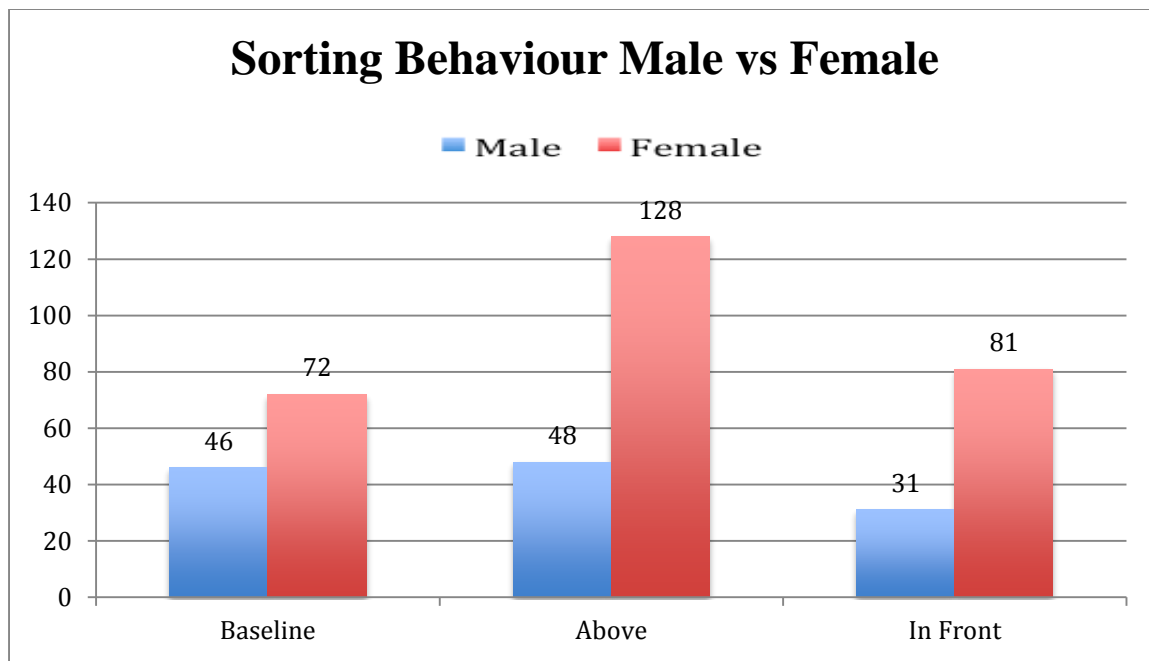


Figure 1. *Sorting behaviour for Male and Female. This graph shows the frequency of sorting behaviour motivation between male and female in different locations (baseline, above, in front)*

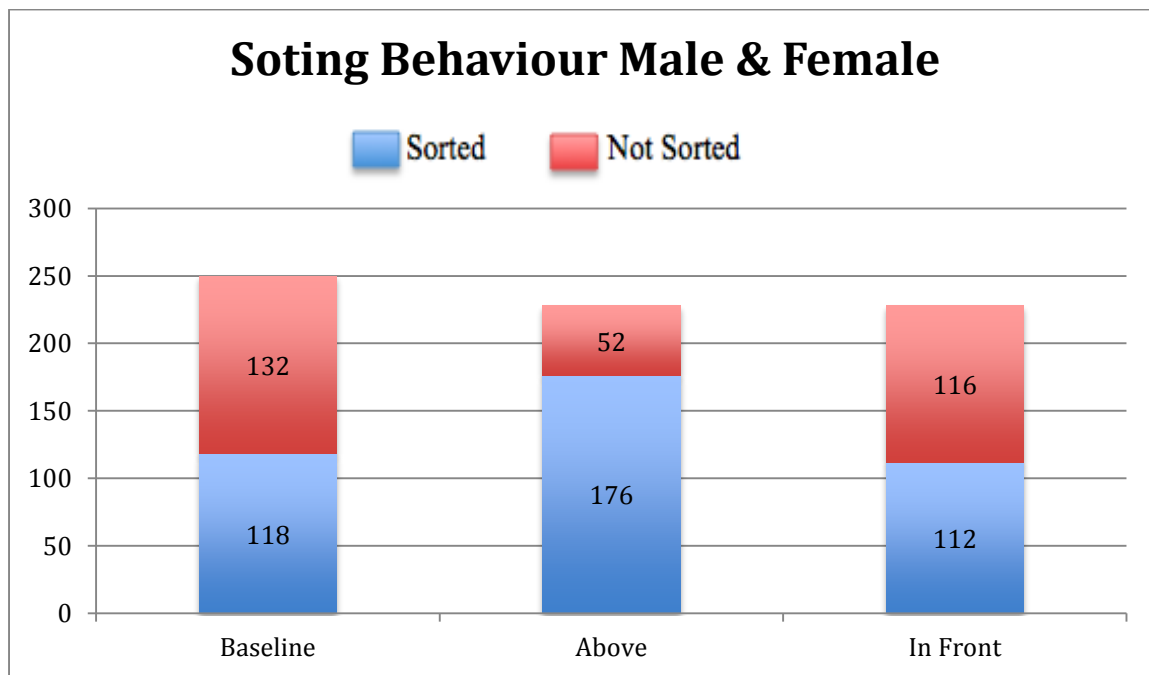


Figure 2. *Sorting behaviour for Male and Female. This graph shows the frequency of sorting behaviour motivation and non- sorting behaviour motivation in different locations (baseline, above, in front). Blue parts refer motivation of sorting behaviour. Red parts refer motivation of non- sorting behaviour.*

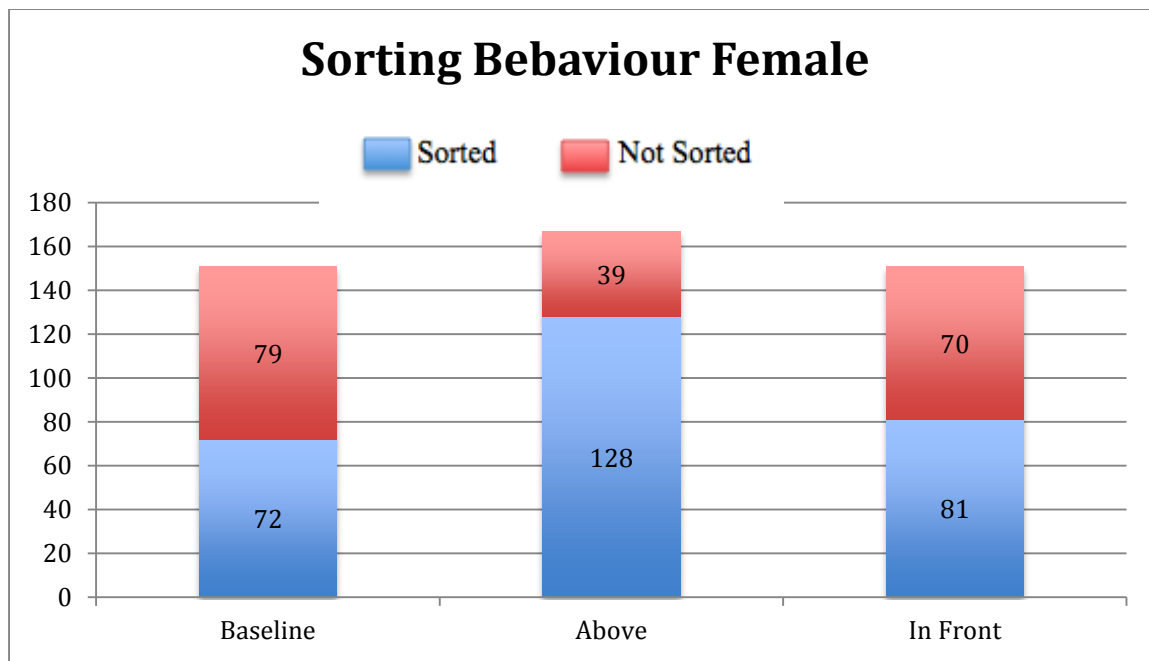


Figure 3. *Sorting behaviour and Non- Sorting behaviour for female. This graph shows the frequency of sorting behaviour motivation and non-sorting behaviour motivation of female in different locations (baseline, above, in front). Blue parts refer motivation of sorting behaviour. Red parts refer motivation of non- sorting behaviour.*

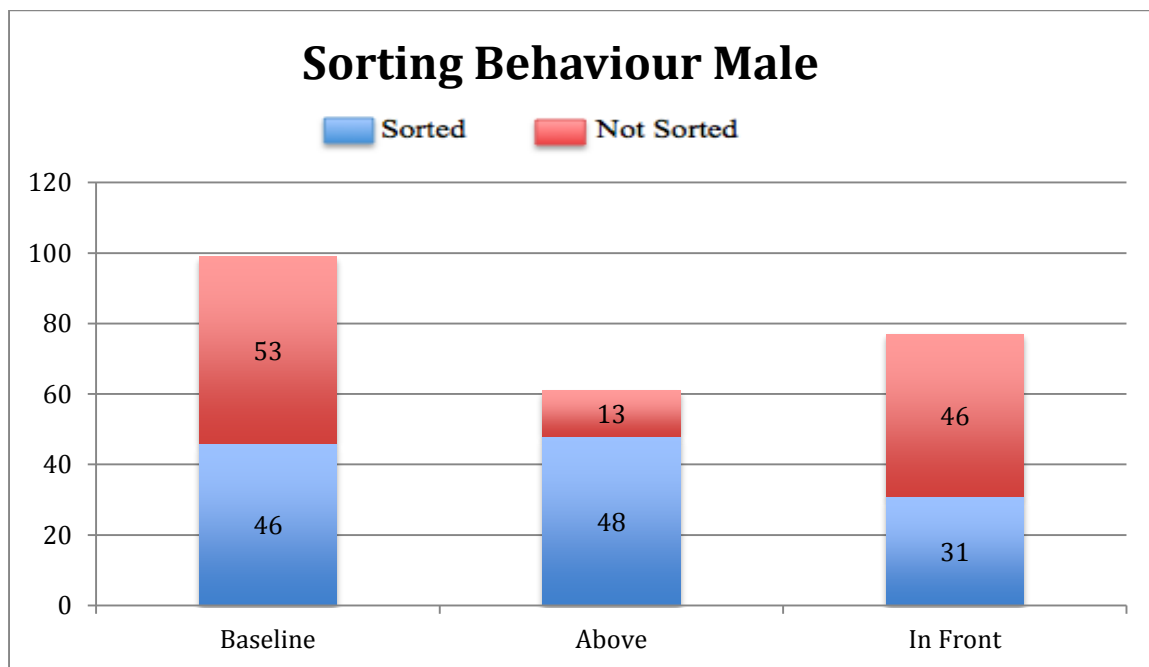


Figure 4. *Sorting behaviour and Non- Sorting behaviour for male. This graph shows the frequency of sorting behaviour motivation and non- sorting behaviour motivation of male in different locations (baseline, above, in front). Blue parts refer motivation of sorting behaviour. Red parts refer motivation of non- sorting behaviour.*



Picture 1. *The sticker (eyes and words) that was used for the study (used in the eyes on top condition and eyes on front condition)*



Picture 2. Starting from Top to Bottom: CC (during the baseline condition, researchers stranded far away from the bin and observed; C2 during the eyes on the front condition, , researchers stranded far away from the bin and observed; and C1 during the eyes on the top condition, , researchers stranded far away from the bin and observed)