



BA Primary Education with QTS

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Module: ECAD6003

Title:

An investigation into the effect that some essential oil smells may have on cognition and memory within a classroom setting?

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Frontispiece.

This is to certify that the contents of this research project are the result of research carried out by the author, except where specific references made to the research of others. The sole purpose of this research project is for assessment of the authors understanding of the subject matter which will contribute towards the overall degree classification of BA (Hons) in Primary Education with QTS at the University of Wales Trinity St David, Carmarthen and has not been presented as part of any award or publicly published.

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Introduction.

This research project was performed to investigate the effect of different smells on memory. The aim of the research is to determine whether certain essential oils can help enable pupils to retain and recall more information that they have learnt. Seven different smells were used during the research, which include lavender, peppermint, rosemary, bergamot, lemon, ylang ylang and sweet orange. The essential oil smell were chosen due to the current research in the olfactory senses area of study.

Lavender is said to have relaxing qualities, peppermint is said to enhance performance, rosemary can aid memory, bergamot is said to help relieve stress and anxiety, lemon can be used to aid memory recall, ylang ylang can help reduce stress and sweet orange can aid with anxiety (Sellar, W 2005). These smells were used to either stimulate or sooth, in order to determine if these odours improved or impaired memory.

The research project has been inspired through the previous research that has been carried out in this field when looking at helping memory in people who have dementia and Alzheimer's. When researching it was discovered that the use of certain smells could aid learning, memory and increase attainment within the school setting. Some research has been conducted within this field that indicates that rosemary can increase test results by 5%-7%. Lavender and peppermint are suggested to help children refocus after lunch (Ball, L, Shoker,J. &Miles, J, 2010).

Smells have a powerful influence on human behaviour which can either attract or repel us dependant on their olfactory properties. Similarly, certain smells seem to be reminders of past experiences. For example, the antiseptic smell of hospitals and the smell of newly cut grass are said to act as cues to recall past events (Laird, D.A,

1935). Our sense of smell is unlike any other of our senses as it directly connected to the environment and is closely located next to our limbic system which controls our sensory processing and emotion and our limbic system is close to the hippocampus which helps to create new long term memories. This explains why different smells such as the smell of a certain soap, the smell of coffee or the smell of the morning dew can evoke such vivid and strong memories. (Jackson, R.N, 2010).

The main aim of this research project is to explore the effect of different essential oil smells on memory recall and to look into the use of smells within a classroom setting to increase attainment, help behaviour and focus the pupils' learning. Rudolf Steiner has incorporated smells and other senses into his teaching for decades. He feels that the learner should be taught as a whole and in a holistic manner. (Steiner, R, 1923). This theory is emulated in the new Donaldson curriculum, soon to be introduced in Wales. Donaldson believes that the learners should have a more holistic learning experience to develop them as individuals, at their own pace and for the learners to follow the path that best suits them to learn. (Donaldson, G, 2015).

It is important to research any area that can raise attainment and increase the potential for learning. The focus in teaching at present is through visual and hearing techniques, however we have many senses that can be used to help learners to learn. As seen through research children learn in different ways, there are kinaesthetic learners, visual learners, logical learners and social learners. (Anderson, J R, 2000). Why then would it be such a leap to teach with the learners olfactory senses in mind. Blooms investigated the learners need to be taught as an individual using any method that would help the child to learn. (Blooms, B, 1956). This method or theory has now been recognised and is being used throughout schools and is now going to play a major part in the education of the learners in Wales as Donaldson suggests that this is the way forward within teaching. (Donaldson, G, 2015).

Ten children from a local school were asked to take part in the research, however only six parents replied and gave consent for their children to take part. The author is aware that this is a small sample group and that the data collected may not be conclusive, however it is expected to show some increase in memory recall.

The main aim of this research is to see if the use of essential oil smells can help memory in children and therefore help their attainment. Through this research it is expected to have a significant impact on the author's teaching methods and future within a classroom setting.

Literature Review.

Essential oils and plant extracts have been used in medicine, spiritual rituals, psychological and physical wellbeing practices for millennia. (Raskin, I, et al, 2002). Essential oils and plant extracts have been used in environmental, personal and religious territories and are documented as to having a varied range of benefits to human health. (Classen, C et al, 1994). Aromatherapy using lavender oil has been used to decrease blood pressure through foot massage (Eguchi, E., et al. 2016), using black pepper extract, smoking behaviours have been changed (Rose, J.E. & Behm, F.M.1994) and bergamot has been used effectively to help with dieting and weight loss. (Foreyt, J.P.& Kennedy, W.A.1971).

Essential oils today are used mostly in massage oils, through steam, in baths or are diffused to help relieve stress, to calm people, to aid in irritability, in some cases it can be used to treat pain and help with sleep. Essential oils can be used by professionals in other ways such as to treat anxiety, boost energy levels, eliminate headaches, ease depression, reduce pain, improve digestion, boost energy levels, increase circulation, speed up the healing process, strengthen the immune system and help deodorise. (Stelflitsch & Stelflitsch 2008 as cited in Jackson, R 2010).

There has been research carried out by Xu et al, Duan et al and Herz to suggest that some essential oils can and do 'create physiological, emotional, and psychological responses.' There are many studies that show the benefit of using essential oils for health and well-being but some studies have been carried out to see the possible effects on memory and cognition. Warm et al show that a higher level of vigilance was achieved by the subjects when exposed to a peppermint aroma. Juxtaposed to this, peppermint has been seen to have a positive impact in pre to post testing moods and cognitive responses when it was compared to Ylang Ylang. (Moses et al, 2008). Essential oils can provide individuals with relief from fatigue, allow them to

have a better mood and overall better mental and physical health (Takeda, Tsujuta, Kaya, Takemura, & Oku, 2008).

It is clear that these studies depend on what cognitive assessments are carried out, environmental variables and the time the studies were carried out influence the data and effects observed. Rosemary has been reported to help with memory and clear the mind to enable focus and concentration. (Herz 2009). Lemon has been seen to be effective to help memory. (Harvard Women's Health Watch, 2008). One essential oil that has seen particular attention in recent years is the aroma of rosemary.

Rosemary has been seen to have beneficial effects on the cognitive memory (Lawless, J, 2014). Due to the research carried out about rosemary having a positive effect on cognition it is not surprising that more research is being carried out to determine the potential for this herb to enhance memory and the human cognitive process. One early investigation showed that rosemary not only improved cognition, which was determined through mathematical calculations, but that it also has an impact on mood. (Diego, M.A., et al.1998). Moses et al (2003) carried out a computerised cognitive assessment with regards to the exposure to the smell of rosemary which showed a positive effect on long term memory. A subsequent finding later supported through investigations into prospective memory. (Moses, M 2014). Many of the studies carried out have been in adults, however there are some studies that have been carried out in children. Czar, K (2009) carried out a study on five year old children who had to complete a maze where they experienced failure. They were then tested with a different cognitive test where the children who experienced failure in the maze who were exposed to the same aroma, performed worse than the other children who were exposed to no aroma or a different aroma. This is not conclusive evidence, but it shows some areas of interest to be further investigated.

Having looked at the research carried out it shows that the use of essential oil smells within the classroom setting could enhance performance and raise attainment. (Czar, K, 2009). Gathercole, S, E et al (2004) and St Clair-Thompson & Gathercole, S, E (2006) state that the working memory and its elements are directly linked to the attainment of the child. Gathercole, S E and Baddely, A (2004) suggest that working memory in children is more important than IQ and if there could be a way to enhance the working memory then this would result in higher attainment across all abilities. Some studies show that essential oils have been used within a classroom to calm

hyperactive children, to focus children who can be easily distracted and, in some cases, can be used as a preventative for cold and flu viruses to be spread.

(Sakamoto, R., Minoura, K., Usui, A., Ishizuka, Y., & Kanba, S. 2005).

Akpınar, B (2005) suggest that the sense of smell is a very important useful sense to use. That the sense of smell has a powerful impact on memory, perception, attention, concentration, communication skills and mood which all have an impact on these learning behaviours. He carried out a study using a lemon aroma which has shown to increase the concentration of the children significantly compared to the control group used. He suggests that teachers focus on the visual and auditory aspects of learning, ignoring the effect that learning through smell can have.

Koca Kutlu,A ,Yılmaz,E,& Çeçen,D (2008) carried out a study during examinations taken by nursing student where they were exposed to lavender. The students that performed better were the group that were exposed to the lavender as they were more relaxed and focused on the task at hand. As seen there have been several studies carried out with regards to the use of smell within certain educational situations.

Aromatherapy has been used to help autistic children to sleep, to refocus, to destress and to distract them from the stress they may feel in the classroom environment. (Lytle, R & Todd, T. 2009). The use of essential oils within the classroom setting can not only be good for the learners but can be beneficial to the teacher also, lower stress levels and relaxing the atmosphere, as it can be with music. (Brown, M & Ralph, S. 1992).

Due to the important nature of the working memory within learners it is not surprising that there have been studies into the effect of physical activity on working memory. (Kamijo, K., et al. 2011). The effect of poor diet and lack of breakfast has been found to have a significant impact on the working memory in children and this information has been reacted upon through the introduction of breakfast clubs and free school meals. (Richardson, A., et al. 2000 & Rampersaud, G.C., et al. 2005).

There are many who are researching the different effects of different environmental aspects of a child's life that may play a role in the effect on their working memory and how this may raise attainment in their education, however there are few researchers looking into the effect of smell or aromatherapy on a child's working

memory. Teachers rarely ask the learners to use their sense of smell in a set task. When out on walks, on school trips or when a smell is smelt within the classroom setting it has not been witnessed that the educator will draw attention to the smell and discuss what they may think the smell is or what the smell reminds them of or even what how the smell makes them feel. (Moss, M., Earl, V., Moss, L. and Heffernan, T. 2017).

New studies have now started looking into the effect of essential oils with children suffering from attention deficit hyperactivity disorder with some very conclusive results showing how lavender and bergamot can aid in the concentration of the child and the level of stress and anxiety that they feel. (Johnson, J 2017).

Cann, A and Ross, D, A (1989) discovered that the use of an aroma when trying to remember a set of pictures and then when the aroma was present at testing it showed a significant improvement from when the participants were tested without an aroma present. The participants showed that the use of an aroma stimulated their cognitive response and short term memory and enabled them to remember more of the pictures when the specific aroma used at learning was present when they were tested. This is what is hoped to be discovered within this research project. The subjects will be exposed to the same smell when they are learning about the objects and when they are tested to discover which is the best aroma for memory recall.

However, there are many sceptics who believe that there is no way to show conclusively that aroma will aid cognitive, psychological or mental procedures. There are some researchers that argue that when you use essential oils the subjects have an expectation before the study is undertaken and that this expectancy alters the outcome of the study. Howard, S & Hughes, B M (2008) have reported that the use of lavender in their study were inconclusive as the participants used in the study were primed and told what the expectation was when they used the essential oil lavender. This would then impact on the results as the participants would be expecting the essential oil to have some benefit and therefore influence their responses. When the participants were told that lavender would help them to relax, they would automatically become more relaxed and in turn the results could not be determined as the expectations had already been set. Howard, S and Hughes B,M

(2008) also suggest that some This would be an important aspect of a study to determine if the 'placebo effect exists' or if the participants expectancy of the study change the results in any way. During this study carried out by Howard, S & Hughes, B, M (2008) they used the placebo effect and decided to manipulate the subjects idea of what may happen when they are exposed to the different essential oil smells. The study discovered that one group of participants who were influenced as to what to expect when they smelt lavender, became more relaxed when exposed to the smell if they were told that this would be the effect and those that were told that the lavender smell would stop them for relaxing showed a more unrelaxed agitated state. The group of participants who were not give the expectations of the essential oil smell measured between the group that was set the expectation of relaxation and the group that was set the expectation of the lavender smell would inhibit them from relaxing, this was the same result for when the placebo effect was applied, showing no real difference unless an expectation was set. This study is not comprehensive enough to conclusively negate all other lavender essential oil studies. It however proves that expectations can produce skew results. To ensure that you have a fair, well-constructed experiment which will produce valid results you must have a control group. You must be able to control the influence of expectation which many researchers have done (Moss, M et al. 2002; Xu, F et al. 2008; Glaser, R, L et al. 2007). Another study showed that the use of essential oils can have an effect on the physiological aspect of the participants. Some did not like the smell of lavender or rosemary and this then contradicted the results that have been found in other research. (McCaffrey,R, Thomas, D,J & Kinzelman, A 2009).

The olfactory system is very complex and is open to interpretation by the individual. This can skew results as an experiment cannot account for each individuals sense of smell. There is much debate about the use of essential oils within the medical profession however plants have been used throughout history to help with medical advances and many medicines these days derive from plants and the natural world. There are many treatments that have come from nature and it would be impossible for of us not to believe that there could be benefits from essential oils and plant extract therapy within psychological and physiological aspects of medicine. (Moss, M Et al. 2017). The fact that smell is individual should be incorporated in to the study,

as what may effect one person may not effect another in the same way. This has again point to individuality and the need to look at the learners as individuals and to determine what may help them in the best way possible, this is supported by Donaldson, G (2015) and his individualised curriculum due to be introduced in Wales in the near future.

Methodology and Research Design.

This section of the research project is to outline the methods used by the author when carrying out the initial research for this project. It will clarify the reasoning behind the method used and the practices used whilst carrying out the research.

In carrying out this research it was of utmost importance that the researcher ensures that the correct and appropriate ethical practices and methods were adhered to, particularly in the initial research that was carried out. The Bera guidelines (2018) state that the participants should be treated with respect, give their consent and have an opt out option available to them at any time. Assent was received by the parents or carers during this research. The parents / carers were issued with letters outlining the research that was to take place and if they gave their consent to their child to participate. (see appendix 1). Only children who had returned their letter took part in the research. This method of consent is recommended by Coady, M (2010). The United Nation Convention on Rights of a Child (1989) state that children should have a choice in what they take part in and that they have the right to

‘States Parties undertake to ensure the child such protection and care as is necessary for his or her well-being, taking into account the rights and duties of his or her parents, legal guardians, or other individuals legally responsible for him or her, and, to this end, shall take all appropriate legislative and administrative measures’.

The research has been anonymised in accordance with the university and BERA guidelines. (BERA, 2018; www.uwtsd.ac.uk). An ethics form has been completed and sent to the relevant people for authorisation prior to the research taking place which is in line with ERW professional code of conduct. (www.erw.wales) and the University research guidelines. (www.uwtsd.ac.uk). It is imperative that the researcher understands the ethical obligations during the research to protect all that participate throughout the research. (Rubin and Rubin,1995). It is argued by Homan (1992) once a letter of consent has been received then the ethical obligations are no

longer needed, however Walliam (2011) states that all participants should be treated with respect prior, during and after the research takes place. All data was kept on a password protected laptop and the participants were assured that the research gathered would not be published or shared to anyone as stated in the university guidelines (www.uwtsd.ac.uk). The participants were also assured that the data collected would be destroyed in July 2019.

In carrying out this research project it was decided that a group of children aged five – six were asked to take part in a smelling memory test. There would be ten items in a tray, a blue bucket, a white shell, yellow counter, bucket, grey toilet roll, orange lollypop stick, black cube, a straw, a green peg, a pink sponge and a red and green bean bag that the children would have five minutes to look at, touch, explain what they thought it was and say out loud the name of the object as many times as they wanted in those five minutes. One of the seven aromas, lavender, rosemary, lemon, bergamot, ylang, ylang, peppermint and sweet orange was present on cotton wool pads attached to straws that the children could smell if they wanted to or just smell the aroma from the cotton pad placed on the table. All six of the children decided to hold the cotton pad to their noses as they looked and discovered the items in the tray. The children would then be asked to leave and continue with their tasks within the classroom for fifteen minutes. The children were then asked to return after the fifteen minutes and recall the items they had seen earlier with the aroma present again. The first test was carried out without an aroma present in order for there to be a control and that a baseline could be set, which is essential when carrying out this type of research. (Moss et al. 2002; Xu et al. 2008; Glaser et al. 2007). The test was carried out in an empty classroom where the children had no distractions to help them concentrate on the task at hand. The children were explained to that they would be asked to smell different smells while looking at the ten objects placed in a tray. Questions were also asked to the children about themselves and their ability to play memory games prior to the test taking place and then what they felt the aroma smelt like, if they had smelt it before and if they liked it or not, see appendix 2.

The research conducted was one of data collection and a table of results were completed at each test and for each child. The children enjoyed having the smells in the classroom. It was requested to carry out a further investigation with regards to

peppermint and lavender refocusing the children after a lunch break, however this was not possible as not all parents gave their consent for the children to take part and in turn the aromas could not be diffused within the whole class. Having not carried out this investigation during the electives period shows that the author adhered to the research methods and ethical procedures recommended by BERA. (BERA, 2018). Having these restrictions meant that the author had limited access to participants which in turn gave a small sample group which then may not show the desired results or significant results to support the research carried out. This will be the main limitation to the research carried out.

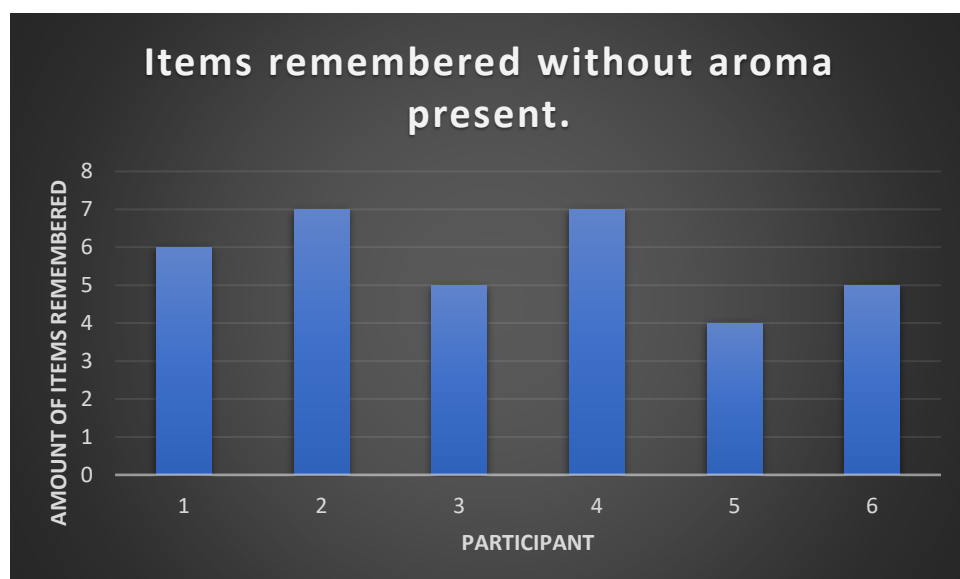
Results.

During this section of the research the results from the investigation carried out will be discussed and evaluated. It was important that the children understood what the author was investigating and that they felt comfortable for the author to conduct the investigation.

The first three days were spent getting to know the children and establishing with the help of the teaching staff which children would best suit the investigation. Ten children were identified of which six gave consent to participate in the investigation.

The following day the control was carried out and the results were as follows in figure 1.

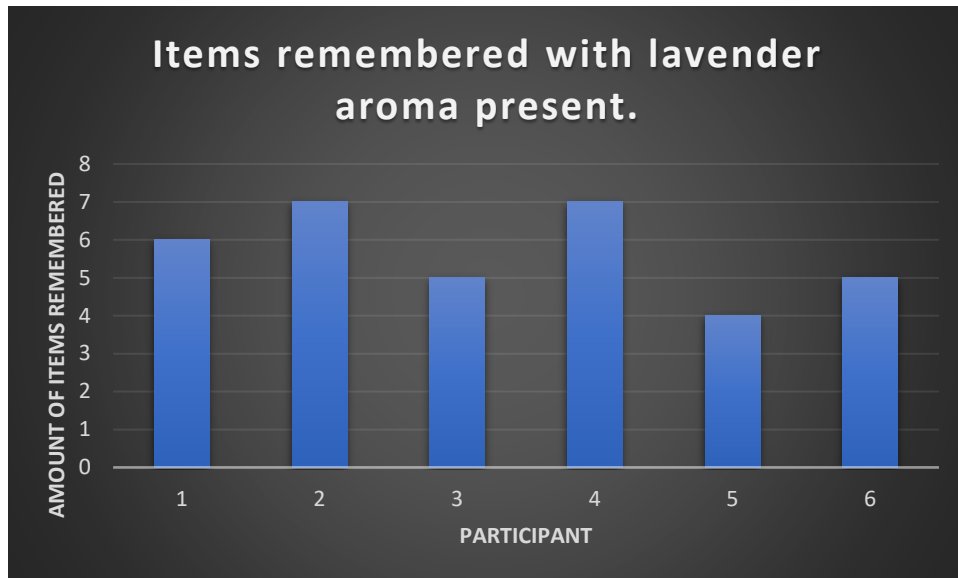
(fig 1).



This shows the baseline for each child which Burger, J,M and Cooper, HM (1980) suggest is the ideal to have conclusive, relevant result during an investigation. The mean of the items remembered in this was investigation was five.

The following day the children were exposed to the lavender smell whilst they looked at the items and the results were as followed in figure 2.

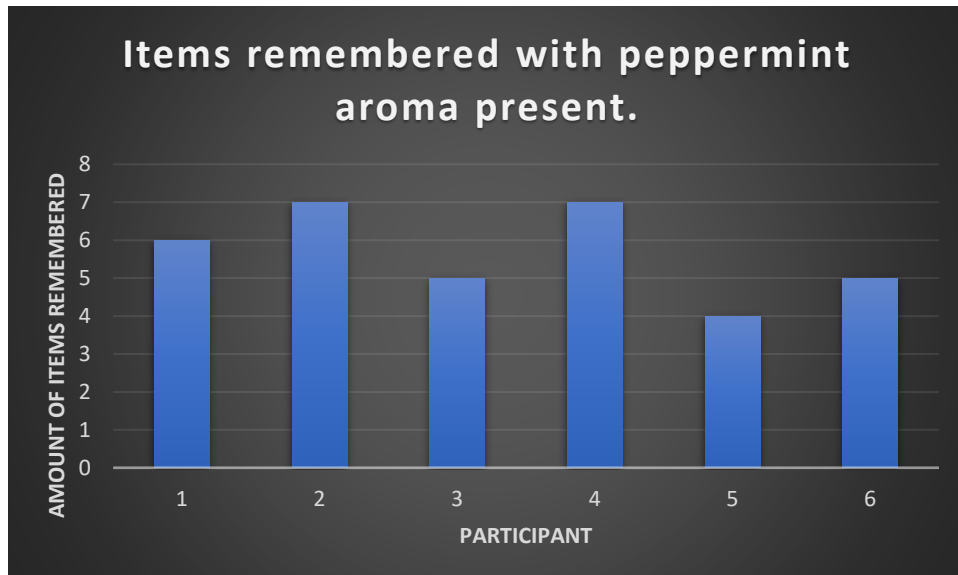
(fig 2)



The mean from the items remembered with the lavender aroma present was 5.5. This shows that lavender had an effect on the memory process and enabled the participants to increase the number of items that they remembered; however one participant showed a large decrease in the number of items that they could remember. Lavender is suggested to help memory through the destressing properties to be found in lavender. (Moss et al, 2010) It is also known to stabilise mood and relax your state of mind. (www.ajol.info).

The following day the aroma of peppermint was introduced. Peppermint has been used to help memory in dementia patients, however again this is more of a relaxing technique to enhance previous memories that may have been forgotten. (Gigliotti et al, 2004). The results showed as followed in figure 3.

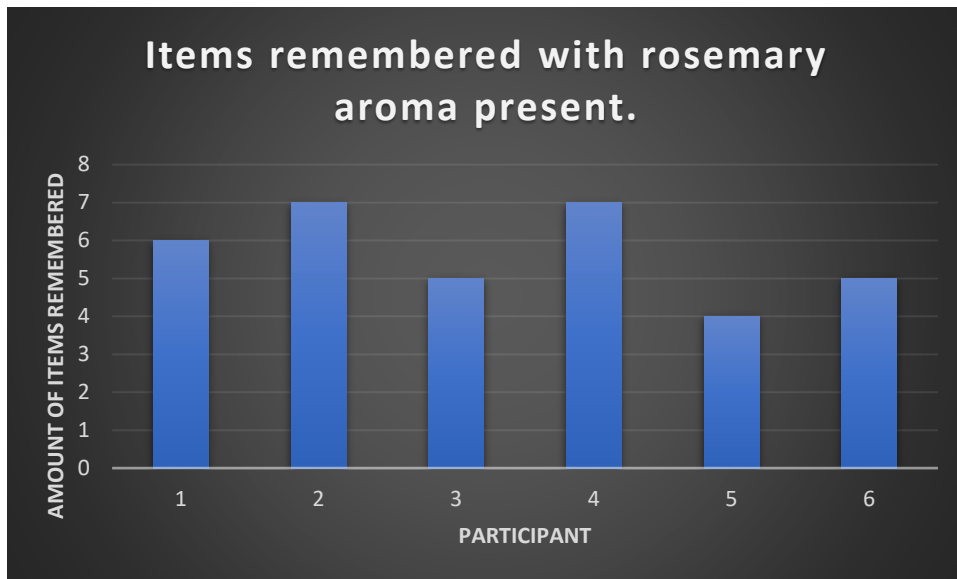
(Fig 3).



The mean results from this study showed 5.8 which was an increase from the lavender and the participants liked the aroma more than the lavender aroma. This shows that there may be some correlation between the use of essential oils and memory recall.

The next day the participants were exposed to rosemary. There have been extensive investigations carried out with rosemary that show an increase in cognition and memory recall. (Gathercole et al, 2001). The results for the exposure to the rosemary aroma were as followed in figure 4.

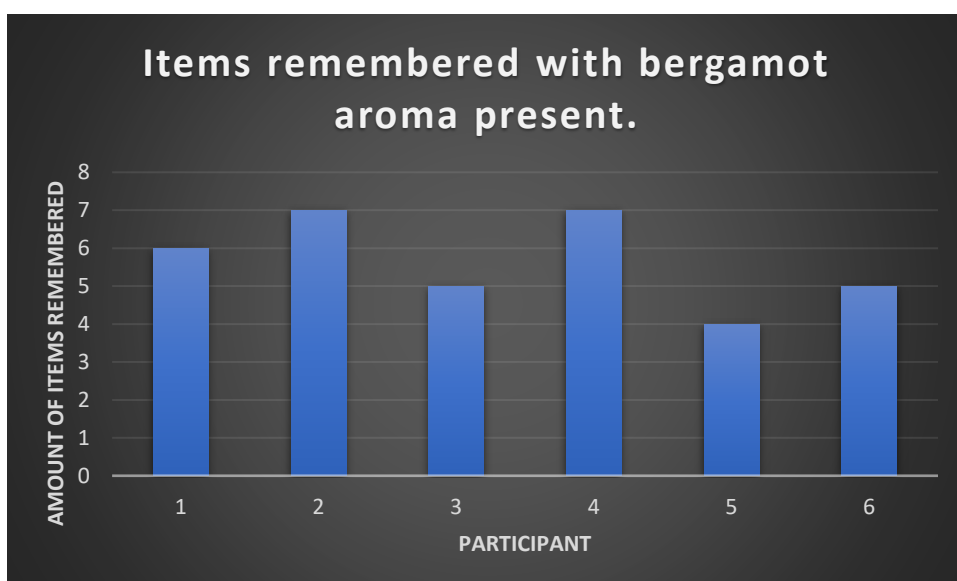
(Fig 4).



The mean of this investigation was 6.5 which shows a significant increase from the previous investigations. This is what was hoped to be found through this investigation. McCaffrey, Thomas & Kinzelman, (2009) found there to be significant increase in memory test when rosemary was present. They suggest that the aroma helped recall within an exam setting and attainment was greater compared to the participants that didn't have the aroma of rosemary present.

The following day the investigation was carried out using bergamot as an aroma. The participants did not like this smell and one said that it reminded them of bleach. The expectations were low for this aroma. The results were as followed in figure 5.

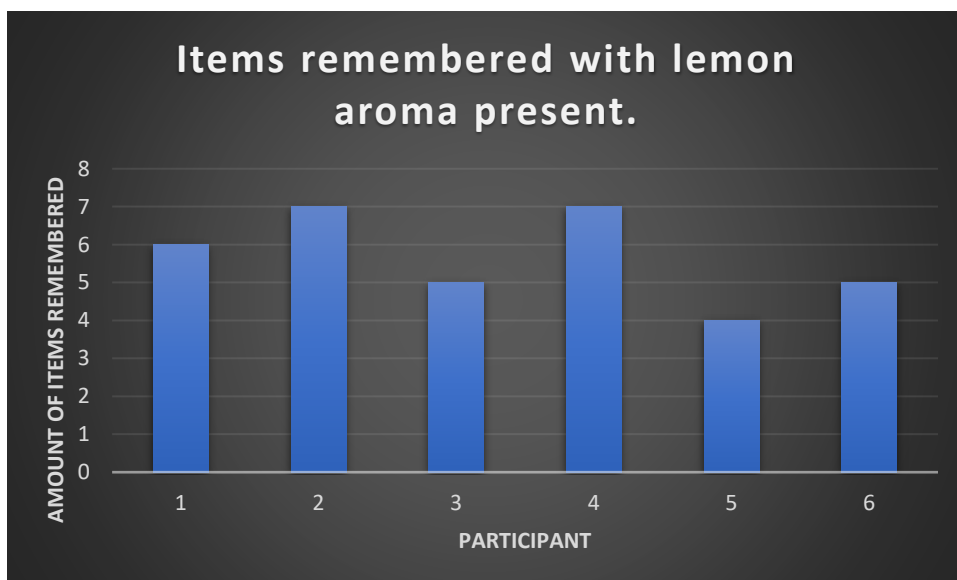
(Fig 5)



The mean from this investigation was 6 which was higher than expected. Bergamot is used with people who suffer from dementia and has proved to improve memory recall. (Price & Price, 2011).

The following day the aroma of lemon was introduced which again has said to have positive impacts on cognition and memory recall. (Price & Price, 2011). The participants liked the smell and were more interested in the aroma than the task at hand. Only four of the six participants took part in this investigation. The result were as follows in figure 6.

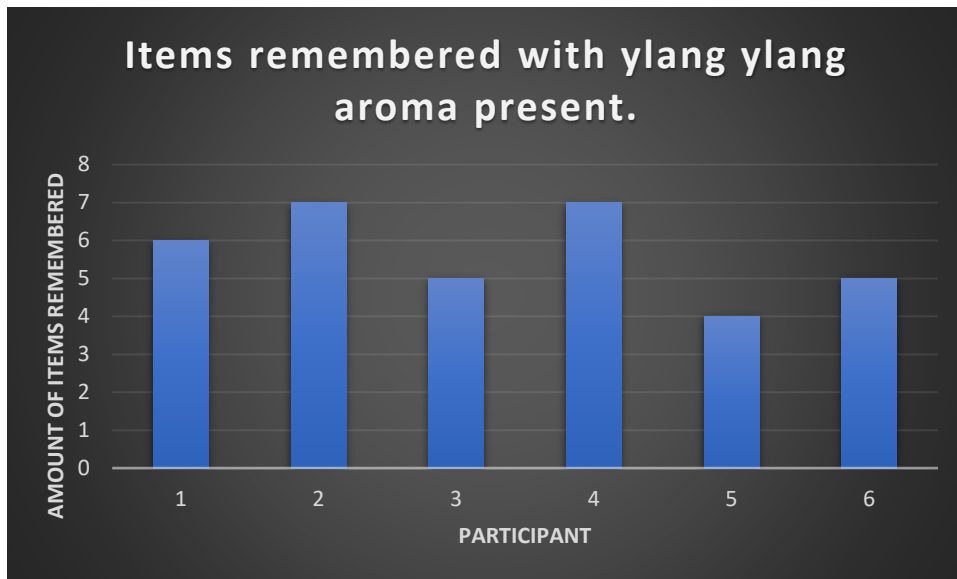
(Fig 6)



This shows that the mean for this investigation was 6.75. The highest of all the investigations. It is not surprising that the lemon aroma has been used in memory recall, relaxation and cognition tests. (Raskin Et al, 2002).

The next aroma that was introduced was the aroma of ylang ylang, again the participants did not like the aroma and only four of the six participants took part. The results are as follows in figure 7.

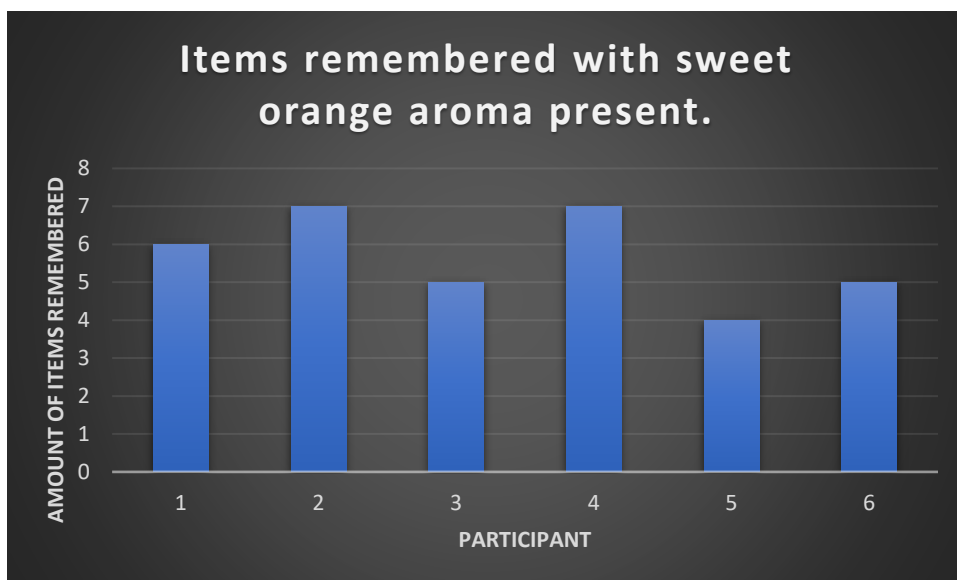
(Fig 7).



The mean for the results were 5 showing a significant decrease in the level of memory recall.

The last aroma to be introduced was sweet orange. The participants liked the aroma and all participants took part in this investigation. The results are as followed in figure 8.

(Fig8).



The mean results of this show 5.6 which indicates that sweet orange does not have a significant effect on the recall memory of the participants. There have been no know studies of this essential oil with regards to memory recall however there has been a slight improvement in the results.

It is important to remember that this is only a very small sample group, however the results show that there was an increase in memory recall with certain aromas such as rosemary, lemon and bergamot. All of these aromas have been used in studies with dementia. One study carried out by Moses Et Al 2017 also carried out some experiments with the use of these aromas and they found with a larger case study that they had significant improvement in memory recall test set out. The University of Massachusetts carried out a study with student from the university using the rosemary aroma and discovered that the student's productivity, cognition, memory and attainment were increased by 7%. This is something that should be investigated further to see what impact this could have on a child's attainment within the classroom.

Conclusion

During this investigation the author has concluded that although there is no conclusive proof that aroma in the classroom helps memory and therefore able to raise attainment it would be difficult to not think that the aroma cannot harm the children within a classroom and may have some benefits to the children's education. The author would be including this in their practices where possible in the future and investigate further as to how this may affect the attainment of the pupils within the classroom. There are many more tests and investigations into the use of essential oils to help with relaxation, cognition and memory recall and with further research it may be implemented in to practice within schools across the country. The results from this small group of children show that there are some improvements to the memory recall, there has been research carried out in adults and some children with regards to memory recall but more must be done to be able to introduce this conclusively into the classroom setting.

It is important to look at the whole child and looking at the results it shows that some children responded better to different smells. It may be possible to group the children through the aid of the smells and what best helps them. There is some evidence in the small group to suggest that this would be a way forward to raise the attainment within the class. If the author was to conduct the experiment again then it would be conducted with two whole classes to determine what essential oil would be most effective and to gain a more conclusive result.

There are many aspects of learning that have been discovered and the olfactory sense has been overlooked. We ensure that children who learn kinaesthetically, visually, orally or through listening have the opportunity to do so however the sense of smell has not been considered. Donaldson (2015) has recommended that we look at the child as a whole and to teach them as individuals, this would be a way to help some of the children move forward with their learning who find the essential oil smell helpful and that it has a positive impact on their school life. Research is always moving forward and new areas of education are being discovered daily. This will enable pupils to be cared for as individuals and may be more inclusive as aromas have been used to help autistic children, children with ADHD and down syndrome. If these children can be helped with the distress of being in school through the use of essential oil aroma then this could only be positive for the whole class.

In the future the author hopes to incorporate this field of study into their professional life ensuring that the pupils that are taught have all aspects of their being considered. The pupils' well-being and emotional state have a great impact on the child's learning and if the scent of an essential oil can aid the child in anyway then the author will look to accommodate the child and adapt the teaching techniques appropriately.

The author hopes to continue this line of investigation during their professional career and bring it to the forefront in order for it to be considered nationwide. This has been an eye-opening experience and one that is hoped to be developed over the coming years.

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