The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 14, Issue 1, January- March, 2026
DIP: 18.01.165.20261401, DOI: 10.25215/1401.165
https://www.ijip.in

Research Paper

Exploring The Impact of Pleasant and Unpleasant Odour on Executive Functioning and State and General Anger Across Genders in Kolkata

Tiyas Bhattacharya[1]*, Dr. Sweta Sah[2]

ABSTRACT

The research explored the impact of pleasant and unpleasant odours on executive function and state and general anger across genders in Kolkata. The study employed an experimental pre-test and post-test control group design, with 60 individuals (30 male and 30 female) aged 18-25 years from Kolkata. Two conditions were presented to the participant's: control condition which consisted of no smell and experimental condition which consisted of one bad smell (turpentine) and one good smell (citrus). The Stroop Effect Test measured executive functioning, while the STAXI-2 assessed state and general anger. Statistical analysis, including Descriptive Statistics, Shapiro-Wilk Test for Normality, Kruskal-Wallis, and Mann-Whitney U tests, was performed using Statistical Package for Social Sciences – 26 (SPSS – 26). Females consistently had higher mean values for state and general anger, regardless of condition. Males showed greater impairment in executive function when exposed to unpleasant odours. Exposure to pleasant odours improved executive functioning in males, but increased anger ratings in females.

Keywords: *Olfaction, Pleasant smell, Unpleasant smell, Executive functions, Anger, State Anger, Trait Anger*

The chemical perception of gaseous scents is called olfaction, sometimes referred to as the capacity to smell. The olfactory nerve, nasal tissues, neurotransmitters, and the cerebral cortex are all involved in the intricate chemosensory process. It is essential for emotional memory recall, social cue recognition, danger detection, and survival. The olfactory bulb receives signals from odorant molecules that bind to receptor proteins on cilia in the olfactory epithelium. This mechanism uses the trigeminal nerve to sense irritation. Age, genetic problems, neurological conditions, medications, pollution, and abnormalities of the nose can all impede olfactory function. Because certain fragrances can be perceived in tiny amounts, perception does not always imply a substance's danger.

The range of cognitive processes that regulate and keep an eye on particular cognitive abilities and actions is referred to as executive functions. The three primary executive functions of working memory, cognitive flexibility, and inhibitory control are widely

[1]Independent Researcher
[2]Assistant Professor, Department of Psychology, Sister Nivedita University, Kolkata, India
*Corresponding Author

Received: November 01, 2025; Revision Received: March 17, 2026; Accepted: March 21, 2026

acknowledged. Higher-order EFs like planning, reasoning, and problem-solving are developed from these. Theorists such as Adele Diamond, Miyake Akira, and Naomi Friedman have expanded on these processes, emphasising their importance in both child development and daily functioning.

Anger is a common, complex emotion that can be connected to health and illness, as well as the likelihood of harm. It can be divided into two categories: state anger, which is an outpouring of rage that occurs at a specific time, and trait anger, which is a characteristic of personality. Neurological, genetic, psychological, and social factors can influence its physiological, cognitive, and behavioural aspects. Anger can be useful for adaptive purposes like self-defence, but excessive or poorly controlled anger has been linked to violence and dysfunction, therefore it needs to be carefully studied and controlled.

Objectives

- To assess the impact of pleasant and unpleasant odours on executive function in young adults.
- To assess the impact of pleasant and unpleasant odours on state and general anger in young adults.
- To assess the difference of pleasant and unpleasant odours on executive functioning in male and female young adults.
- To assess the difference of pleasant and unpleasant odours on anger in male and female young adults.

LITERATURE REVIEW

According to researchers Dana Sisdikarini, Endah Sulistiawati, and Dhias Cahya (August 2024), turpentine oil, often known as spirits of turpentine, is a white liquid with a strong, pungent scent that evaporates rapidly. It is created by distilling highly flammable pine sap. Turpentine oil ranges from 10 to 17.5% in pine resin, with new sap producing a higher percentage.

Citrus essential oil has long been utilised in aromatherapy as a therapeutic strategy, according to researchers like Pooja Agarwal et al. (November, 2022). Citrus essential oils are aromatic volatile molecules that alter blood flow or haemodynamic parameters when inhaled. They do this via controlling circulation via the autonomic nervous system. Orange and bitter orange are among the many citrus essential oils that have been shown to provide sedative, analgesic, depressive, anticonvulsant, and anxiolytic effects. They also affect emotional conduct in general.

Researchers Sandra A. Wiebe & Julia Karbach noted that executive functioning is a group of higher-order cognitive processes involved in controlling thoughts, behaviours, and attention. Executive functioning is intimately associated with the prefrontal cortex, a top-down control region that "is critical in situations where the mappings between sensory inputs, thoughts, and actions either are rapidly changing or are weakly established relative to other existing ones." A wide range of activities, including response inhibition, working memory updating, attention shifting, goal monitoring, and action planning, are included in the numerous models of Executive functioning that have been put forth. Over the course of life, the structure of Executive functioning varies, growing increasingly complex during childhood and adolescence and then decreasing in late age.

Researchers Vasudeva Murthy Challakere Ramaswamy and Peter William Schofield discovered that there are several objective tests for olfaction that may be used to evaluate olfaction. The most obvious application is to detect smell alterations reported or suspected by patients. The body of research on the association between olfactory anomalies and certain neuropsychiatric diseases is growing rapidly, and the use of olfactory testing to enhance traditional evaluations in clinical and research settings is evolving. Many of the brain networks involved in executive functioning, which are mostly located in the frontal lobes, have significant similarities to those involved in olfactory processing and cognitive abilities. Sima Noohi et al. identified emotions as a social-phenomena that is biological, goal-oriented, and subjective. Innate occurrences occur in different people under identical settings, are rarely altered by cultural or educational backgrounds, and cause distinct physiological reactions. Angry feelings are some of the most basic human emotions. Anger can range from minor irritation to full-blown outbursts. Nonetheless, it is considered a typical occurrence that reflects human emotions, hygiene, and mental wellness. Anger-related physiological changes can negatively impact both mental and physical health, making decision-making difficult.

Researcher Smiljana Mutic et al (January,2016) noted that a high survival benefit is the capacity to identify conspecifics that could pose a threat to an individual. Humans use all sensory modalities, including the chemosensory systems, to convey information that is relevant to social interactions. In study 1, we investigated if a stranger's body scent can indicate hostility when they want to cause harm. During an ergometer session (exercise chemosignal) and a boxing session with aggressive techniques (aggression chemosignal), 16 healthy male participants provided their body odour samples. Aggression induction resulted in increased self-reports of anger, aggression-related physical activity, and motivation to injure. In study 2, we looked at whether chemosignal recipients perceived emotional reciprocity (fear) or contagion (fury). In a double-blind study, 22 healthy adults were randomly exposed to aggression and exercise chemosignals in order to assess affective/cognitive processing (for example, emotion identification task, emotional stroop test). Behavioural findings indicate that users of strong chemosignals have anxiety-like affective and cognitive reactions. The study looks into how emotional reciprocity mechanisms transfer motivational and affective information to humans through chemosensory signals.

METHODS

Research Design

The study employs an experimental pre-test and post-test control group design to investigate the effects of pleasant and unpleasant odours on executive performance and anger in both genders. Participants were separated into two groups: Control Group: No smell exposure (neutral condition). The experimental group was exposed to bad odour first, followed by good odour.

Hypotheses

- H0: There is no significant impact of pleasant and unpleasant odour on executive function in young adults
  H1: There is a significant impact of pleasant and unpleasant odour on executive function in young adults
- H0: There is no significant impact of pleasant and unpleasant odour on state and general anger in young adults.

H1: There is a significant impact of pleasant and unpleasant odour on state and general anger in young adults.

- H0: There is no significant difference of pleasant and unpleasant odour on the male and female in terms of executive functioning.
  H1: There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of executive functioning.
- H0: There is no significant difference of pleasant and unpleasant odour on the male and female gender in terms of state and general anger.
  H1: There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of state and general anger.

Sample

The sample size includes 30 female and 30 male individuals aged 18 to 25 who live in Kolkata. This study utilised simple random sampling, which is a table of random numbers.

Tools of Research:

- **General Health Questionnaire:** The GHQ-28 was developed by Goldberg and Hillier in 1979 is self-report screening measure used to detect possible psychological disorder.
- **Stroop Effect:** John Ridley Stroop, an American psychologist, created and published the Stroop Effect Test (1935). The stroop effect demonstrates cognitive inhibition and the idea of parallel processing.
- **State -Trait Anger Expression Inventory– 2 (STAXI -2):** The 57-item Staxi-2 developed by Spielberger, 1996 is a self-report instrument designed to evaluate anger in a psychological context, and to measure how the multiple dimensions of anger affect physical health

DATA ANALYSIS: Quantitative data was evaluated using descriptive statistics, including the Kruskal-Wallis, and Mann-Whitney U test.

Table 1: Descriptive Statistics

Odour Condition	Variables	Male (N=30)			Female (N=30)		
No Odour		Mean	S.D	Skewness	Mean	S.D	Skewness
	State - Anger	18.967	5.075	1.964	20.200	6.830	1.920
	General - Anger	34.000	11.723	0.575	36.733	9.184	0.611
	Congruence	0.000	0.000	0.000	0.000	0.000	0.000
	Incongruence	1.033	1.159	1.070	1.667	1.626	0.892
Bad Odour	State -Anger	18.300	4.684	1.727	19.367	6.289	1.778
	General -Anger	34.733	11.700	0.003	35.667	10.62	0.356
	Congruence	0.000	0.000	0.000	0.000	0.000	0.000
	Incongruence	1.933	0.718	0.718	1.426	1.426	1.164
Good Odour	State- Anger	17.600	3.359	1.806	18.667	5.333	1.555
	General -Anger	32.500	10.258	0.294	38.367	10.88	0.525
	Congruence	0.000	0.000	0.000	0.000	0.000	0.000
	Incongruence	0.767	0.728	0.396	1.367	1.189	0.538

Table 2: Kruskal Wallis

Variables	Condition	Mean Rank	Statistic	Significance
State -Anger	No Odour	98.07	2.216	0.330
	Bad Odour	88.78		
	Good Odour	84.66		
General- Anger	No Odour	90.73	0.004	0.998
	Bad Odour	90.16		
	Good Odour	90.61		
Congruence	No Odour	90.50	0.000	1.000
	Bad Odour	90.50		
	Good Odour	90.50		
Incongruence	No Odour	85.02	11.034	0.004**
	Bad Odour	107.68		
	Good Odour	78.81		

The 'no odour' condition had a higher mean rank for state anger (98.07) and general anger (90.73), indicating that scent conditions did not significantly impact participants' anger levels. The scent condition had no significant impact on congruence, since all three means ranked similarly.

Table 3.1: Mann Whitney [No Odour]

Variables	Gender	Mean Rank	Statistic	Significance
State -Anger	Male	30.08	437.500	0.851
	Female	30.92		
Trait- Anger	Male	24.68	275.500	0.10
	Female	36.32		
General - Anger	Male	28.37	386.000	0.344
	Female	32.63		
Congruence	Male	30.50	450.000	1.000
	Female	30.50		
Incongruence	Male	27.20	351.000	0.127
	Female	33.80		

Table 3.2: Mann Whitney [Bad Odour]

Variables	Gender	Mean Rank	Statistic	Significance
State Anger	Male	30.12	438.500	0.860
	Female	30.88		
Trait Anger	Male	24.97	284.000	0.014**
	Female	36.03		
General - Anger	Male	30.02	435.500	0.830
	Female	30.98		
Congruence	Male	30.50	450.000	1.000
	Female	30.50		
Incongruence	Male	33.33	365.000	0.188
	Female	27.67		

Values indicate that exposure to a bad odour may influence anger more prominently in females compared to males, while other variables remain unaffected.

Table 3.3: Mann Whitney [Good Odour]

Variables	Gender	Mean Rank	Statistic	Significance
State - Anger	Male	31.23	428.000	0.734
	Female	29.77		
Trait - Anger	Male	23.73	247.000	0.003**
	Female	37.27		
General - Anger	Male	25.97	314.000	0.044*
	Female	35.03		
Congruence	Male	35.50	450.000	1.000
	Female	35.50		
Incongruence	Male	26.22	321.500	0.046*
	Female	34.78		

Females had a significantly higher mean rank in incongruence (34.78) compared to males (M = 26.22), with a significant value of 0.046.

DISCUSSION

According to the Stroop effect scores in the incongruence variable, one of the main conclusions of the study was that odour, particularly unpleasant odour, had a statistically significant impact on executive functioning. Participants exposed to the unpleasant odour (turpentine) showed noticeably higher incongruence scores on the Kruskal-Wallis test ($p = 0.004$), indicating slower executive functioning and impaired cognitive control. According to previous research, unpleasant olfactory stimuli can function as environmental stressors that impair cognitive functions like inhibition and attention (Matthias Hoenen et al., 2020; Ana Fagundo, 2023).

The Kruskal-Wallis test did not show a significant correlation between olfactory conditions and rage levels. This contradicts prior research by Robert A. Baron (2010), who discovered that scents can alter violent conduct. The current study's olfactory exposure may vary in strength and duration. Exposure to an unpleasant odour may have a greater impact on anger in females, but it may not be sufficient to elicit behaviour.

Females had higher anger levels and were more emotionally affected by both types of odours across all situations, whereas males shown greater variability in cognitive performance. The Mann-Whitney U test revealed that males performed better on executive function tasks when the scent was pleasant, but females had more cognitive interference (incongruence scores) ($p = 0.046$). This could be due to gender differences in coping techniques and emotional processing patterns. Research suggests that gender differences may be influenced by hormonal, neurological, and psychological factors (Smiljana Mutic et al., 2016; Sarah Holley et al., 2017).

CONCLUSION

The study confirms that, with subtle differences between genders, olfactory stimuli can modulate aspects of emotional reactivity and cognitive performance. These results underline the potential of olfactory interventions in managing cognitive-emotional outcomes in everyday and clinical settings, and they add to the increasing body of evidence that links sensory perception with executive control and emotional regulation.

Limitations

Small sample size, time constraint, geographic restriction, age restriction, non-inclusion of non-binary individuals, no physiological measurements, insufficient long term monitoring.

Applicability

- Helpful in creating aromatherapy treatments meant to manage anger or enhance executive functioning.
- Can use fragrance to direct the design of environments (such as therapy rooms and classrooms) to enhance cognitive function.
- Provides a foundation for studies on olfactory responses based on gender, encouraging investigation of neurobiological variations.
- Promotes more research that combines psychological testing and physiological data to confirm the effects of odour.
- Draws attention to how cognition and sensory perception interact, which can help guide cognitive neuroscience.

REFERENCES

Aćimović, M. & Department of Vegetable and Alternative Crops, Institute of Field and Vegetable Crops Novi Sad. (2021). Essential Oils: Inhalation Aromatherapy – A comprehensive review. In Journal of Agronomy, Technology and Engineering Management (Vols. 4–2, pp. 547–557).

Agarwal, P., Sebghatollahi, Z., Kamal, M., Dhyani, A., Shrivastava, A., Singh, K. K.,Sinha, M., Mahato, N., Mishra, A. K., & Baek, K. (2022). Citrus essential oils in aromatherapy: therapeutic effects and mechanisms. Antioxidants, 11(12), 2374.

Anderson AK, Christoff K, Stappen I, Panitz D, Ghahremani DG, Glover G, Gabrieli JD, Sobel N. Dissociated neural representations of intensity and valence in human olfaction. Nat Neurosci. 2003 Feb;6(2):196-202. doi: 10.1038/nn1001. PMID: 1253 6208.

Ardila, A. (2008). On the evolutionary origins of executive functions. Brain and Cognition, 68(1), 92–99.

Averill, J. R. (1982). Anger and aggression: An essay on emotion. New York, NY: Spriner-Verlag

Baron, R. A. (1980). Olfaction and human social behavior: Effects of pleasant scents on physical aggression. Basic and Applied Social Psychology, 1(2), 163–172.

Berkowitz, L., & Harmon-Jones, E. (2004). Toward an understanding of the determinants of anger. Emotion, 4(2), 107-130. doi:10.1037/1528-3542.4.2.107

Cain WS. To know with the nose: keys to odor identification. Science. 1979 Feb 2;203(4379):467-70. doi: 10.1126/science.760202. PMID: 760202.

Carver, C. S., & Harmon-Jones, E. (2009). Anger is an approach-related affect: Evidence and implications. Psychological Bulletin, 135(2), 183-204. doi:10.1037/a0013965

Casey, B. J., Tottenham, N., Liston, C., & Durston, S. (2005). Imaging the developing brain: What have we learned about cognitive development? Trends in Cognitive Sciences, 9, 104–110.

Acknowledgment
The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest
The author(s) declared no conflict of interest.

How to cite this article: Bhattacharya, T. & Sah, S. (2026). Exploring The Impact of Pleasant and Unpleasant Odour on Executive Functioning and State and General Anger Across Genders in Kolkata. *International Journal of Indian Psychology*, *14*(1), 1651-1658. DIP:18.01.165.20261401, DOI:10.25215/1401.165