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**Influences of Respondent Conditioning with Packaging Labels on  
Preference for Soft Drinks**

A thesis  
submitted in partial fulfilment  
of the requirements for the degree  
of  
**Master of Applied Psychology – Behaviour Analysis**  
at  
**The University of Waikato**  
by  
**MIKAELA ALEXANDRA NEILL-WOODD**



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## **Abstract**

In this study a respondent conditioning procedure was used to pair three arbitrary symbols indirectly with emotive words. Stimuli consisted of words (A), consonant-vowel-consonant nonsense syllables (B) and symbols (C) and were paired B-A and B-C. Participants were then presented with soft drink samples. A pre-tasting preference assessment was conducted in which the participants were asked which drink they would like to taste first, followed by a tasting and taste-test preference assessment. It was hypothesized that the respondent procedure would facilitate the transfer of function and the participants would prefer the positively labelled drink. A matching-to-sample one-to-many technique was used to test for stimulus equivalence (A-C). Twenty-two participants aged between 19 and 59 took part. Results showed that 13/22 participants met the 65% criterion for equivalence with 17/22 preferring to taste the positively labelled drink first. The results of the taste-test showed no significant effect between the three drink labels for the group results. A preference for the positively labelled drink over the neutral and negatively labelled drink was found among those who demonstrated equivalence and for the group results. Participants preferred the positively labelled drinks, followed by the neutral and negatively labelled drinks. Preference for the positive words was also indicated with 18/22 participants preferring the positive word, three preferring the neutral and one preferring the negative word. The current findings are consistent with previous research that suggests a stimulus pairing procedure is suitable for conditioning preference.

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## **Introduction**

The emotional connotation of a word can impact a person's preference for a variety of objects, topics or situations. For example, a nonsense syllable that is associated with a positive word has been shown to be more preferred over a nonsense syllable associated with a negative word (Valdivia-Salas, Dougher, & Luciano, 2013). These preferences can influence day to day living, which social interactions people choose to engage in, what food is consumed and which goods we purchase, to name a few (De Houwer, Thomas, & Baeyens, 2001). Some research suggests that likes and dislikes are learned (De Houwer, Thomas, & Baeyens, 2001; Hofmann, De Houwer, Perugini, & Baeyens, 2010), such as avoiding foods that have caused ill feelings in the past or developing a liking for new foods (Smeets & Barnes-Holmes, 2003), while others suggest there may be a genetic component (Polton & Menzies, 2002).

### *Evaluative Conditioning*

Evaluative conditioning (EC) “refers to the changes in the liking of a stimulus that result from pairing that stimulus with other positive or negative stimuli” (De Houwer, Thomas, & Baeyens, 2001, p.853). A form of Pavlovian conditioning, EC looks at the change in the valence of the neutral stimulus (Valdivia-Salas, Dougher, & Luciano, 2013).

Gorn (1982) looked at pairing a pen with liked and disliked music to determine how the preference of the pen changed based on its association with each music type. The conditions consisted of light blue pen-liked music, light blue pen-disliked music, beige pen-liked music and beige pen-disliked music. A pilot

group of ten participants were recruited to evaluate 10 different pieces of music and rank them based on whether they were liked or disliked. A second group of participants were randomly allocated to one of the four conditions and told that advertisers were trying to select music for pen commercials. A slide with the pen on it was presented as some music played. Following the slide and music presentation, participants were required to evaluate the music from dislike (1) to like very much (5). In return for their help, the participants were told they would receive a pen and to stand according to which pen they would like to receive; the advertised pen, or the non-advertised pen. A questionnaire was given, and participants were to fill it in and drop it in the box next to the pens.

Approximately 10 participants were removed from the data for each of the conditions as their response to the music evaluation indicated that they did not prefer the liked music and liked the disliked music. Seventy-four out of 94 participants preferred the pen associated with the liked music, while 30 out of 101 preferred the pen associated with the disliked music. Of those who indicated they had a reason for their preference, 114 of 164 said it was due to the pen colour. Only five participants mentioned the music as having influenced their choice. Gorn (1982) discusses how the reason for few participants mentioning the music could be due to a lack of ability to explain the relevant feelings, justifying their choice with more easily explained statements like the pen colour being a favourite.

### *Stimulus Equivalence*

Stimulus equivalence is the relation of conditional discriminations; when the stimuli involved become related in ways that are not explicitly taught (Barnes-Holmes, Barnes-Holmes, Smeets, Cullinan, & Leader, 2004); also referred to as derived relational responding (Blackledge, 2003). Sidman and Tailby (1982) discuss the three properties of equivalence classes, reflexivity, symmetry and transitivity, in a mathematical context. In order to demonstrate reflexivity the subject must be able to select the relevant stimulus when tested against itself; for example if  $a$  then  $a$  and if  $b$  then  $b$ . For symmetry, a subject must be able to demonstrate that if  $a$  then  $b$ , and with additional training the reverse, if  $b$  then  $a$ , must also be true. Transitivity involves the addition of a third stimulus. In this instance, if  $a$  then  $b$  and if  $b$  then  $c$  are taught, upon which if  $a$  then  $c$  needs to be achieved without additional training. For example, when a participant is presented with  $a-b-c$  and taught to select  $a$  when shown  $b$ , and  $b$  when shown  $c$ . Transitivity is demonstrated when the participant selects  $c$  when shown  $a$ , without being explicitly taught that the two are related. When reflexivity, symmetry and transitivity are proven to be present, these properties then indicate that the stimuli are members of an equivalence class (Minster, Jones, Elliffe, & Muthukumaraswamy, 2006; Kinloch, McEwan, & Foster, 2013).

### *Transformation of Function*

The transformation of stimulus function is when, without additional training, one stimulus in a derived relation changes the function of another (Dymond & Rehfeldt, 2000; Valdivia-Salas, Dougher, & Luciano, 2013). For example, if  $b-a$  and  $c-b$  are trained, there would likely be a derived relation between  $a-c$ . If  $a$  were

to have reinforcing functions associated with it, then *b* and *c* could acquire similar properties (Valdivia-Salas, Dougher, & Luciano, 2013). Research into transformation of function has been found to have implications in a variety of areas such as self-awareness, stereotyping, emotional disorders, moral behaviour and verbal behaviour (Dymond & Rehfeldt, 2000).

Barnes-Holmes, Barnes-Holmes, Smeets, & Luciano (2004) looked at the transfer of mood functions through equivalence relations. Twenty-eight stimulus cards were used; 24 cards had three stimuli on them, the remaining 4 cards had one. Two pieces of classical music, each 7 minutes long were used; one 'happy' and one 'sad,' and played through headphones to the participants. A mood-rating and an incentive rating scale were presented to the participants as self-report mood measures. Each participant was required to rate their likelihood of engaging in 6 potentially pleasurable activities. The mood and incentive ratings were conducted four times each throughout the experiment. Phase one of the experiment used matching-to-sample to train two conditional discriminations (A-B and A-C). When shown the stimuli cards, the participant was instructed to point to the stimuli on the bottom that related to the top one. Feedback was given for correct answers. Once the participant could answer 8 consecutive relations correct for the A-B relations, the A-C relations were trained.

Phase 2 consisted of symmetry and equivalence tests. Four symmetry and equivalence tasks were presented. Success for the symmetry task was defined as achieving eight consecutive correct answers. Should a participant fail, they were reexposed to Phase 1 until successful and then repeated the symmetry test. This

cycle was repeated until the participant achieved success. The equivalence test was conducted similarly and had the same success criteria. Failure to achieve success resulted in the reexposure to phase one and the symmetry test until success for all stages was achieved. Phase 3 involved the mood function training; the pairing of the happy and sad music pieces with the B stimuli, and Phase 4 tested to see that the pairing had been established. The cards with the B stimuli were presented individually for 3 minutes, after which the participants were given the two rating measures. Phase 5 tested to see if the mood functions had transferred to the C stimuli by presenting the B and C stimuli individually for 3 minutes each and asking the participants to complete the same two rating measures.

All 16 participants showed a preference for the stimuli paired with the happy music, with one participant failing to show derived transfer, rating the sad stimuli higher than the happy one. Three participants failed to show incentive during the incentive. High incentive and mood ratings were produced when the participants were exposed to the happy music and low ratings produced when participants were exposed to the sad music, regardless of whether the stimuli were directly or indirectly paired.

### *Matching-to-Sample*

Matching to sample (MTS) is founded on operant learning and involves the presentation of a sample stimulus, followed by one or more comparison stimuli (Kinloch, McEwan, & Foster, 2013). Participants are required to select one of the comparison stimuli and feedback is given regarding if they were correct or not (Kinloch, McEwan, & Foster, 2013). The sample and comparison stimuli are

often visual, but can also be presented as auditory, olfactory, haptic or gustatory (Barnes-Holmes, Barnes-Holmes, Smeets, Cullinan, & Leader, 2004). As a result of MTS training, relations can also be derived instead of being explicitly taught in training. For example, an MTS training where *b* is selected when *a* is presented and *c* when presented *b* and reinforcing when correct responses are made. After the pairs have been trained, further tests can show whether equivalence has been established by testing to determine if *c* is selected when shown *a*, without providing reinforcement (Leader, Barnes & Smeets, 1996).

Barnes-Holmes, Keane, Barnes-Holmes and Smeets (2000) conducted an experiment using an MTS training method to establish equivalence. Using words with presumed established negative and positive connotations, the study aimed to see if the pairing of these words with nonsense syllables would influence the participants perception of associated pleasantness for an item or brand; in this case the arbitrary brands linked to the cola soft drink. The training phase utilised a computer programme which presented the sample and comparison stimuli on the screen. Participants were required to select the correct pairing for each presentation while feedback was given on the screen. Following this phase, the testing phase was conducted immediately, involving matching to sample trials for each of the tasks, without feedback. The rating phase required the participants to sample two cola drinks, labelled BRAND X and BRAND Y that were otherwise exactly the same. Participants rated the drinks on a scale of 1 (least) to 7 (most) pleasant.

The results of the experiment showed that 27 of the 36 participants achieved the equivalence criterion of 85% or more; with 16 of the 27 participants who demonstrated equivalence preferring the positively labelled drink, rating it higher than the negatively labelled one. Four rated the negatively labelled drink higher and seven rated both equally. Of those who didn't meet the equivalence criterion, four rated the positively labelled drink higher, two rated the negative and three rated both drinks equally. The authors suggested the possibility that the transfer of function was not facilitated only by the MTS procedure, but also by later testing for equivalence. As a result, they conducted the experiment again with new participants, this time removing the equivalence test. They found that without conducting an equivalence test, six of the eight participants preferred the positively labelled drink and showed transfer of the emotive function, suggesting that the testing was not necessary for the transfer of preference.

Building on Barnes-Holmes et al. (2000), Smeets and Barnes-Holmes (2003) conducted a similar experiment with young children and an MTS training procedure. Instead of words, pictures, shapes and symbols were used to make it easier for the children to discriminate between the stimuli. The children were divided into four conditions. The first part of the MTS training consisted of the children being presented the two sets of stimuli individually ( $B_{1-2}$ - $A_{1-2}$  and  $C_{1-2}$ - $B_{1-2}$ ), then both sets presented together. The equivalence testing followed the MTS training. If a child did not demonstrate equivalence on the first test they were exposed to the test once more. The preference test was conducted regardless of the child's performance on the equivalence test. The preference test required the children to select which of the two drink samples (labelled  $C_1$  and  $C_2$ ,

respectively, both filled with the same green soda) they wanted to taste first. After tasting, the children were asked which they preferred and prompted to give an answer.

The results of this experiment showed that all the children learned the baseline test. For conditions 1 and 2 the average number of trials required to learn the baseline tasks was 186. For conditions 3 and 4 the average was 184. Those in conditions 1 and 2 met the equivalence criterion of 11/12 correct, with 6 of the children achieving equivalence in conditions 3 and 4. For the preference test, most of the children preferred the drink with the positive label, with 14 of the 16 children indicating they wanted to taste that one first. A second experiment was also conducted with the removal of the equivalence phase; the same method was used otherwise. The results from this experiment were very similar to those of the first, with 6 of those in conditions 5 and 6 preferring the positively labelled drink. All 7 participants in conditions 7 and 8 preferred the positively labelled drink. As with Barnes-Holmes et al. (2000) these results also suggest that the equivalence test was not necessary in the transfer of emotive function.

Valdivia-Salas, Dougher, & Luciano (2013) conducted an experiment looking at how derived relations impacted on the generalisability of evaluative conditioning. The first phase consisted of training four pictograms to the associated shape, using MTS. The training served to find out which of the pictograms were more reinforcing as they were to later serve as consequences for the participants' selections of shapes. Two shape pairs were each presented 27 times, with the first 12 used as training and the remaining 15 used as the testing.

During this time participants were also randomly allocated to 1 of 3 conditions, CondClass (condition and classes), CondNoClass (conditioning and no classes), and NoTreat (no treatment). Phase two had the least pleasant pictograms presented with a burst of 100 dBA white noise alongside the unpleasant slides, with the more pleasant pictogram paired with the pleasant slides. This delayed conditioning procedure consisted of 24 trials; eight conditioning trials and four extinction trials for each B stimulus. Phase 3 saw the presentation of 30 discrimination trials alongside the same instructions in Phase 1. The first 15 trials looked at the reinforcing properties held by B1 and B2, followed by the same for C1 and C2 during the remaining 15 trials. Equivalence testing followed and consisted of a one-to-many approach to train and test the formation of the stimulus classes. Phase 5 was a repeat of Phase 2 and done to recondition the two pictograms, however three novel slides were selected for each of the pictograms. Three trials for each of the two stimuli were presented; 6 trials in total. Phase 6 consisted of the repetition of Phase 3. Phase 7 was a domino effect intervention which required the experimenter to present a piece of paper to the participants. On the paper were equations linking individual letters to the individual shapes presented earlier. Following this phase, another 30 discrimination trials were conducted. In the final phase the participants were required to select one of two letters presented on screen. This was then repeated for another pair of letters (two pairs in total).

The results of this study showed that most participants were inclined to choose the shape related to the positively conditioned stimulus over the negative for participants who were allocated to the CondClass and CondNoClass

conditions. “All of the participants in the CondClass condition met the test criteria for the establishment classes within two cycles of testing” (p.211). There was also a change between the C stimuli, with 30% of participants shifting their preference from C1 to C2, despite not having been trained to relate B to C.

### *Stimulus Pairing Observation*

Stimulus pairing observation procedure (SPO) is an alternate training technique founded on associative learning in which an individual stimulus is presented, known as the sample, and is followed by the associated comparison stimuli (Kinloch et al. 2013). For example, *a* is presented on screen for 2s, followed by *b* for 2s. Participants are required to observe the pairs as they are presented, and no response is necessary at the time (Clayton & Hayes, 2004; Leader & Barnes-Holmes, 2001). Leader, Barnes and Smeets (1996) conducted experiments to determine whether it was possible to establish equivalence in participants using a respondent training procedure. The results showed that with this form of training it is possible, which is supported by Leader and Barnes-Holmes (2001). To test for equivalence after using an SPO training procedure, a standard MTS test can be used (Leader & Barnes-Holmes, 2001).

Omori and Yamamoto (2013) used SPO to train pictures, Kanji characters and spoken sounds in children with developmental disabilities (ASD and ADHD). Using a PowerPoint presentation, the stimuli were presented to the children. Each set of stimuli consisted of 3 pairs of a Kanji character, a spoken word and a picture. If they were able to, the children were required to read the stimuli out loud. The baseline consisted of two tests, a Kanji reading test and a picture naming test. The stimulus pairing training and testing followed. This consisted of

the Kanji character being presented simultaneously with spoken word for two seconds, followed by the related picture for two seconds and then one second of black screen. The three pairs were presented 6 times at random for 18 presentations in total. Following the completion of the SPO training, those that successfully completed the reading test then underwent a picture naming test, Kanji-picture MTS and picture-Kanji MTS. Those who were unsuccessful in passing the reading test, picture naming and picture-Kanji MTS tests repeated the training blocks until success was achieved. Follow up tests were then conducted at one and two weeks post experiment. The results showed mixed retention abilities among the participants. While at the end of the experiment all participants finished with 100% correct, many saw a reduction in performance for any of the four tasks, if not at the one-week post-test, then at the two-week post-test.

Kinloch, McEwan and Foster (2013) looked at the differences between MTS and SPO, comparing the two methods. Ninety-four participants, divided into 12 groups, took part in the experiment. The 12 groups were comprised of three factors, the procedure type (MTS or SPO), arrangement of the stimuli (many to one, one to many, or linear) and the number of trials they received (60 or 120). Those who completed the SPO trainings were only required to watch the computer screen as the pairs of nonsense syllables were presented. One syllable was presented for 1s, followed by a 0.5s break (white screen), then the second syllable of the pair for 1s. Between each pair there was a 3s gap of white screen. The number of presentations depended on which condition the participants had; some received 60 presentations (10 of each pair) or 120 presentations (20 of each pair). No feedback was given. Those who completed the MTS conditions were

required to watch the computer screen and use the keyboard to select the correct syllable when presented, with one syllable on the top and three on the bottom. If the participant made a correct response, the word “correct” was presented on screen paired with a 1000 Hz tone. If an incorrect response was made, the word “incorrect” was presented on screen. Participants were given a total of 4 sessions consisting of two training and testing cycles to demonstrate the six symmetry relations and 3 equivalence relations. This was assessed by MTS testing at the end of every training procedure. Success was defined as the participants achieving 9 out of 10 correct responses for each of the tested relations.

Of the 94 participants, 61 met the session criterion of demonstrating both symmetry and equivalence. Ten participants failed to meet the criterion due to only getting 9 out of 10 correct on either the symmetry or the equivalence, but not both. Those who completed the linear procedure with 60 trials had the lowest equivalence rate, with only half of the MTS and none of the SPO participants successfully meeting the equivalence criterion. Looking at the training procedures, those trained using MTS had a marginally higher equivalence success rate (68.1%) than those on SPO (61.7%). Of the three stimulus arrangements, one to many was the most successful with 83.3% demonstrating equivalence.

The current study looked at combining the works of Barnes-Holmes et al. (2000) (Experiment 1) and Smeets & Barnes-Holmes, (2003) (Experiment 1) and using Omori & Yamamoto (2013) as a guideline to create the SPO training procedure. The purpose of this was to determine whether an SPO training procedure could produce similar results in regards to transfer of function, as this

method is more reflective of how everyday marketing works, therefore having more real-life implications. Several method changes were implemented. Firstly, the matching to sample training procedure was replaced with a stimulus pairing observation training technique to see if SPO can condition preference. Secondly, participants were given the option of selecting words from lists presented to them for each of the three conditions. The purpose of this was to ensure that the words used were ones that were more likely to elicit a strong emotional response in each participant. Third, as an alternative to the idea in previous works (Barnes-Holmes, et al. 2000; Smeets & Barnes-Holmes, 2003) that equivalence testing is not necessary for transfer of function, the equivalence test was conducted after the preference assessment to prevent it from influencing the results of the preference assessment. Fourth, a neutral stimulus condition was introduced to function as a reference point for the positive and negative conditions. As there was no neutral condition in the previous studies, it is impossible to determine whether the participants established a preference for the positive stimuli, aversion to the negative stimuli, or both.

## Method

### *Participants*

Twenty-two participants, 4 men and 18 women, aged between 20-59 (M=34.86) took part and were recruited via flyers advertised around University of Waikato Campus. Participants were provided with a digital copy of the information sheet and consent form upon their expression of interest. Informed consent was obtained prior to starting the experiment and the participants were supplied with hard copies of the information sheet and consent form to take with them. An opportunity to ask any questions was given. The research was approved by the University of Waikato Psychology Research and Ethics Committee, application #17:60.

### *Sessions and Setting*

Individual sessions were held in a quiet, windowless psychology laboratory at the University of Waikato and ran for approximately 30 minutes. The Dell Optiplex 9020 (model D07S) computer processor, running Windows 7 Enterprise, was set up with a Dell 27-inch P2714Hc monitor.

Three conditions were delivered: positive, neutral and negative. Each consisted of two pairs of stimuli, a consonant-vowel-consonant (CVC) nonsense syllable paired with a word, and a symbol paired with a CVC nonsense syllable.

Lists of 10 words were compiled from a combination of word lists by Abernethy (1991), Anderson (1968), and Gilhooly & Hay (1977). One word from each list was removed during the development of the computer programme for presentation purposes as it was too long. The final word lists, CVC nonsense syllables and symbols are presented in Table 1.

| <b>Stimuli</b> | <b>Positive</b>   | <b>Neutral</b>  | <b>Negative</b>   |
|----------------|---|---|---|
| A              | Warm<br>Health<br>Light<br>Clean<br>Baby<br>Friend<br>Happy<br>Peace<br>Helps | Apron<br>Ranch<br>Reason<br>Chair<br>Wheat<br>Hovel<br>Ease<br>Cloth<br>Juice | Boring<br>Grief<br>Rain<br>Sad<br>Greed<br>War<br>Fear<br>Ghost<br>Liar |
| B              | <i>QOW</i>  | <i>CIF</i>  | <i>ZUH</i>  |
| C              | ⌘   | φ   | ⌘   |

*Table 1.* Words list, CVC nonsense syllable and symbol for each condition

### *Training Phase*

Before starting, the participants were required to select one word from each of the condition lists.

During this experiment you will be seeing three words repeated amongst other stimuli. Each word is linked to a specific state; Positive, Negative or Neutral.

Please choose the word you wish to use for each of the three states.

Positive:

Negative:

Neutral:

[Click here when you are happy with your choices](#)

*Figure 1.* Word selection presentation.

The pairs were trained by presenting B followed by A stimuli and C followed by B stimuli. Both types of stimuli pairings were presented together in random order. Stimuli in each pair were presented individually for 2s in the middle of the screen immediately after one another, followed by 2s of blank screen before the presentation of the next pair. Before starting the experimenter instructed the participants to watch the screen, paying close attention to the pairs presented. Following every three pair presentations a memory test was conducted (Figure 2). For the memory test, the three pairs that were just shown were presented alongside a fourth pair not shown with the previous 3. The fourth pair was one of the remaining pairings that was included in the experiment but was not shown in the current grouping.

**QOW – Warm**

**CIF – Apron**

Please choose one pair that you have not seen in the previous three pairings.

 – **QOW**

 – **ZUH**

*Figure 2.* Example of the pair presentations during memory test.

Participants were required to select the pair that was not shown, using the computer mouse. Feedback was given in the form of a green tick in the centre of the screen for correct answers (Figure 3) and a red cross for incorrect (Figure 4). If an incorrect answer was selected, participants were re-exposed to the trial once more. If they answered incorrectly a second time, the programme automatically moved on to the next trial. The purpose of conducting a memory test was to ensure participants were paying attention to the task at hand. One trial consisted of the three pair presentations and the memory test. A minimum of 20 trials were conducted with those who answered any incorrectly receiving more than 20, to a maximum of 40.



Figure 3. Example of a correct response during the memory test.

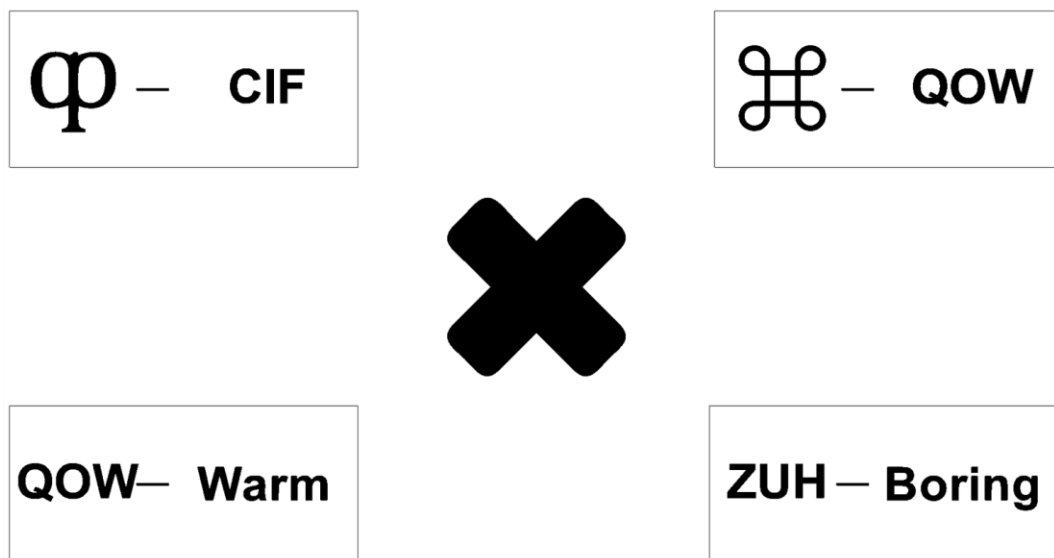


Figure 4. Example of an incorrect response during the memory test.

#### *Preference Assessment*

Three small cups filled with sugar-free lemonade, each labelled with a symbol used in the training phase, were presented on a table to the left of the computer. Each cup was filled with the same drink and prior to testing they were covered by a towel.

The pre-tasting assessment required the participants to select which of the drinks they would like to taste first, second and third. Following this, the participants were asked to taste the drinks in order from left to right. The order drinks were presented was differently each time so there was no set order in which the participants tasted the drinks. The taste-test assessment required the participants to verbally rank the drinks in order of which they liked most to least. If unable to decide, the participant was told they had to pick one. Lastly, the participants were asked which of the three words they preferred the most.

#### *Equivalence Test*

Carried out on the computer, the equivalence testing involved an MTS one-to-many approach. For each trial, one of the three words used earlier was presented, centred, in the top half of the screen, with the three symbols beneath the word, as shown in Figure 5. The participants were verbally instructed to select the symbol, using the computer mouse, that they associated with the presented word and that no feedback would be given. Each word was presented in random order four times, with 12 trials in total.

# Boring

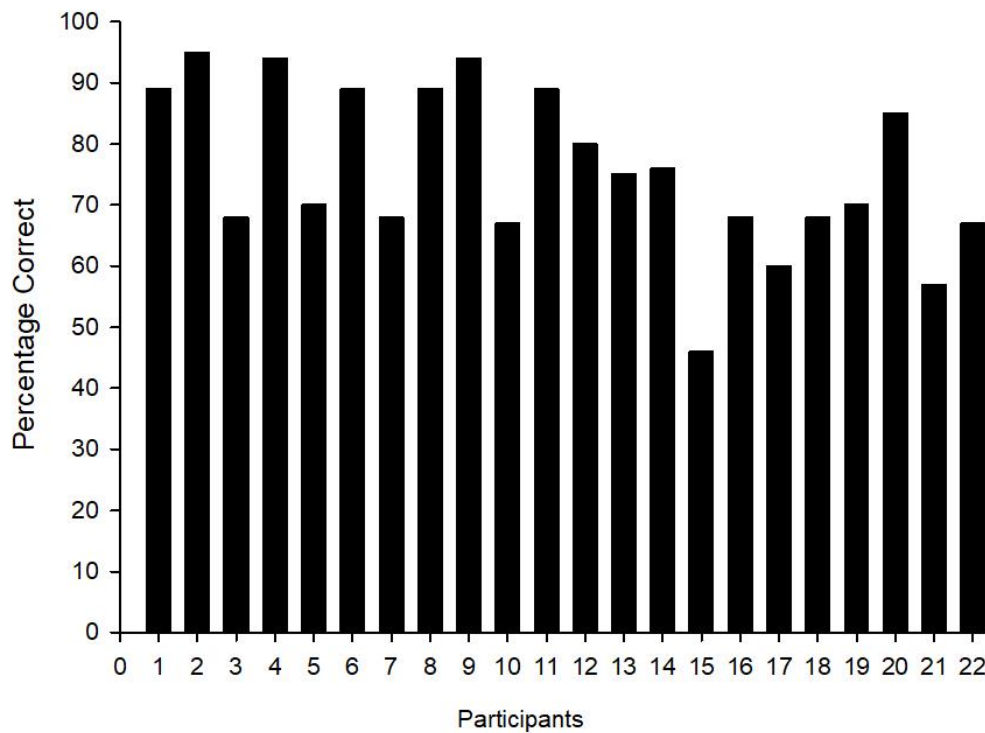


*Figure 5.* Example of MTS test presentation.

## Results

Results from the memory test section of the experiment are displayed in Figure 6.

No participant achieved 100% correct in this section; the highest being 95% correct and the lowest 46% correct. 20 out of 22 scored 60% correct or higher. On average, participants scored 76% correct.



*Figure 6.* Percentage correct for each participant in memory tests presented during SPO training.

Figure 7 shows that the participants were more inclined to choose the drink with the positive label as their first choice (mean=1.23;  $SD=.429$ ), followed by the neutral label (mean=2.18;  $SD=.664$ ) and then negative (mean=2.36;  $SD=.658$ ).

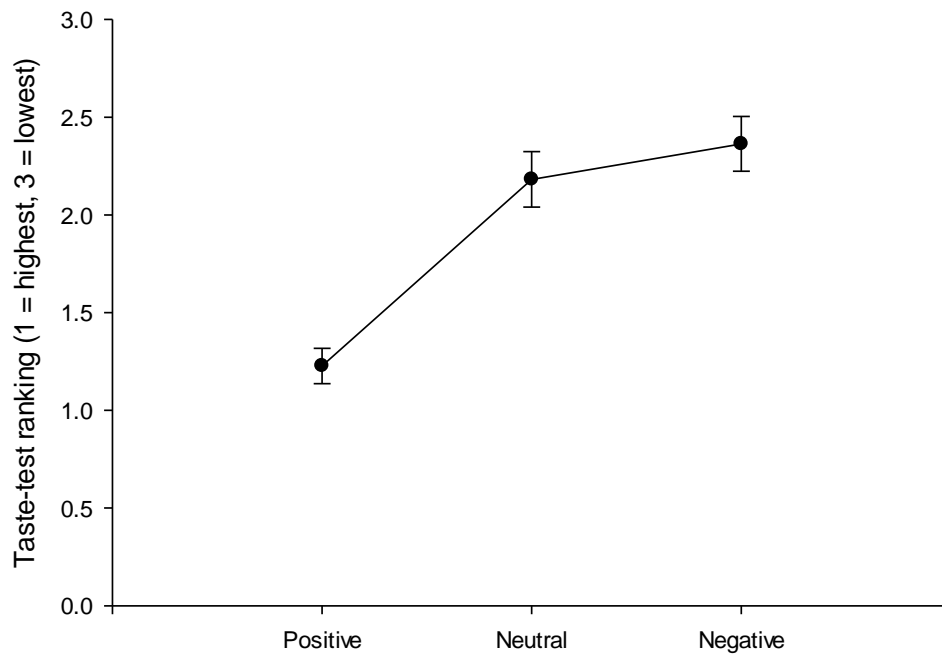
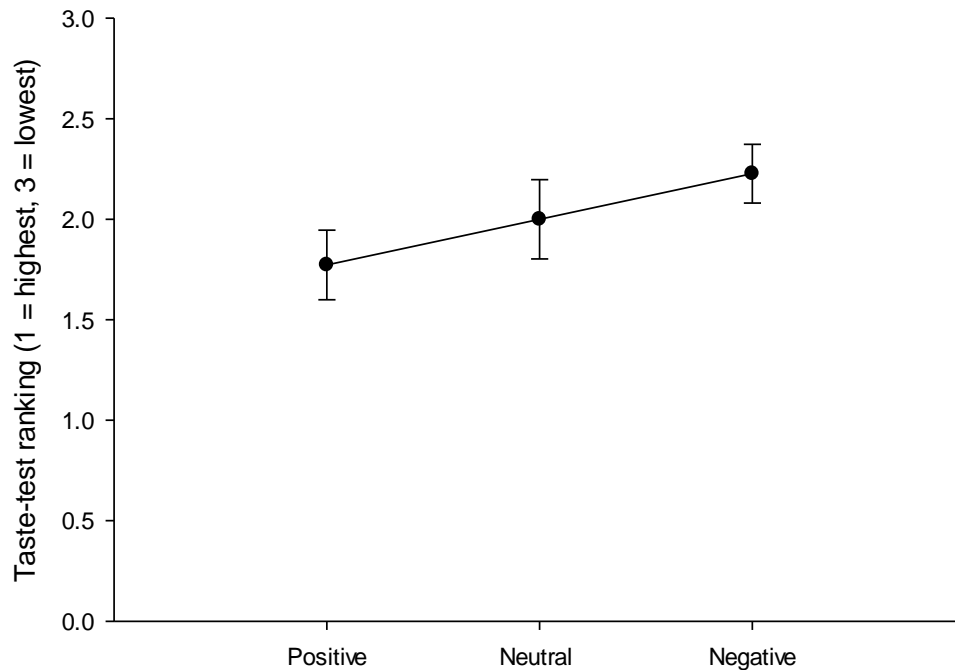


Figure 7. Mean order selected in multiple stimulus without replacement (MSWO) for pre-tasting soft drink preference with standard error.

A one-way repeated measures ANOVA was conducted to compare the effect of soft drink labels on preference, prior to the participant tasting the soft drink. Mauchly's test indicated the assumption of sphericity had not been violated. There was a significant effect of the soft drink label on the participants' preference before tasting,  $F(2,20) = 15.959, p < .001$ . Pairwise comparisons (with Bonferroni adjustment) comparing the mean difference between each of the three pairs, revealed a significant difference between the order in which the positive and neutral labelled soft drinks were chosen ( $p = .001$ ) and the positive and negative labelled soft drinks were chosen ( $p < .001$ ). There was no significant difference between the neutral and negative labelled soft drinks ( $p = 1$ ).

Figure 8 shows the participants' preference for the taste-test ranking. Participants were more inclined to choose the drink with the positive label as their

first choice (mean=1.77;  $SD=.813$ ), followed by the neutral label (mean=2;  $SD=.926$ ) and then negative (mean=2.23;  $SD=.685$ ).



*Figure 8.* Mean order selected in MSWO for taste-test ranking preference assessment with standard error.

A one-way repeated measures ANOVA was conducted to compare the effect of soft drink labels on preference, after the participants tasted the soft drink. Mauchly's test indicated the assumption of sphericity had not been violated. There was no significant effect of the soft drink label on the participants' preference after tasting,  $F(2,20)= 1.591$ ,  $p =.228$ .

Results of the MTS equivalence test are displayed in Figure 9. Of the 22 participants, six scored 100% correct and 3 scored 0%. The average score was 61%.

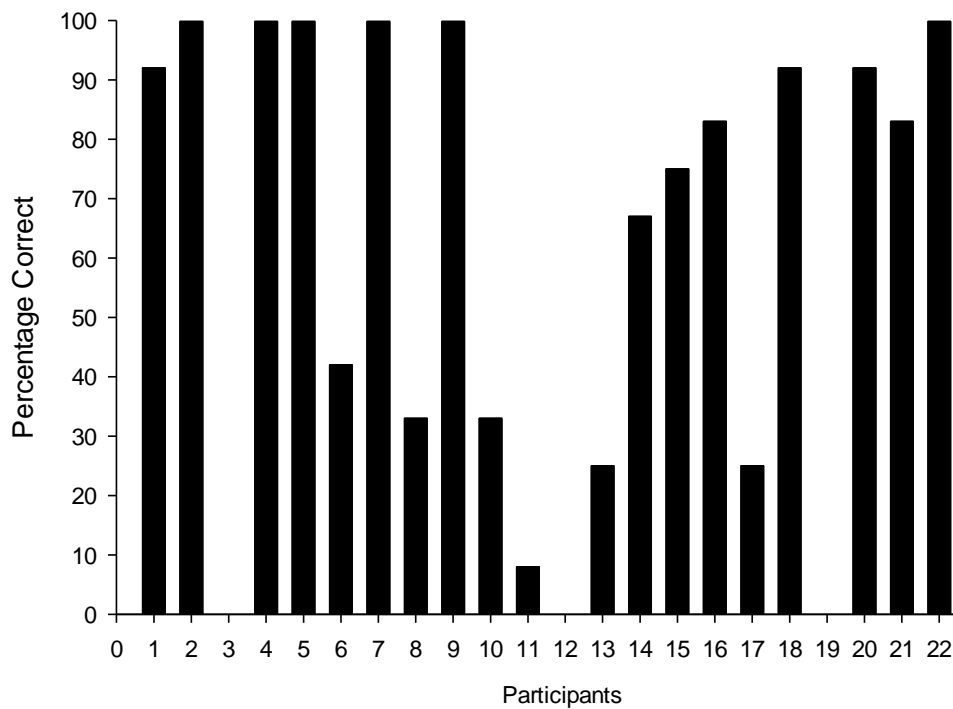


Figure 9. Percentage of correct trials for each participant in MTS.

Pearson’s correlation between the participants’ memory test performance and MTS performance showed a weak, statistically nonsignificant, positive correlation,  $r(20) = .076, p = .738$ .

The data from the preference assessments were analysed again, excluding those who did not reach the equivalence criterion of 65%. This equivalence criterion was selected given that there was a 33% chance the participants will randomly select the correct answer; if performance was above 65% then they were considered to be actively selecting the correct answer consistently. Of the 22 participants, 13 reached the equivalence criterion.

Figure 10 shows that the participants who met the MTS criterion were more inclined to choose the drink with the positive label as their first choice (mean=1.23;  $SD=.439$ ), followed by the neutral label (mean=2.15;  $SD=.689$ ) and

then negative (mean=2.38;  $SD=.650$ ).

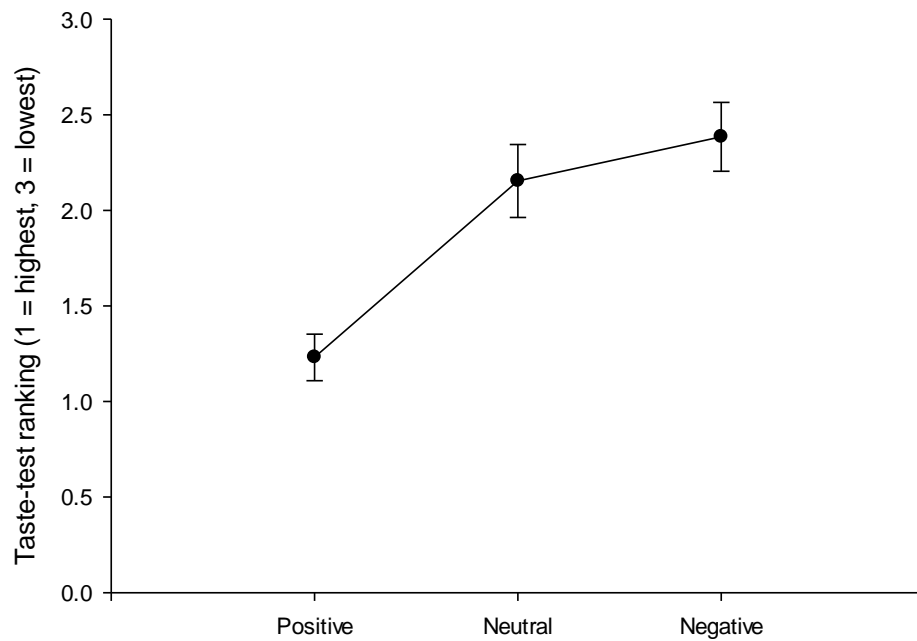
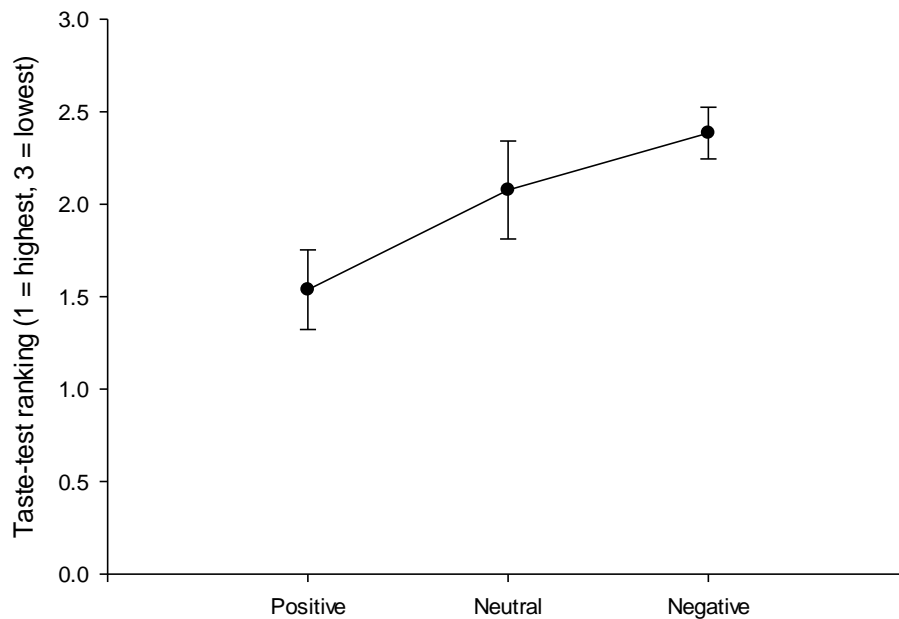


Figure 10. Mean order selected in MSWO for pre-tasting preference assessment with standard error for participants who met equivalence criterion.

A one-way repeated measures ANOVA was conducted to compare the effect of soft drink labels on preference, prior to the participant tasting the soft drink for those who reached the equivalence criterion. Mauchly's test indicated the assumption of sphericity had not been violated. There was a significant effect of the soft drink label on the participants' preference before tasting,  $F(2,11)=8.878, p=.005$ . Pairwise comparisons (with Bonferroni adjustment) comparing the mean difference between each of the three pairs, revealed a significant difference between the order in which the positive and neutral labelled soft drinks were chosen ( $p=.023$ ) and the positive and negative labelled soft drinks were chosen ( $p=.004$ ). There was no significant difference between the neutral and negative labelled soft drinks ( $p=1$ ).

Figure 11 shows that the participants who met the MTS criterion were more inclined to choose the drink with the positive label as their first choice (mean=1.54;  $SD=.776$ ), followed by the neutral label (mean=2.08;  $SD=.954$ ) and then negative (mean=2.38;  $SD=.506$ ).



*Figure 11.* Mean order selected in MSWO for taste-test ranking preference assessment with standard error for participants who met equivalence criterion.

A one-way repeated measures ANOVA was conducted to compare the effect of soft drink labels on preference, after tasting the soft drink for those who reached the equivalence criterion. Mauchly's test indicated the assumption of sphericity had not been violated. There was a significant effect of the soft drink label on the participants' preference taste test ranking,  $F(2,11)=5.920$ ,  $p =.018$ . The pairwise comparison (with Bonferroni adjustment) compared the mean difference between each of the three pairs, positive/neutral, positive/negative and neutral/negative. There was a significant difference between the order in which positive and negative labelled soft drinks were chosen ( $p =.016$ ). There was no significant

difference between the positive and neutral labelled soft drinks ( $p = .798$ ) and neutral and negative labelled soft drinks ( $p = 1$ ).

The data from the equivalence test was analysed according to how many positive, neutral and negative stimuli each participant got correct. Figure 12 shows that the participants performed better with the positive stimuli ( $M=2.86$ ,  $SD=1.670$ ), followed by the negative stimuli ( $M=2.27$ ,  $SD=1.751$ ) then the neutral stimuli ( $M=2.23$ ,  $SD=1.926$ ) when they were presented in the equivalence test.

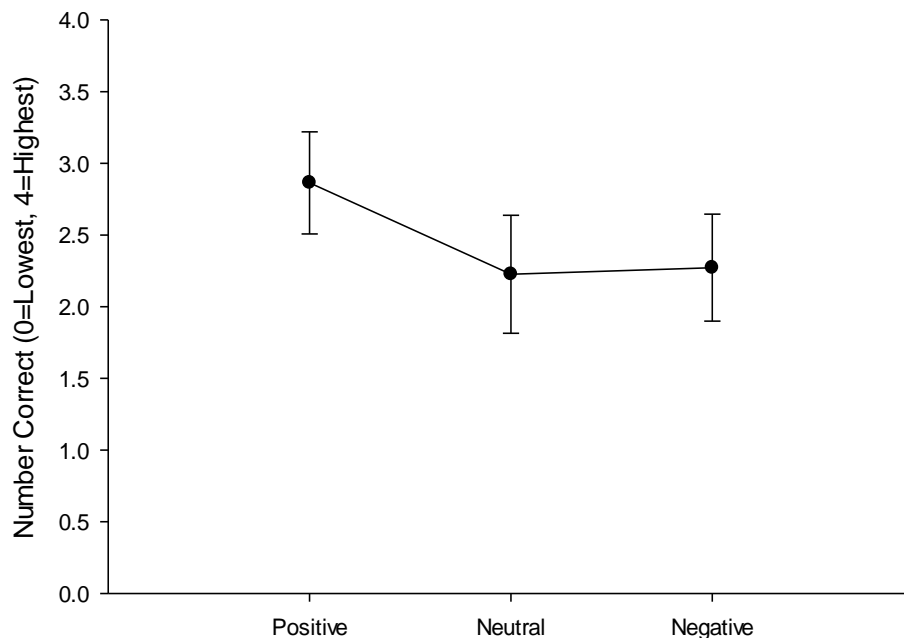


Figure 12. Mean number of correct for positive, neutral and negative stimuli in the MTS with standard error.

A one-way repeated measures ANOVA was conducted to compare the effect of the participants' performance on the positive, neutral or negative stimuli. Mauchly's test indicated the assumption of sphericity had not been violated. There was no significant effect on the participants' performance for any of the conditions,  $F(2,20) = 2.071$ ,  $p = .152$ .

## Discussion

In this study participants were exposed to a stimulus pairing observation procedure in which three arbitrary symbols were indirectly paired with potentially emotive words. Following the training procedure, soft drinks labelled with each symbol were presented and participants were asked which they would like to taste first. The soft drinks were then sampled, and participants were asked to rank which they liked from most to least. It was hypothesised that the stimulus pairing observation procedure would facilitate the transfer of function and the participants would prefer the positively labelled drink over the neutral and negatively labelled drinks.

The pre-taste-test ranking results for all participants showed a preference for the positively labelled drink, followed by the neutral, then the negative. Those who met the equivalence criterion of 65% correct in the training trials ranked the positively labelled drink higher than the neutral and the negatively labelled drinks. Statistically significant differences were found between the positive and neutral conditions, as well as the positive and negative conditions.

The taste-test ranking results showed significant difference in preference for the participants who demonstrated equivalence. Statistically significant differences were found between the positive and neutral conditions, and the positive and negative conditions. No statistically significant effects were found for the overall group taste-test rankings. These results are reflective of Barnes-Holmes et al., (2000) which showed that those who demonstrated equivalence tended to prefer the positively labelled drink over the negative.

The average performance on the memory test conducted during the stimulus pairing observation was 76%, with an average performance of 61% on the equivalence test. There was a statistically nonsignificant, weak, positive correlation between the memory test and equivalence results, showing that the participants' performance on the memory test was not predictive of matching-to-sample performance.

The results of the present study and those of Omori and Yamamoto (2013), who trained Kanji characters, spoken words and images using a similar stimulus pairing procedure, suggest that it is possible to establish stimulus equivalence using this type of training. Leader and Barnes-Holmes (2001) also drew the conclusion that respondent type training procedures can reliably produce equivalence. However, compared to the results of Leader, Barnes & Smeets (1996), where 84% of the participants met the equivalence criterion of 90% correct on test trials, under a respondent type procedure, and Smeets and Barnes-Holmes (2003), where 87.5% of children met the 92% equivalence criterion, the current study has a significantly lower pass rate of 59.1% based on an equivalence criterion of 65% of test trials correct. Not only was there a lower pass rate for the current study, but the equivalence criterion was also lower, meaning there is a greater difference between the results and should it be taken into consideration when making comparisons.

One reason for a lower pass rate could be the participants' exposure to fewer training trials. In Barnes-Holmes et al. (2000) participants were required to repeat the 4 matching-to-sample tasks until they were able to complete 24 consecutive trials correctly. Smeets and Barnes-Holmes (2003) participants were exposed to blocks of 14 trials for the A-B stimuli, repeated until 11/12 trials

consecutively correct, and blocks of 16 for the B-C stimuli, repeated until 15/16 trials consecutively correct. Participants in Omori and Yamamoto (2013) were exposed to blocks of 18 trials repeatedly until the criterion of being able to read three Kanji characters consecutively for two blocks was achieved. Kinloch et al. (2013) also found that participants exposed to a higher number of trials (120 trials) performed better in both matching-to-sample and stimulus pairing observation procedures, than those who were exposed to fewer (60 trials). Participants in the current study were not required to reach any mastery criteria before progressing to the next phases of the experiment and only exposed to one grouping of 20 trials, which is much lower than the number of trials used in other studies. With this evidence in mind, should the current stimulus pairing procedure be repeated it could be beneficial to increase the number of trials and/or add a mastery criterion for the participants to meet before they can progress in the experiment.

The use of memory tests in stimulus pairing procedures is uncommon; none were conducted in Omori and Yamamoto (2013) or Kinloch et al. (2013). The purpose of including a memory test in this study was to ensure participants were paying attention to the pair presentations. It is possible that it may have functioned as a pair presentation of sorts, as it allowed the participants to see each of the stimuli in the pairs side by side. However, as the current method was not designed to assess the effectiveness of a memory test, it is not possible to make any definitive conclusions about the memory test as both a means of ensuring participants are paying attention and as an additional means of stimuli pairing. Repeating the experiment and using two groups, one with a memory test and one without, could allow for comparisons to be made and conclusions to be drawn

about the efficacy of the memory test and if it acts as another effective means of stimulus pairing presentation.

It was thought that by allowing participants to select the words used for each condition that there would be a more intense respondent function to be transferred, instead of using words that were presumed to have a positive or negative association as in Barnes-Holmes et al. (2000). Barnes-Holmes et al. (2000) found that when using words with presumed functions, some participants failed to show transfer while still demonstrating equivalence. Barnes-Holmes et al. (2000) thought that this could be a result of the presumed functions of each word not being the same for all participants, therefore those who did not demonstrate transfer may have seen each word differently.

Table 2 shows the word lists with how many participants selected each one in brackets. When asked after the taste-test which of the chosen words the participants preferred the most, 18 out of 22 said they preferred the positive word. Fifteen of the participants who preferred the positive word also preferred the positively labelled drink in the pre-taste-test. With a significant effect of the soft drink label found during the pre-taste-test for those who met the MTS criterion, it is possible that allowing the participants to select words that elicited stronger emotional response for each condition may have contributed to the transfer of stimulus function. Although Smeets & Barnes-Holmes (2003) used images instead of words, they found that 13/16 participants preferred the positive stimuli over the negative. It should also be noted that the current design was not set up to test for the relative effectiveness of word selection over using pre-determined word lists.

| <b>Positive</b> | <b>Neutral</b> | <b>Negative</b> |
|-----------------|----------------|-----------------|
| Warm (2)        | Apron (3)      | Boring (1)      |
| Health (3)      | Ranch          | Grief (2)       |
| Light (1)       | Reason (2)     | Rain (1)        |
| Clean           | Chair (10)     | Sad (8)         |
| Baby (2)        | Wheat          | Greed (2)       |
| Friend          | Hovel          | War (6)         |
| Happy (11)      | Ease (4)       | Fear            |
| Peace (2)       | Cloth          | Ghost           |
| Helps (1)       | Juice (3)      | Liar (2)        |

*Table 2.* Word list for each condition with how many participants chose each in brackets

While Barnes-Holmes et al. (2000) and Smeets & Barnes-Holmes (2003) both argued that equivalence testing was not necessary for the transformation of function, which was explored by removing the matching-to-sample test in later experiments and comparing the results, conducting the test after the preference assessment appears to negate any issues testing may pose on the outcome of the transfer.

The rationale behind implementing a neutral condition was to establish a reference point for the positive and negative conditions and see if participants tended to respond toward the positive stimuli, away from the negative, or both. The group data for the pre-taste-test preference assessment shows that the participants had a strong preference for the positively labelled drinks. Those who met the equivalence criterion showed a preference for the positively labelled drink alongside a slight, statistically nonsignificant, aversion for the negatively labelled

drink relative to the neutral label. It is not possible to determine whether the neutral stimuli condition acted as a reference point for individual data as it is a ranking and therefore cannot provide information about the degree of preference. At a group level the neutral condition appears to be an informative addition to the procedure. These results could mean that conditioning with positive stimuli was more effective or it had a stronger emotional function. While the current research was not designed to look at this, it could be investigated further.

Due to an error with the computer program, only 17 trials were administered to the participants instead of the 20 trials that had initially been intended. All participants were exposed to 8 groups of all 6 stimuli pairs (16 trials). Since the pair presentations were random, the final 3 presentations for each participant varied, with each receiving an extra exposure to any 3 of the 6 pairs. As a result, it is possible that the conditioning for these pairs may have been more effective than for the pairs which had fewer exposures. Without conducting the experiment again, it is hard to say just how the computer error influenced the current results.

Another limitation to the study is that despite being told minimal information about the study, the participants may have identified the purpose of the study and therefore may have responded according to what they thought the experimenter wanted to see. For example, participants may have altered their preference assessment responses to align with what they think should be the preferred drink. Furnham (1986) points out that there is evidence to support the idea that some people are able to identify what is being measured in questionnaires and experiments. The desire to perform according to what a person

thinks is expected of them is a common issue amongst research, especially within psychology (King & Bruner, 2000).

Similarly, the possibility of experimenter biases being present is also impossible to rule out. If biases were present, it is possible that the experimenter could have inadvertently hinted toward correct answers or revealed what it was that the experiment was looking for. As a result, participants could have noticed and responded accordingly. If the study was to be repeated, multiple experimenters could be used to create a double-blind experiment. The current experimenter was fully aware of the intentions and hypotheses of the study. By keeping the research intentions from those administering the experiment there is less chance of them inadvertently influencing the results of the participants, reducing any experimenter effects.

There was no deception used, however the main hypothesis of the current study was not explicitly stated to the participants. In future studies, elements of deception could be employed to reduce any participant biases, such as keeping all hypotheses from participants. Gorn (1982) used deception where participants were not told of the hypothesis, whether the music paired with the product influenced preference, but were instead misled and told that marketing researchers were trying to select music for an advertisement. Should the current study be repeated, participants could be misled to think that researchers are looking at something else, for example, looking at the bubblyness of the drink or different off market drink formulas, rather than the effect of the branding. The participants were also told of the three conditions, positive, neutral and negative, therefore in future studies participants could remain naïve to the three conditions to ensure that this

does not create any biases and alter the emotive function of the words used in each condition.

The purpose of using a stimulus pairing observation procedure for training the stimuli was to make it more reflective of real-world marketing. However, the addition of the memory test goes against this idea as it would not be possible in a real-world marketing situation. In terms of allowing participants to select words, the active selection process is not necessarily feasible in real-world situations. Although websites, like Facebook, are now able to collect data from online interactions and use that to target which advertisements would be of more interest to individuals. For example, if Facebook collects data that shows you are interested in an overseas holiday, then travel related advertisements will start to appear more frequently. As an alternative to participants directly selecting words, a word survey of the wider target audience/participant pool could also be conducted prior to the experiment as a way of determining which have a stronger respondent function.

The results show that soft drinks with positive associations are more preferred over those with neutral or negative associations, and that preference can be transferred from stimuli, like words or seasons, to products. With this, it could be implied that products with positive associations, either in labelling or advertising, could be more likely to be purchased by consumers. For example, if we think of the ‘Open Happiness’ advertising campaign run by Coca Cola, did the use of the word “Happiness” and the association to summer increase sales? Is this approach the most effective way to market products? These questions could be answered by implementing a marketing approach like a stimulus pairing procedure and pairing different products with different positive stimuli and seeing

which pairings result in better sales. For example, pairing a fluffy dog with a warm heat pump, versus pairing the same fluffy dog with a car. The pairing of the fluffy dog is likely to result in more sales of one of the products than it is the other. Variations to the method could include changing how long each stimulus is exposed to viewers, the size of the stimuli on the screen/page, or how many times the pairs appear within a set time. This would require significantly more resources and effort but would result in a more accurate representation of how consumers respond to different marketing approaches.

Another area for further investigation is using stimulus pairing to shift preference between similar products of the same type or different products, for example, shifting preference from sugary drinks to a healthier alternative, or shifting preference away from tobacco. Being able to shift preference away from products that are bad for us and/or toward those which are better would have implications for wider societal issues like obesity and addiction. The current research, and future ones like it, could be beneficial to existing campaigns like anti-smoking and anti-drinking-driving, by allowing researchers to look at how different stimuli presentations are perceived by viewers and which are more effective and shifting preference on a larger scale. On a smaller more individual level stimulus pairing could be used to potentially help facilitate recovery programmes for those who struggle with addiction.

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## Appendix A. Consent Form.



### CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant.

**Research Project:** Influences of Package Labelling on Preference

| <b>Please complete the following checklist. Tick (✓) the appropriate box for each point.</b>  | <b>YES</b> | <b>NO</b> |
|---|------------|-----------|
| 1. I have read the Participant Information Sheet (or it has been read to me) and I understand it.   |            |           |
| 2. I have been given sufficient time to consider whether or not to participate in this study  |            |           |
| 3. I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet                                   |            |           |
| 4. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty                              |            |           |
| 5. I have the right to decline to participate in any part of the research activity  |            |           |
| 6. I know who to contact if I have any questions about the study in general.  |            |           |
| 7. I understand that the information supplied by me could be used in future academic publications.  |            |           |
| 8. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study |            |           |
| 9. I wish to receive a copy of the findings   |            |           |
| Email:  |            |           |
| 10. I wish to enter into the draw to win a \$50 Pak n Save  |            |           |
|   |            |           |

**Declaration by participant:**

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Psychology Research and Ethics Committee (Dr Rebecca Sargisson, phone 07 837 9580, email: [rebecca.sargisson@waikato.ac.nz](mailto:rebecca.sargisson@waikato.ac.nz))

Participant's name (Please print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Declaration by member of research team:**

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it. I believe that the participant understands the study and has given informed consent to participate.

Researcher's name (Please print): Mikaela Neill-Woodd \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Psyc Café/Forms and Guides/Research forms/Consent Form

## ***Appendix B. Information Sheet.***



### **Influences of Package Labelling on Preference Participant Information Sheet**

#### **What is the purpose of this research?**

The purpose of this study is to see if labels on packaging have any influence over a person's preference. This study will use a stimulus-pairing procedure to train relations between different symbols/words, in an effort to keep the approach similar to that of real world marketing techniques.

#### **What will be required of me?**

Should you choose to participate in this study, you will be invited to arrange a time with to meet, go through the consent process and complete the experiment. The experiment will consist of three phases, training, preference testing and equivalence testing. All three phases will be conducted in a psychology laboratory, with the training and equivalence phases done on a computer. The experimental session is expected to take approximately 45 minutes.

***Please note: Participants will be required to sample a sugar-free soft drink.***

#### **Can I see the results?**

Absolutely! Should you wish to see the results, please indicate so, and you will receive a summary of the results via email. The results will also be presented in a thesis and may be submitted for publication in peer-reviewed journals.

#### **Confidentiality**

All information regarding the experiment and its participants will be kept strictly confidential. Raw data from the experiment will be kept secure, with any published data kept anonymous.

#### **What happens if I no longer wish to participate?**

You have the right to withdraw from the study without any consequences, should you choose to. Upon completion of the experiment, you will have up to 2 weeks to have your data removed from the results.

#### **What if I have questions?**

If you have any questions, would like something clarified, or need to contact me you can do so on the following

Mikaela Neill-Woodd  
[man14@students.waikato.ac.nz](mailto:man14@students.waikato.ac.nz)  
0277750350

Alternatively, you can contact my supervisor Dr Tim Edwards  
([tim.edwards@waikato.ac.nz](mailto:tim.edwards@waikato.ac.nz))

*This research project has been approved by the School of Psychology Research and Ethics Committee of the Faculty of Arts and Social Sciences, University of Waikato. Any questions about the ethical conduct of this research may be sent to the convenor of the Research and Ethics Committee (currently) Dr Rebecca Sargisson, phone 07 557 8673, email: [rebeccas@waikato.ac.nz](mailto:rebeccas@waikato.ac.nz)*

**Appendix C. Data Collection Sheet.**

Participant Number \_\_\_\_\_ Age: \_\_\_\_\_

First Choice

☺                      ☹                      ☐

Second Choice

☺                      ☹                      ☐

Third Choice

☺                      ☹                      ☐

Drink order

Rank in order of preference:

1:

2:

3:

Word preference – which they liked best

Word Choice

| Positive ☺ | Negative ☹ | Neutral ☐ |
|------------|------------|-----------|
|            |            |           |

## Appendix D. Research flyer.



# Research Participants Wanted!!



This research is looking at effects of packaging labels on a people's preferences for soft drink.

*Please note; participants will be required to taste sugar free soft drink.*

Participation will take approximately 45 minutes.

All participants will have the opportunity to win a \$50 Pak n Save voucher.

*This research has been approved by the University of Waikato School of Psychology Human Research Ethics Committee and is being conducted by Mikaela Neill-Woodd in partial fulfilment of the requirements for MAppPsy(BA), supervised by Dr Tim Edwards.*

For more information contact Mikaela Neill-Woodd  
([man14@students.waikato.ac.nz](mailto:man14@students.waikato.ac.nz); 0277750350)

Mikaela Neill-Woodd; 0277750350  
[man14@students.waikato.ac.nz](mailto:man14@students.waikato.ac.nz)

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