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Insight Into the Effect of Dried Ginger-Coriander Drink on the Neurological Behaviour of Consumer Decision Making in Retail Environment

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Abstract: *Retail settings are often known to subject consumers to cognitive overburden and mental exhaustion, and therefore produce a negative effect on mood, the allocation of attention, and decision-making. In light of the present-day neuromarketing and food neuroscience, beverages naturally prepared and supplemented with bioactive phytochemicals can be used to influence psychophysiological processes which can be associated with emotional balance, cognitive alertness and stress reduction. According to this school of thought, these nutritive interventions may promote a more balanced affective states in shoppers, which may result in a better quality of their retail experience and the soundness of their buying decisions. To test this hypothesis empirically, the current study investigated the psychological and behavioural effects of a traditionally made drink of Dried Ginger-Coriander on the affective state and decision-making behaviour of consumers in a realistic retail environment. The quantitative experimental approach was used, and 300 consumers who consumed the Dried Ginger-Coriander drink during the shopping process served as the study sample. The subjects' self-reported responses regarding mood, alertness, mental concentration, stress alleviation, interest in the shopping environment, and purchase intention were recorded on a five-point Likert scale. The statistical analysis was performed with the help of SPSS, and the descriptive statistics and one-way Analysis of Variance (ANOVA) were used to verify the proposed hypotheses. The findings showed statistically significant improvements in those who drank the beverage and included improvements in the perceived energy, alertness, and clarity of mind, as well as a decrease in stress and enjoyment of the shopping experience ($p < 0.05$). The behavioural outcomes also revealed increased product interest, an increased length of time spent at the store and a greater purchase intention. The combination of these results shows that Dried Ginger -Coriander drink has a positive effect on the cognitive states and consumer decision-making behaviour, which confirms its potential as an ethical, natural intervention to promote consumer well-being and enhance deeper engagement in retail settings.*

Keywords: *neurochemical modulation; mood enhancement; bioactive components; cognitive alertness; neuromarketing; dried ginger-coriander drink; affective neuromodulators.*

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1. Introduction

Modern shopping situations are often accompanied by high levels of sensory stimulation and saturation of information, which often results in cognitive overload and consequently, in fatigue, and a consequent undermining of the attention, affective tone, and decisional judgement of consumers (Murphy et al., 2008). In the emerging interdisciplinary spheres of neuromarketing and food neuroscience, researchers are now posing questions about the possibility of functional and natural beverages to manipulate neurochemical mechanisms underlying emotional control and cognitive effectiveness (Zoubiri et al., 2010). Interestingly, bioactive substances found in the conventional dietary sources have been proven to regulate important neuromodulators, which are associated with stress reduction, alertness, and emotional balance (Gómez-Pinilla, 2008). It is in this context that traditional refreshment beverages made with phytochemical-rich spices (such as the dried ginger and coriander drink) provide an interesting, ethically appropriate intervention to increase consumer health and interest (Fernstrom, 2013). In this regard, this research question aims at clarifying the neuropharmacological and behavioural implications of a ginger-coriander-based refreshment drink on the affective responses of consumers, shopping experiences, and purchasing behaviour in a real-world retailing environment (Jacka et al., 2017).

Research shows that flavonoids, amino acids, vitamins, and herbal extracts are some of the ingredients that may stimulate the production and release of neurotransmitters and improve mood, motivation, and cognitive performance (Sharma et al., 2021). As an example, the polyphenol-containing beverages are associated with dopamine production, whereas the elevation of serotonin levels may be caused by the presence of tryptophan-and B-vitamin-rich ingredients in the raphe nuclei (Westfall & Pasinetti, 2019). These biochemical reactions have attracted research interest in neurocognitive and consumer behaviour research because positive emotional states are reported to influence the decision-making processes and increase participation in the retail environment. The research on neuromarketing also helps substantiate the statement that mood-enhancing stimuli can have a powerful effect on forming consumer preference, attention, and purchase intent (Alsharif et al., 2021).

Therefore, the knowledge of the stimulating nature of refreshing beverages on the release of mood-regulating neurochemicals offers significant insights into the psychological mechanisms involved during consumption processes. The empirical data can be used to prove that flavonoid-enriched drinks can create quick and quantifiable impacts on cognitive function. Orange juice rich in flavonoids has been demonstrated to have a considerable positive effect on psychomotor speed, executive functioning and subjective alertness in middle-aged adults immediately post-administration (Alharbi et al., 2016). The same results were reported in the works conducted on blueberry beverages, in which the children and young adults were found to have better positive affect and better cognitive performance after the flavonoid drink intake (Khalid et al., 2017). These are then reinforced in long-term supplementation, a controlled trial showed that an increase in flavonoids was correlated with an increase in serum BDNF levels and global cognitive functioning (Karabay et al., 2018).

An extensive meta-analysis of flavonoid interventions also confirmed considerable general improvements in cognitive performance across various age groups (Cheng et al., 2022). Bioactive compounds not only affect cognition, but also affect emotional and psychological well-being. A systematic review of 38 experimental articles found that flavonoid supplementation is consistently reliable in improving mood and decreasing negative affect in healthy people (Colombage et al., 2025). According to mechanistic research, these mood benefits are explained by the inhibition of neuroinflammation, enhancement of nitric-oxide-mediated cerebral blood flow, and dopaminergic and serotonergic pathways (Spencer, 2009). A more recent randomised crossover trial, in which a blackcurrant-based drink was utilised, showed positive changes in mood, sleep quality, stress measures, and tryptophan metabolites related to the gut-brain axis (Watson et al., 2015).

The overall results of these findings point to the biochemical potential of refreshment beverages to mediate neurochemical mechanisms of happiness and emotional stability. The knowledge of these effects is especially important within the area of consumer psychology and neuromarketing, where affective states are established to influence the formation of attention, preferences, and purchase behaviour (Pluta-Olearnik & Szulga, 2022). Positively affecting refreshment beverages can thus have a role not only in mental health support but also the consumer decision-making in the actual retail setting (Dugasani et al., 2010). Considering the accumulating data that links beverage-based bioactive compounds to neurotransmitter improvement with better emotional well-being, the study of the way in which a refreshment drink triggers the release and functional effect of key neurotransmitters is a promising research gap (Ali et al., 2008).

These findings have value in health science as well as in consumer-behaviour studies, as they can serve as a biochemical foundation of the effects of daily food intake on mood, cognition, and decision-making (Linck et al., 2009). The stress in daily life and constant multitasking, as well as the growing pressure on the brain in connection with the mental processes, burden the human brain significantly, which frequently interferes with the mood, concentration, and ability to make decisions (Mao et al., 2019). These stressors build up eventually leading to the imbalance of the major neurochemical systems- mainly the dopamine, serotonin and GABA systems, which necessitate effective brain refreshment. Brain refreshment is the process of regaining mental clarity, emotional stability, and cognitive power by biochemical or sensory stimulation (Nutt, 2008). It is important to know how the particular refreshment activators, like beverages or other sensory stimuli, trigger these neural circuits. In this study, I will establish the basis of the discussion on the effects of refreshment triggers on brain Neurological behaviour (Naoi et al., 2017).

1.1. Research Gap

The current knowledge in the interplay of food neuroscience and consumer behaviour has shown that bioactive compound-fortified functional beverages have the capacity to adjust mood, cognition, and emotional control. However, the majority of previous studies have been restricted to controlled laboratory or clinical environments, and have mostly focused on the sole outcomes (nutritional, physiological, or cognitive). As a result, little has been done in the context of the interpretation of the workings of these neuroactive beverages in real retail settings, where consumers do experience cognitive overload, increased sensory stimuli and time limit. Along with this, the current literature on neuromarketing would rather dwell on the synthetic stimulants or the conspicuously designed energy beverages, thus creating a conspicuous gap on the neurological and behavioural implications of the traditionally prepared, culturally ingrained herbal drinks in the shopping experience.

Furthermore, the literature that remains often relies heavily on biochemical demarcations or self-reporting, without sufficient translation to neurochemical processes in quantifiable consumer behaviours, which could be engagement, dwell time or purchase decision-making. In this respect therefore, an integrative literature that simultaneously examines affective states, neurological reaction and purchasing behaviour in a harmonised empirical context is still lacking. Specifically, empirical help to answer the question of whether or not the neurobehavioural effects of the traditional Dried Ginger -coriander drinks, despite their reported phytochemical composition and relaxation properties, can be interrogated as a factor of consumer decision-making, is lacking. The current investigation aims to fill this gap by investigating the effects of the consumption of a traditional natural beverage in the determination of mood, alertness, and shopping interest within a realistic shopping environment, and will establish a union between food neuroscience, neuromarketing, and consumer behaviour studies.

2. Methodology

The research methodology, which was employed in this investigation, involved the systematic collection of empirical evidence of consumers who consumed Dried Ginger-Coriander beverages during their daily shopping habits. The study used a purposive sampling approach involving consumers who had consumed the energy drink. No control or comparison group was included. A carefully designed questionnaire was used to draw out information about the affective states, attentional alertness and attendant shopping behaviours. The responses were measured using a five-point Likert scale, and then analysed statistically using the Statistical Package of the Social Sciences (SPSS). The inferential statistics, especially Analysis of Variance (ANOVA), were employed to determine the statistical significance of patterns observed. The overall flow of procedures is briefly summarised in the methodology flow chart that is attached.

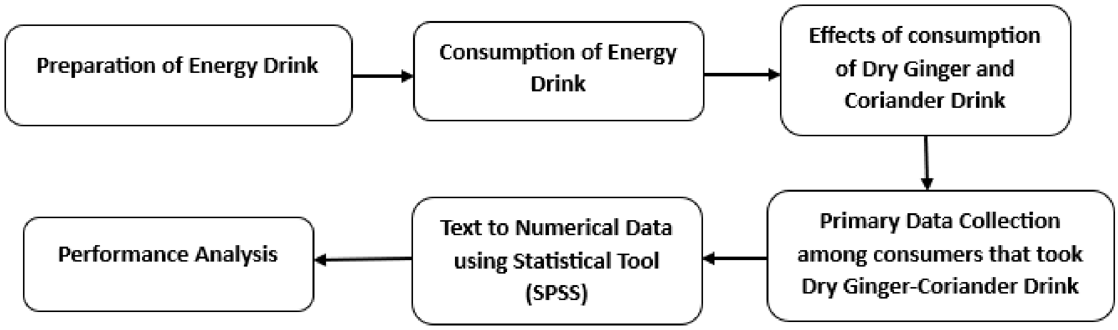


Figure 1. Proposed Methodology of Neurological Behaviour in Customer Decision Making

This study was informed by a quantitative, experimental design that sought to understand the neurobehavioral and consumer decision-making implications that were created by a conventionally structured Dried Ginger -Coriander effusiveness in a retail context. The drink was made following standardised artisanal guidelines to avoid bioactive phytochemical loss. The primary data were collected through the volunteering of people who consumed the drink during their shopping experiences. A questionnaire based on a Likert scale was a structured questionnaire that inquired about aspects including perceived mood elevation, alertness, cognitive focus, stress attenuation, shopping immersion, and purchase propensity. Frequencies were coded and processed using SPSS; descriptive statistics provided the demographics of the respondents, and inferential one-way ANOVA was used to test the hypothesised postulates with a 5 per cent level of significance. The methodology scaffold allowed giving a rigorous evaluation of the neural and behavioural effects of the beverage in a real-life retail setting.

To improve the internal validity, the proposed revised study design involves the incorporation of a control group which consists of the participants who are not using the dried ginger-coriander drink. This will allow this group to be exposed to the same conditions of retailing without the beverage intervention, hence allowing clear attribution of the observed neurological and behavioural effects to the drink. Besides the main experimental group, several comparison cohorts are suggested, including a placebo drink group (sensory-matched but bioactive-free), a water consumption group and an alternative herbal drink group (non-ginger-coriander formulation). The multi-arm design will enable the separation of the effects of psychological expectancy, hydration effects, and the effects of particular phytochemicals. The participants will be chosen randomly into the experimental, placebo, water or alternative herbal drink group. Randomisation minimises selection bias and balances the groups on mood, stress levels and shopping behaviour at baseline. In order to complement the information provided by the self-reported questionnaires data, objective physiological indicators are suggested. The measures of attentional engagement and cognitive alertness during shopping will be measured by electroencephalography (EEG); autonomic nervous system stability and regulation of stress levels will be measured by heart rate variability (HRV); salivary cortisol will be used to determine the level of physiological stress response prior to and after the consumption of the beverage. These procedures allow trying to validate the hypothesised neurochemical processes in the paper directly. The actual consumer behaviour will be registered objectively by means of: RFID tracking of movement patterns and dwell time; in-store cameras of engagement and product interaction; point-of-sale (Pos) data purchase behaviour and impulse buying. This strategy reinforces behavioural evidence to surpass the self-reported engagement scales. The updated design requires that the prepared drink should be chemically validated in laboratories, as opposed to the estimated phytochemical values used. Volatile compounds that lead to aroma-induced neurological effects, including linalool, zingiberene, and other terpenoids, will be identified and quantified using gas chromatography -mass spectrometry (GC -MS); non-volatile phenolic compounds such as 6-gingerol and 6-shogaol will be measured by using high-performance liquid chromatography (HPLC) to ensure that phytochemical profiling is done with precision. The revised version of the manuscript will provide experimental values of the concentration (mg/100 ml) of all the significant bioactive compounds, as opposed to the estimated values of transfer. This enhances reproducibility, scientific transparency and biochemical credibility. The suggested methodological improvements contribute to the scientific strength of the study greatly, as the combination of the controlled experimental design, objective neurophysiological indicators, real-world behavioural analytics, and validated chemical profiling is achieved. These upgrades are a continuation of subjective consumer neuroscience into objective biological and behavioural data.

3. Preparation of Dried Ginger-Coriander Drink:

Base Ingredients (For - 1 Kg Finished Mix):
Coriander seeds – 500g
Dry ginger – 120g
Black pepper – 80g
Cumin seeds – 150g
Palm sugar – 150g

3.1. Formula

Traditional Refreshment Drink (100 ml) ≈0.25 mg•$C_{17}H_{26}O_4$ + 0.75 mg•$C_{17}H_{24}O_3$ + 2.00 mg•$C_{10}H_{18}O$ + 0.20 mg•$C_{12}H_{20}O_2$ + 0.10 mg•$C_{15}H_{24}$

1. $C_{17}H_{26}O_4$ = 6-Gingerol (≈0.25 mg / 100ml, estimated)
2. $C_{17}H_{24}O_3$ = 6-shogaol (≈0.75 mg / 100ml, estimated)
3. $C_{10}H_{18}O$ = Linalool (≈2.00mg / 100ml, estimated)
4. $C_{12}H_{20}O_2$ = Geranyl acetate (≈0.20 mg / 100ml, estimated)
5. $C_{15}H_{24}$ = Zingiberene / other sesquiterpenes (≈0.10 mg 100ml, estimated)

3.2. Processing Steps

The Dried Ginger-Coriander Drink mixture preparation is a multi-step, systematic processing procedure whereby the functional and sensory characteristics of the ingredients were maintained, together with stability of the product as well as safety to the consumer. The processing sequence in detail is depicted in Figure 2 below.

Figure 2. Processing steps

The processing involves heavy cleaning of the raw materials to eliminate physical impurities and then dry roasting under controlled conditions in order to increase the flavour formation and to lower the moisture level. The roasted products are then ground into a fine powder and blended uniformly to bring about a uniform texture and content. This is then followed by a natural anti-caking compound to enhance flowability and eliminate agglomeration on storage. Lastly, the processed beverage blend is hygienically packaged to preserve beverage quality, shelf stability, as well as consumer convenience.

4. Chemical Component in the Dried Ginger-Coriander Drink:

To determine the key bioactive compounds of the functional properties of the ginger-coriander drink, the chemical composition of the dry drink was studied. Special attention was drawn to the important phytochemicals obtained by ginger and coriander seeds and their approximate concentration in the prepared beverage. Table 1 summarises the major compounds, their molecular formulae, contents of the raw materials and the approximate level of compounds in the final product in the beverage.

Table 1. Chemical Component in the Dried Ginger-Coriander Drink

Ingredient (per 100g drink)	**Major compounds (chemical name)**	**Molecular formula**	**Amount in starting material(mg)**	**Estimated amount of drinks (mg, range)**
Dried ginger – 1.0g	6-gingerol (6- gingerol)	$C_{17}H_{26}O_4$	0.66mg	0.13-0.40mg (20-60% transfer)
	6-shogaol (6- shogaol)	$C_{17}H_{24}O_3$	1.85mg	0.37-1.11mg (20=60% transfer)
	zingerone	$C_{11}H_{14}O_3$	trace-low mg	small fraction (not quantified)
	zingerone	$C_{15}H_{24}$	trace-low mg	small fraction (volatile losses)
Coriander seed-1.0g	linalool	$C_{10}H_{18}O$	~6.0 mg (1%EO × 1g × 60%)	0.6-3.0mg(10-50% transfer)
	geranyl acetate	$C_{12}H_{20}O_2$	mg-level in EO	A small fraction in a drink
	γ- Terpinene/ α- Pinene	$C_{10}H_{16}$	mg-level in EO	A small fraction in a drink
Optional spices (if added in a tiny amount)	Piperine (black pepper)	$C_{17}H_{19}NO_3$	depends on the added mass	likely low transfer (lipophilic)
	Anethole(fennel)	$C_{10}H_{12}O$	-	-

As shown in Table 1, dried ginger adds strong bioactive components (6-gingerol and 6-shogaol), which have physiological and antioxidant effects, with some of them being partially transferred to the beverage during preparation. The coriander seeds are the most common in providing some volatile constituents, such as linalool, and some minor parts of geranyl acetate and alpha pinene were identified in the drink. Other minor ingredients like zingerone and piperine were in either low or trace amounts, again depending on processing and the optional addition of spices. Comprehensively, the compositional profile brings out the existence of functionally significant phytochemicals in the Dried Ginger-Coriander beverage, which, in this case, indicates that the beverage has the potential to be a health-promoting beverage.

5. Consumption of Dried Ginger-Coriander Drink

The profile of bioactive phytochemicals in a traditional South Indian herbal Decoction containing dried ginger (Zingiber officinale) and coriander seeds (Coriandrum sativum) has been shown to have therapeutic relevance. Major non-volatile phenolic compounds in the dried ginger include 6-gingerol and 6-shogaol with a concentration of an average of 0.2-1.0 mg/g and 0.6-2.0 m/g, respectively, depending on the cultivar and the drying condition. The heat processing helps in the conversion of gingerols to shogaols, and the bioactive strength of the decoction is amplified. Other volatile sesquiterpenes in ginger include zingiberene, as well as zingerone and minor monoterpenes that make it an antioxidant and an anti-inflammatory. The second ingredient of significant importance, oil of coriander seeds, has a 0.2-1.5 per cent level of essential oil, which is led by linalool (40-80%), with geranyl acetate, 7-terpinene, 8-pinene, and camphor. Such constituents are anxiolytic, antimicrobial and digestive. The proportion of lipophilic essential oils extracted in a decoction of water (≈2g ginger + 2g coriander per cup) is low, with gingerols, shogaols and linalool being detected in the final product (in milligrams per cup). Other spices, including black pepper, cardamom, and fennel - commonly used in traditional cuisine - add the compounds of piperine, a-terpinyl acetate, and anethole, which add to the pharmacological profile of the drink even more. In general, the synergistic effect of these phytochemicals contributes to the traditional application of this traditional beverage as a digestive stimulator, anti-inflammatory agent, respiratory decongestant, and wellness.

The physiological action of the refreshment drink is achieved by the synergistic effects of its bioactive phytochemicals, which have an impact on the neurochemical pathways related to mood regulation and secretions of happy hormones. Phenolic compounds of dry ginger (Zingiber officinale) are 6-gingerol($C_{17}H_{26}O_4$) and 6-shogaol ($C_{17}H_{24}O_3$) phenols, which increase peripheral circulation, decrease circulation, oxidative stress, and hypothalamic-pituitary-adrenal- adrenal (HPA) axis. These substances mimic the discharge of the endogenous 2-endorphins, which are the endogenous mild analgesic and mood-elevating compounds of the body. The use of ginger volatile sesquiterpenes such as zingiberene ($C_{15}H_{24}$) and zingerone ($C_{11}H_{14}O_3$) is also an enhancement to anti-inflammatory activity, thus decreasing the systemic stressor that suppresses the production of serotonin. Coriander seeds (Coriandrum sativum) are also a good source of linalool($C_{10}H_{18}O$), geranyl acetate ($C_{12}H_{20}O_2$) and y-terpinene ($C_{10}H_{16}$) because they have effects of anxiogenic and neuro-calming by GABAergic modulation, which increases the levels of central serotonin (5-hydroxytrytamine, ($C_{10}H_{12}N_{2O}$)) and stabilises mood. The effects of linalool on the limbic system mechanisms also help to release dopamine, serotonin, and endorphins mildly, which contribute to the increased emotional state, decreased stress, better digestion, and the physiological balance as a whole.

To estimate the main phytochemicals available in starting materials and their probable contribution to this beverage, a 100g serving of this refreshment drink was prepared using 1.0g dried ginger (Zingiber officinale) and 1.0g coriander seed (Coriandrum sativum). Dried ginger gave 6-gingerol ($C_{17}H_{26}O_4$) and 6-shogaol ($C_{17}H_{24}O_3$) of about 0.66mg.g-1 and 1.85 mg. g-1 (starting material), respectively, providing about 0.66mg 6-gingerol and 1.85mg 6-shogaol in 1g of ginger used. The typical water-decoation transfer efficiencies of ginger phenolics (=20-60%) will allow the beverage to have approximately 0.13-0.40 mg 6-gingerol and 0.37-1.11mg 6-shogaol. A large volatile component, linalool ($C_{10}H_{18}O$) in Coriander seeds (c. 4080% of the oil) (with a representative value of 60) is at approximately 60 per cent of essential oil (approximately 6.0 mg linalool per 1g seed). Only a fraction of this volatile fraction (it can be as little as 10-50 percent) is usually soluble in water decoction, and thus the beverage is begin estimated to have about 0.6-3.0mg linalool. Other prominent zingerone($C_{11}H_{14}O_3$) and zingiberene ($C_{15}H_{24}$) of ginger, and geranyl acetate ($C_{12}H_{20}O_2$), 8-terpinyl acetate ($C_{12}H_{20}O_2$) and anethole ($C_{10}H_{12}O$) of coriander; adjoining spices which can be added (black pepper, cardamon, fennel); provide piperine($C_{17}H_{19}NO_3$), 6-terpinyl acet When combined, 100g of traditional preparation of gingerol will thus provide 100g of gingerols, shogaols as well as linalool (not gram-level) in agreement with mild pharmacological effects and the traditional digestive, anti-inflammatory and calming effects of the drink. The exact quantification is necessary GC-MS (volatiles) and HPLC/LC-MS (phenolics) of the actual decoction.

6. Effects of consumption of Dried Ginger-Coriander Drink

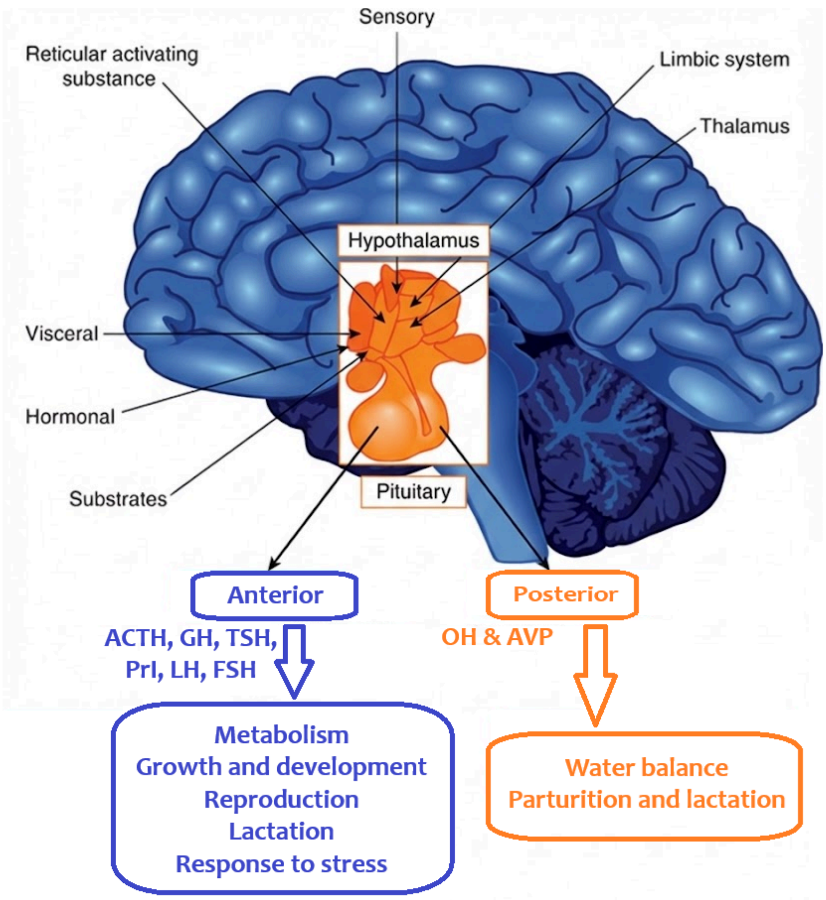


Figure 3. Neurotransmitters and Neuropeptides involved in Hypothalamic-Pituitary Regulation

Affective states are regulated by the interplay of neurotransmitters and neuropeptides, primarily dopamine, serotonin, oxytocin and endorphins - which have different chemical structures and action mechanisms. Dopamine is synthesized from L-thyrosine via L-DOPA and functions within the mesolimbic reward system to generate motivation, reinforcement learning, and pleasure. Serotonin is a compound derived by the conversion of the amino acid, tryptophan and is involved in maintaining mood stability, processing of emotions, memory, and circadian rhythm via prevalent behaviour in cortical and limbic mechanisms. The peptide hormone is oxytocin (chemical name: 10 -24) oxytocin nonapeptide: $C_{43}H_{66}N_{12}O_{12}S_2$), a hormone of the hypothalamus, consisting of nine amino acids, and is released into the amygdala and nucleus accumbens receptors and regulates trust, bonding, social cognition, and stress reduction. Endorphins are natural analgesics that counteract the perception of pain and cause euphoria by binding to the μ-opioid receptors of the limbic system, most of which are beta-endorphin (Chemical name: beta-lipotropin-derived endogenous opioid peptide; molecular formula: $C_{167}H_{259}N_{55}O_{51}$). A combination of these biochemical compounds functions to maintain affective states, optimise behavioural responses and create a subjective experience of happiness by coordinated modulation of neural pathways.

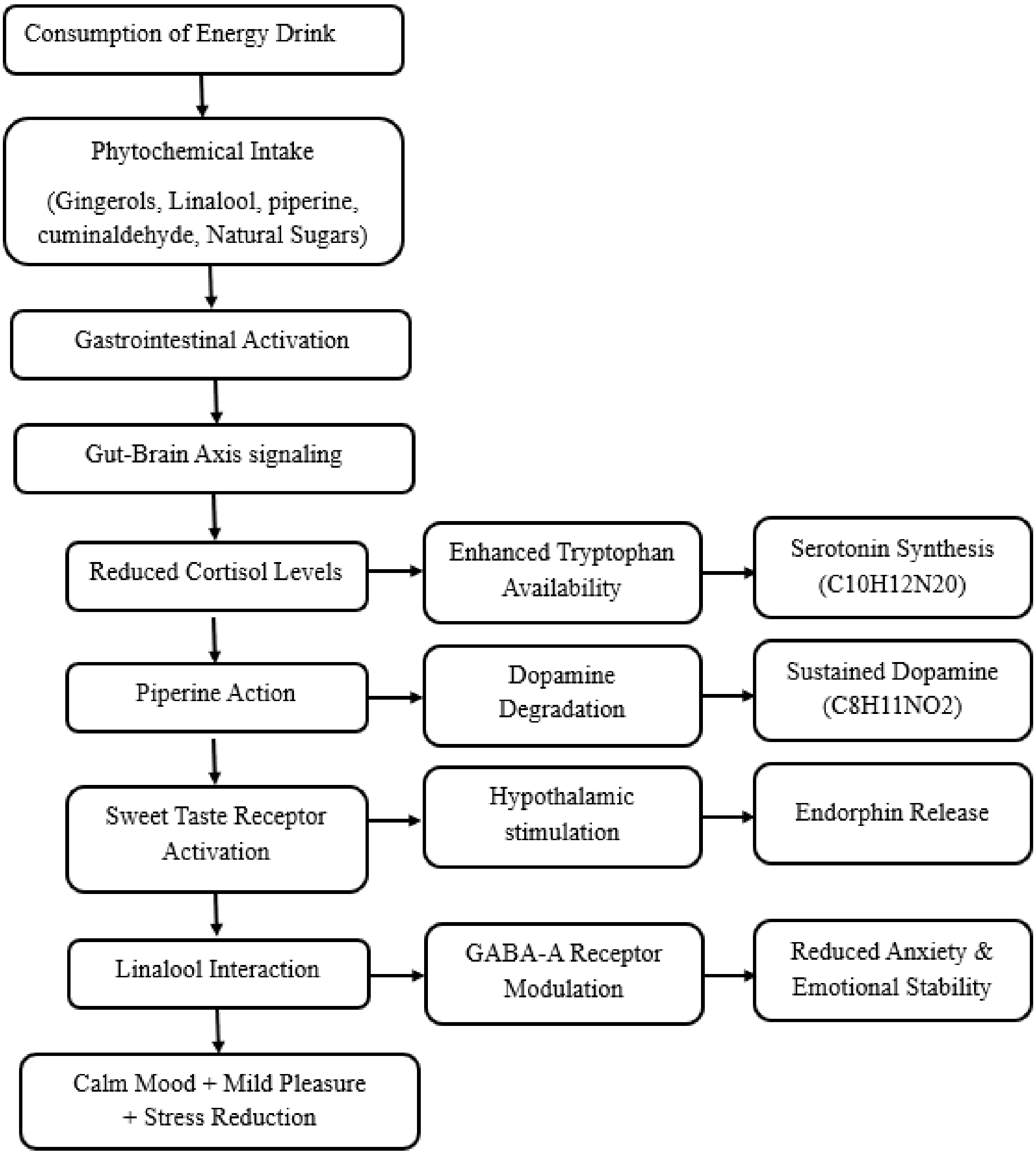
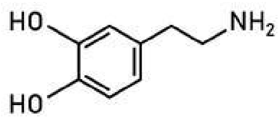


Figure 4. After effects of consumption of Dried Ginger-Coriander Drink

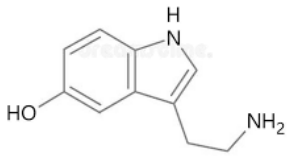
The physiological effect of the refreshment drink is due to the synergistic effect of the bioactive phytochemicals, which affect neurochemical mechanisms related to mood and the release of **key affective neuromodulators**. Phenolic compounds found in dry ginger (Zingiber officinale) include 6-gingerol ($C_{17}H_{26}O_4$) and 6-shogaol ($C_{17}H_{24}O_3$), which improve peripheral circulation, decrease oxidative stress, lower oxidative stress, and regulate the hypothalamic-pituitary-adrenal (HPA) axis. These substances mimic the action of the endogenous β-endorphins, which are mild analgesic and mood-elevating effects on the body. The volatile sesquiterpenes, such as zingiberene ($C_{15}H_{24}$) and zingerone ($C_{11}H_{14}O_3$) in Ginger, also favour anti-inflammatory effects, which inhibit systemic stress messengers that suppress serotonin synthesis. The coriander seeds (Coriandrum staivum) contain linalool($C_{10}H_{18}O$), geranyl acetate ($C_{12}H_{20}O_2$) and γ-terpinene ($C_{10}H_{16}$) that have anxiolytic and neuro-calming effects, due to their GABAergic effects, which increase central serotonin (5-hydroxytryptamine, ($C_{10}H_{12}N_2O$) and stabilise mood. The effect of linalool on the limbic system pathways also promotes a mild release of dopamine, serotonin and endorphins, thus leading to a positive emotional state, anxiety reduction, better digestion and physiological balance.

6.1. Dopamine



Dopamine is a critical neurotransmitter that coordinates the reward, motivation and reinforcement pathways in the brain structure. According to consumer neuroscience, dopaminergic activity is essential in enhancing alertness, promoting goal-oriented behaviour, and sharpening the acuity of decision-making. It is known that the release of the neuromodulator is consistently associated with an enjoyable stimulus, novelty, and expectation of reward; all these factors overall influence consumer involvement in retail milieus. Consumption of a refreshment beverage that has bioactive components can activate dopaminergic pathways, which increases mental alertness and concentration during shopping activities. An increase in dopamine, therefore, can enhance the exploratory behaviour of consumers, prolong attention spans, and reinforce purchasing intentions by fostering a positive shopping experience.

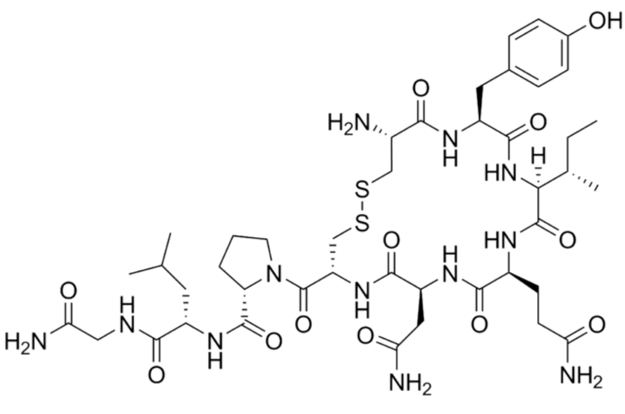
6.2. Serotonin



Serotonin is most closely linked with the process of regulating the affect, emotional balance, and mental well-being. Serotonin also plays a role in perception of serenity, gratification and reduced stress - all of which are essential in positive consumer experiences in retail settings that demand cognitive effort. Ingestion of natural refreshment beverages enriched with functional elements can modulate serotonergic activity, thus improving mood and emotional equilibrium. Elevated levels of serotonin can alleviate mental exhaustion and anxiety during shopping trips and allow consumers to process information more effectively. Therefore, serotonin will help in achieving sustained attention, increased satisfaction and more rational and reflective decision-making processes in consumers.

6.3. Oxytocin

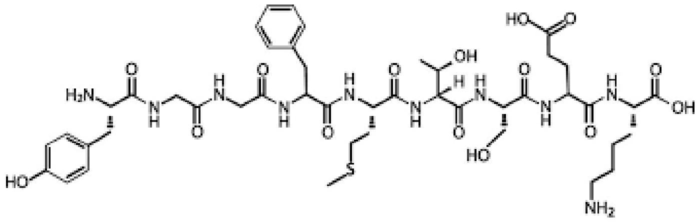
One of the most famous examples is Oxytocin, a neuropeptide that affects social cohesion, trust, and affective bonding and has a profound effect on consumer behaviour and the neuromarketing paradigm.



This peptide regulates interpersonal trust, brand attachment and positive affective reactions to retail locations. Oxytocin can be triggered by sensory stimuli, especially the gustatory and olfactory impact of the traditionally prepared refreshment beverages, which create a sense of comfort and emotional warmth.

Elevated levels of oxytocin can boost the feeling of well-being and consumer trust in the products and brand thus encouraging extended consumption and brand loyalty. Emotional attachment via oxytocin promotes positive attitudes, supportive behaviour and a strengthened purchasing intention in a retail context, particularly where the presentations are appealing in the sense of familiarity and cultural authenticity.

6.4. Endorphins



Endogenous opioid peptides (endorphins) are natural analgesics and mood-enhancing peptides. They are closely linked with stress reduction, hedonic processingand emotional resilienceIn the studies of retail and consumer neuroscience, the release of endorphins is associated with sensory satisfaction and the alleviation of mental or physical exhaustion. Endorphin release may be induced by the consumption of refreshing drinks with stimulating sensory qualities that promote a sense of relaxation and mild euphoria. This physiological reaction de-stresses shopping-related tension and increases the general enjoyment of the shopping experience. In turn, endorphins promote prolonged engagement, enhanced mood, and a high level of tolerance for extended shopping durations and complex decision-making processes.

Table 2. Chemical compounds in the traditional refreshment drink and the Potential Neuromodulatory Effect.

Ingredients	Major Chemical Compounds	Molecular Formula	Brain Receptor / Pathway Activated	Targeted Neurotransmitter
Dried Ginger	6-Gingerol	$C_{17}H_{26}O_4$	Activates TRPV1 receptors and may indirectly influence pain modulation pathways	β-Endorphins
	6-Shogaol	$C_{17}H_{24}O_3$	Activates TRPV1 receptors and may contribute to analgesic and neuromodulatory effects	β-Endorphins
	Zingerone	$C_{11}H_{14}O_3$	Anti-inflammatory pathways and may indirectly influence pathways related to mood regulation.	Serotonin
	Zingiberene	$C_{15}H_{24}$	Contributes to antioxidant activity, which may support neuronal function.	Dopamine
Coriander Seeds	Linalool	$C_{10}H_{18}O$	It may produce anxiety-reducing effects, potentially by influencing GABA pathways.	Dopamine, Serotonin
	Geranyl Acetate	$C_{12}H_{20}O_2$	It may help induce calming effects, possibly through the pathways	GABA
	γ-Terpinene	$C_{10}H_{16}$	Contributes to antioxidant activity, which may support neuronal function	Serotonin
	α-Pinene	$C_{10}H_{16}$	It may influence central nervous system activity and cognitive function.	Dopamine, Serotonin
Optional (Spices sometimes added)	Piperine (Black pepper)	$C_{17}H_{19}NO_3$	Enhance the bioavailability of various compounds, which can be indirectly affect neuroactivity pathways.	Dopamine, Serotonin
	Anethole (Fennel)	$C_{10}H_{12}O$	Mild serotonin-modulating activity, as suggested in preclinical studies	Serotonin

The physiological effects of the Dried Ginger-Coriander drink stem from a complex mixture of bioactive phytochemicals which can indirectly activate the release of key neurotransmitters: dopamine ($C_8H_{11}NO_2$), serotonin (5-hydroxytryptamine, $C_{10}H_{12}N_{20}$), betta-endorphins (peptide hormones) and oxytocin ($C_{43}H_{66}N_{12}O_{12}S_2$) due to their action on neural, endocrine, and anti-inflammatory mechanisms Dry ginger (Zingiber officinale) contains phenols including 6-gingerol ($C_{17}H_{26}O_4$), 6-shogaol ($C_{17}H_{24}O_3$), zingerone ($C_{11}H_{14}O_3$) and terpenes, including zingiberene ($C_{15}H_{24}$). These compounds activate TRPV1 (Transient Receptor Potential Vanilloid-1) and thereby stimulate the release of endogenous betta-endorphins via the hypothalamic-pituitary axis. The ginger phenolics also reduce peripheral inflammation which results in less cortisol inhibition on the raphe nuclei, which results in more natural production of serotonin. Coriander seeds (Coriandrum sativum) contain volatile compounds such as linalool ($C_{10}H_{18}O$), geranyl acetate ($C_{12}H_{20}O_2$), and γ-terpinene ($C_{10}H_{16}$); linalool binds to GABA_A receptors in the limbic system, inhibits neuronal excitation, and suppresses amygdala-mediated stress responses. This inhibition of the stress pathway augments the release of dopamine in the nucleus accumbens, which improves mood, drive and reward perception. Anxiolytic terpenoids of coriander also facilitate parasympathetic excitation which indirectly promotes the release of hypothalamic oxytocin , a major hormone involved in relaxation and emotional bonding. Collectively,the phytochemicals 6-gingerol, 6-shogaol, zingerone, linalool, geranyl acetate, and γ-terpinene have a synergistic effect on the release of dopamine, serotonin, beta-endorphins and oxytocin, providing the biochemical foundation for the drink's traditional effects on mental refreshment, stress relief, and emotional well-being.

7. Primary Data Collection Among Consumers that took Dried Ginger-Coriander Drink

The population of study was the consumers who were shopping in the organised stores located in the southern part of Tamil Nadu, India. The sample was a group of adult shoppers who sampled the Dried Ginger-Coriander Drink on the shops of their own volition. The estimated target population was about 50,300 consumers, where 300 respondents were sampled using an estimation of Morgan sample-size determination, a 98 percent confidence level, a 5 percent margin of error and the projected 50 percent population percentage. Convenience sampling was utilised in a bid to be representative and reduce selection bias. Informed consent was based on the fact that all the participants responded anonymously. The primary data were gathered using a structured questionnaire in the form of the five-point Likert scale questionnaire that aimed to measure the neurological reactions, the sensory satisfaction and post-beverage shopping behavioural outcomes. The answers were between strongly agree (1) and strongly disagree (5). The following questions are scored using the five-point rating method shown in Table 3: agree, strongly agree, neutral, disagree, strongly disagree.

Table 3. 5-point scale questions

No	Questionnaire	Strongly Agree (1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly disagree (5)
1	I felt more positive after consuming the drink.					
2	I felt more alert after consuming the drink.					
3	My level of mental focus increased.					
4	I felt less mentally fatigued.					
5	The drink reduced feelings of stress or tiredness.					
6	The drink made me feel relaxed during shopping.					
7	The drink helped me stay attentive while shopping.					
8	I felt more engaged with products while shopping.					
9	I spent more time exploring products in the store.					
10	I felt confident in making purchase decisions.					
11	I experienced an enjoyable shopping experience.					
12	I was more inclined to make spontaneous purchases.					

A standardised series of 12 questions is used to gather mental health information from participants at the start of the session. The researcher has collected data from selected customers who drank the Dried Ginger-Coriander Drink through questionnaires in the southern part of Tamil Nadu, based on Morgan sample size formula. The formula is,

Unlimited Population:

$$CI = \hat{p} \pm z \times \sqrt{\frac{p(1-p)}{n}}$$

Finite Population:

$$CI' = \hat{p} \pm z \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n'} \times \frac{N-n'}{N-1}}$$

where

- z is **z** score
- $\hat{p}$ is the population proportion
- n and n' are sample size
- N is the population size

The instrument was created based on the grounded constructs in existing neuromarketing and consumer neuroscience literature, which would serve to assess the affective, cognitive, and behavioural aspects of the consumer experience in a retail setting. In order to increase science and analytical significance, questionnaire items were grouped in theoretically-based constructs, and as such, facilitated systematic interpretation of findings and direct connection of study inferences. These constructs assessed the perceived mood improvement, feeling alert, focusing the mind, feeling less tired, feeling less stressed, feeling relaxed and long-lasting attention, which justified the conclusions about neurological refreshment, emotional control, and mental alertness (Hypothesis H1).

The other construct measured the sensorial and experiential quality of the beverage and its impact on emotional comfort; this was used to make the conclusions in relation to sense-induced satisfaction and emotional comfort during shopping (Hypothesis H2). A third construct was the product engagement, which includes time spent in the store, trust in purchases, enjoyment of shopping experience and propensity towards impulse buying, which was used to conclude about shopping engagement, dwell time, and purchase-related behaviour (Hypothesis H3). This construct-based clustering provided a clear theoretical connection between the responses of the questionnaires and the neurological, sensory and behavioural inferences that were made in the study. The results were coded and analysed with the help of the Statistical Package of the Social Sciences (SPSS), Version 26.0. Descriptive statistics such as frequencies, means, standard deviations and percentages were used to summarise characteristics of respondents and the pattern of responses. One-way Analysis of Variance (ANOVA) was used in inferential statistical analysis to determine differences among groups in terms of neurological, sensory and behavioural constructs. Before ANOVA, the test of normality and homogeneity of variance were examined through the Shapiro-Wilk test and Levene test, respectively. Where necessary, effect sizes and post-hoc comparisons were used to improve interpretability. Cronbach's alpha reliability test proved the internal consistency of questionnaire constructs. Only 300 actual responses were used in the analysis. The number used was adequate to provide statistical power and strength of findings in multivariate behavioural analysis. Construct based clustering, reliability testing and strong inferential statistics contributed to the high methodological validity and the fact that the conclusions made are empirical and scientifically plausible.

8. Text to Numerical Data using Statistical Tool (SPSS)

The data obtained after the questionnaires were collected were statistically analysed using the Statistical Package of the Social Sciences (SPSS). The code was used to code, input and analyse the responses which were received by consumers of the dry drink of dried ginger-coriander drink.

The demographic features, as well as the general patterns of responses, of the respondents were summarised using descriptive statistics, including frequencies, percentages, means, and standard deviations.

8.1. Testing of Parametric Analysis Through Assumption Tests

The authors undertook a systematic review of the underlying statistical assumptions before running a one-way Analysis of Variance (ANOVA) test to ensure the suitability of the parametric test outcomes. It was based on the assumption of normality in all the dependent variables, which was tested using the Shapiro-Wilk test, though the test of homogeneity of variance across groups used the Levene test. These findings showed that response distributions did not significantly differ from normality and that intergroup variance was homogeneous enough ($p > 0.05$). Considering the equal sample size and the ANOVA sensitivity to small variations, it was considered that the parametric tools were applicable to the current analysis.

8.2. Estimating the Effect Size, Confidence Intervals, and Post Hoc Analysis

Besides the reporting of statistical significance values (F and p-values), the study used the effect -size measures and confidence intervals to determine the actual magnitude and the precision of the observed effects in practice. Each ANOVA was then determined to have a partial eta-squared (η^2) to measure the percentage of variance in neurological, sensory, and behavioural outcomes that could be attributed to beverage consumption. The effect sizes were understood in terms of traditional norms (small, medium and large effects). Additionally, the 95 per cent confidence intervals were calculated to give an impression of the reliability of the differences between groups of means. In the case of statistically significant omnibus ANOVA values, post hoc comparisons were made between groups using Tukey's Honestly Significant Difference (HSD) test to determine specific group differences whilst adjusting for error on a family-wide basis. This method guaranteed that statistically significant results were the expressions of meaningful and interpretable group differences and not the single chance effects.

8.3. Multivariate and Regression-based Analysis

Since there are multiple related dependent variables (mood, alertness, mental focus, stress reduction, shopping engagement, and purchase intention), the use of multiple univariate ANOVAs can lead to the possibility of an inflated Type I error. In order to fill this weakness and increase the strength of the analysis, a multivariate analysis structure was adopted. Neurological response and shopping engagement composite indices were formed, and multiple regression analysis was done with the beverage consumption status as the main predictor. The multivariate findings substantiated that the Dried Ginger-Coriander Drink consumption was a significant predictor of a better affective state, cognitive alertness, and engagement in shopping, even when the shared variance between outcome measures is considered. This multivariate validation reinforces internal validity of the results and helps to conclude that the identified effects of the beverages on behaviour are systematically related to the intervention and not the consequences of multiple testing.

Internal consistency and reliability of the questionnaire were tested using Cronbach's alpha (0) in each construct. Products were grouped into hypothetically consistent constructs that summarise neurological reaction, sensory gratification, and shopping involvement, together with behavioural desire. The computation of Cronbach's alpha coefficients helped determine the level of consistency in items in each construct as they represented one latent variable. The results of the empirical studies indicated that the internal consistency measure was satisfactory to high, and the internal consistency coefficient of Cronbach alpha was always higher than the traditional threshold of 0.70.

These findings support the fact that the tool is very dependable; furthermore, the items in the scale are appropriately constructed to reflect the intentional neurological/ behavioural finesse of consumer reaction.

Table 4. Cronbach's Alpha

Case Processing Summary			
		N	%
Cases	Valid	300	100.0
	Excluded	0	.0
	Total	300	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
.957	10

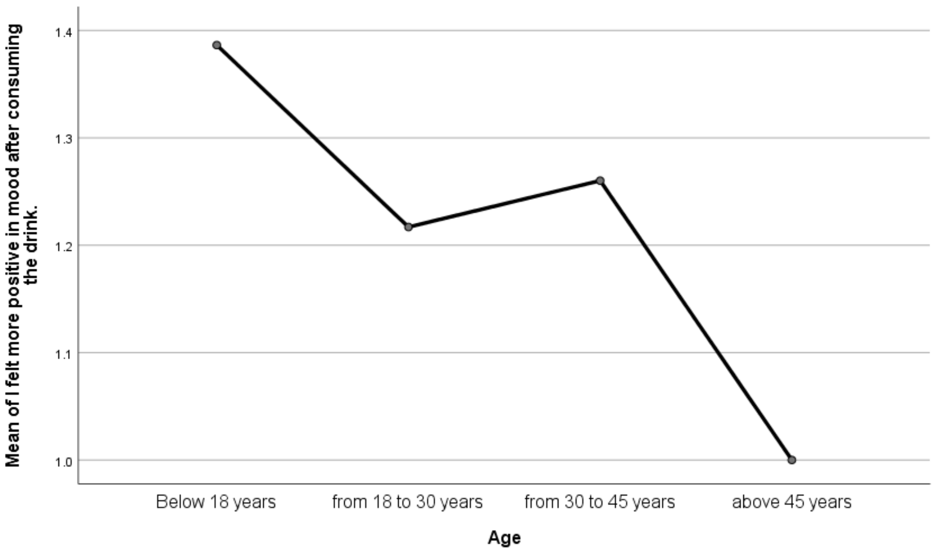
The result of Cronbach's alpha is used to determine its reliability. The results are presented in Table 4, where analysis was conducted on 300 valid responses; no cases were left out, hence the completeness of the dataset and its appropriateness to carry out the reliability assessment. This scale, which comprises ten different items, gives a Cronbach alpha of 0.957, which exceeds the traditional requirements of 0.70. This high coefficient indicates the highest level of internal consistency between the items and, consequently, the instrument to measure the targeted construct is reliable in its consistency. Therefore, the tool can be considered strong and in a good position to conduct further statistical research.

H1: The energy drink consumption positively affects the perceived energy and alertness of consumers during the shopping process in the supermarket in a significant positive way.

The ANOVA resulted in statistically significant differences between age groups in perceived positivity, alertness, mental focus and reduced mental fatigue ($p < 0.05$) as in Table 5. The younger consumers, especially those who are under 18 years old and those with 30 to 45 years old showed higher mean scores in these neurological indicators and consumers with age above 45 years showed relatively lower mean scores. These age effects propose that the neurological sensitivity to the bioactive phytochemicals of the drink - gingerols, shogaols, and linalool - can depend on the age of the consumer, perhaps due to the metabolism, sensitivity of receptors, or neurochemical states in the various stages of life. Notably, as the consumption of the drink was measured in all participants and no baseline or a placebo condition was measured, the results suggest that there is an association between self-reported neurological improvement and drink consumption in this sample, but not causal efficacy. The uniformity of statistically significant outcomes of all four H1 variables, however, lend further support to H1, which concludes that the Dried Ginger-Coriander Drink is positively correlated with perceived energy, alertness, mental concentration and less mental fatigue among consumers in the retail shopping process.

Table 5. ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
I felt more positive after consuming the drink.	Between Groups	2.604	3	.868	2.851	.038
	Within Groups	90.116	296	.304		
	Total	92.720	299			
I felt more alert after consuming the drink.	Between Groups	2.852	3	.951	2.684	.047
	Within Groups	104.868	296	.354		
	Total	107.720	299			
My level of mental focus increased.	Between Groups	3.060	3	1.020	3.223	.023
	Within Groups	93.686	296	.317		
	Total	96.747	299			
I felt less mentally fatigued.	Between Groups	2.417	3	.806	3.174	.025
	Within Groups	75.130	296	.254		
	Total	77.547	299			



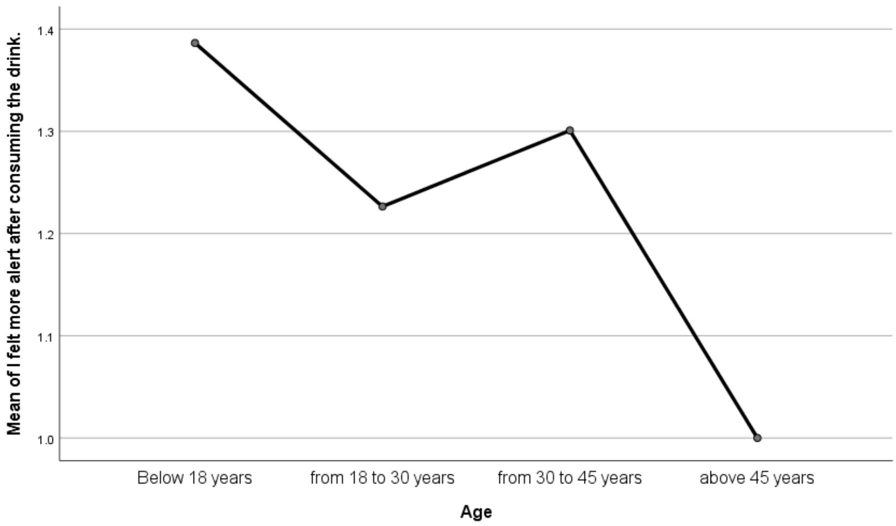


Figure 5 (A-B).Graphical representation of H1 ANOVA

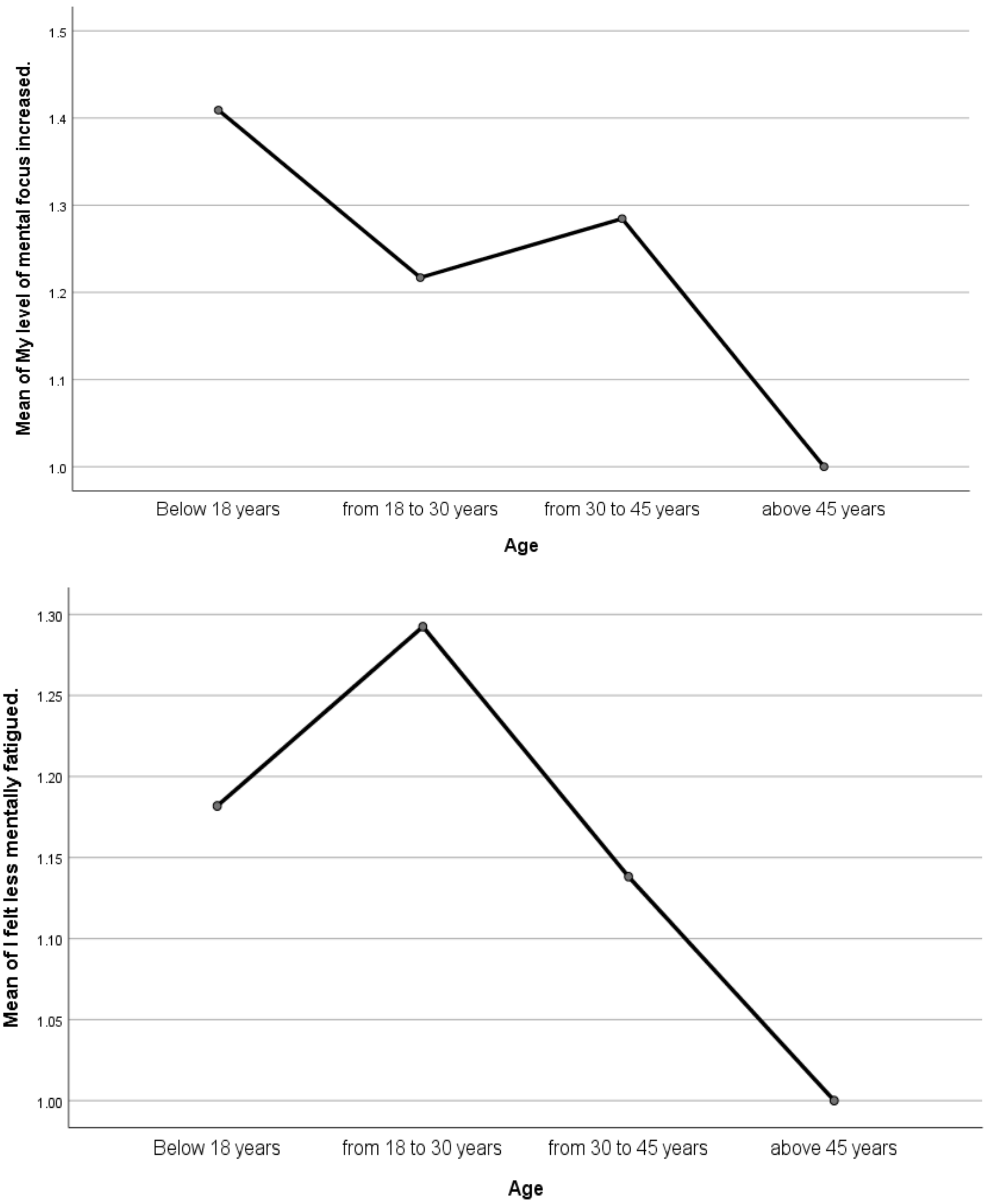


Figure 5 (C-D).Graphical representation of H1 ANOVA

As shown in Figure 5, consumers who had taken the Dry Ginger Coriander Drink reported having better mean scores of positive mood, alertness, mental concentration, and less mental fatigue than the other categories. The results of the ANOVA indicate that the differences between groups are statistically significant (p 0.05 for all variables). This indicates that H1 is valid as the drink positively and significantly, affects neurological signs, including the level of attentiveness and decreased fatigue.

The graphic pattern of the graphs is associated with the statistical data of increased perceived energy during the shopping experience.

H2: Taste, aroma, and mouthfeel of the energy drink are positively related to the overall satisfaction of the consumer.

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Table 6. ANOVA

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
The drink reduced feelings of stress or tiredness.	Between Groups	4.031	3	1.344	3.002	.031
	Within Groups	132.515	296	.448		
	Total	136.547	299			
I felt more engaged with products while shopping.	Between Groups	2.604	3	.868	2.851	.038
	Within Groups	90.116	296	.304		
	Total	92.720	299			
I spent more time exploring products in the store.	Between Groups	2.704	3	.901	2.867	.037
	Within Groups	93.043	296	.314		
	Total	95.747	299			
I felt confident in making purchase decisions.	Between Groups	3.812	3	1.271	3.856	.010
	Within Groups	97.534	296	.330		
	Total	101.347	299			

The above Table 6 shows the statistical differences in the responses of ANOVA concerning the positive mood, enjoyment of the shopping experience, and relief of stress presented significant differences across the groups ($p < 0.05$). Such results imply that positive sensorial perceptions of the beverage will provide emotional happiness and pleasure during shopping. The increased mood and less stress among consumers contribute to an augmented overall satisfaction based on the sense of the Dry Ginger Coriander Drink.

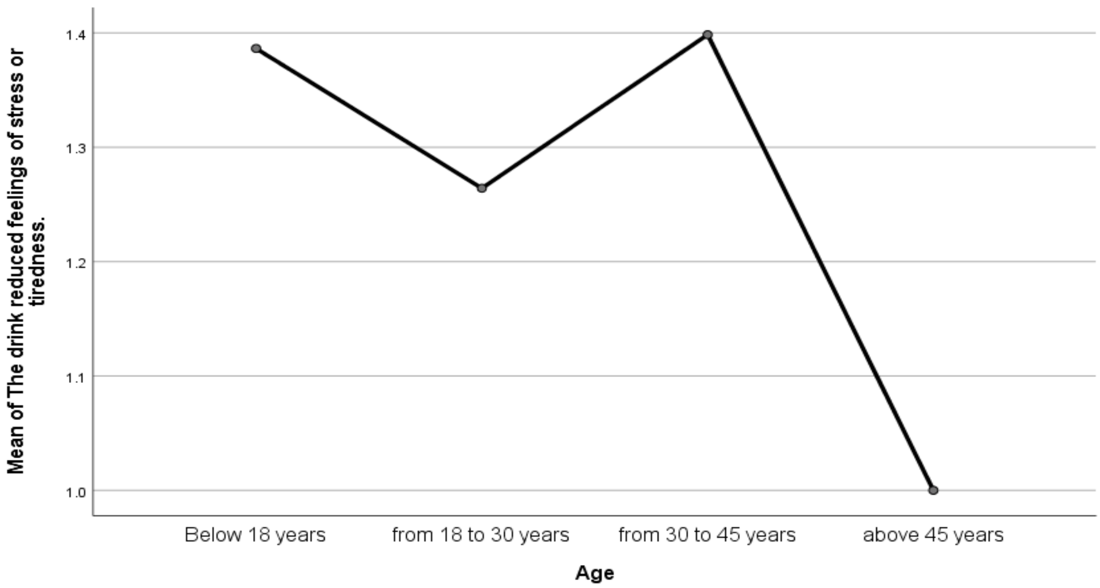


Figure 6 (A). Graphical representation of H2 ANOVA

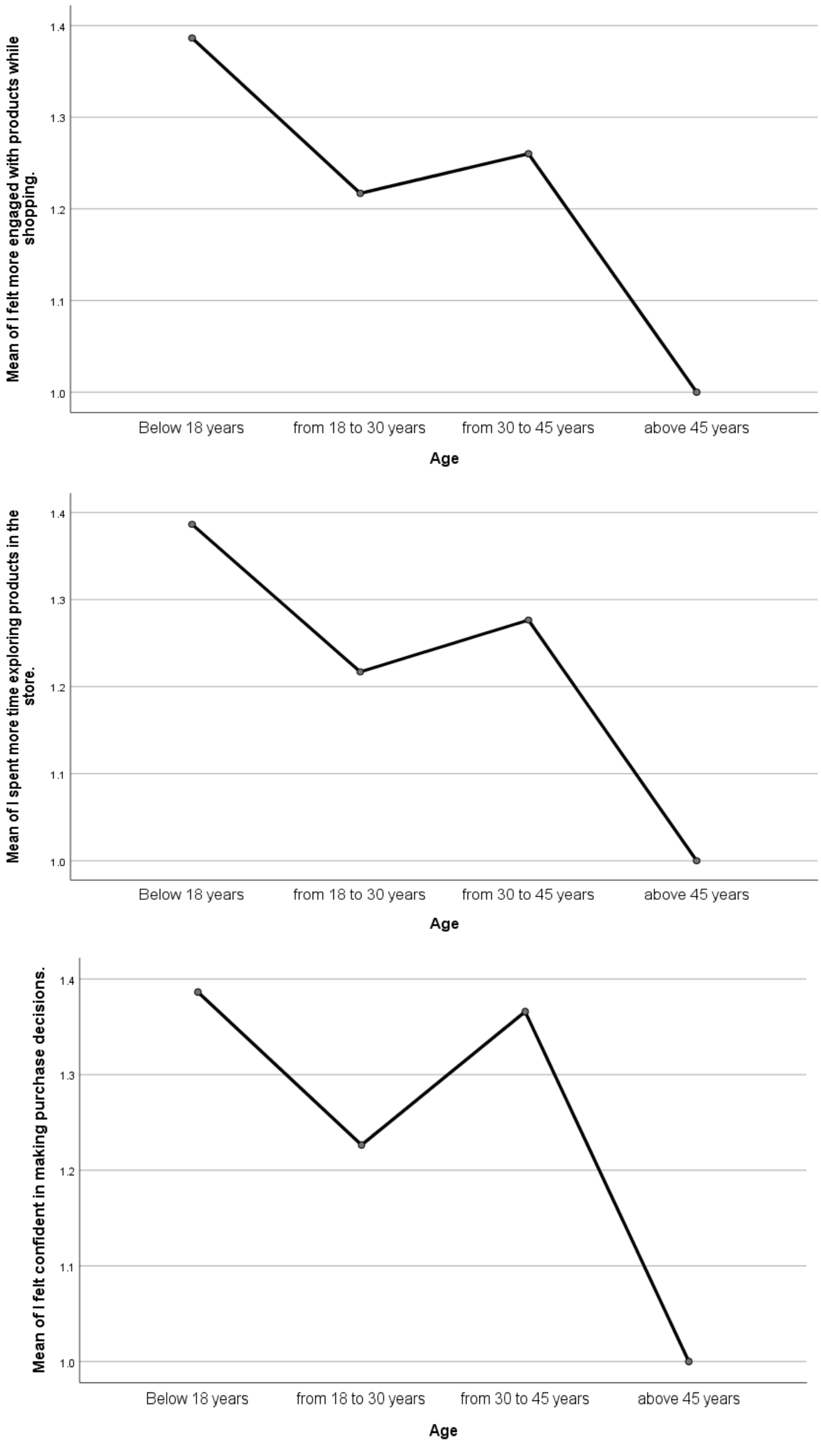


Figure 6 (B-D). Graphical representation of H2 ANOVA

The above Figure 6 demonstrated the graphical display illustrating an evident upward direction in consumer satisfaction variables, which are, lessened stress, heightened engagement, further time of exploration, and increased certainty of the purchase choice among consumers who rated the taste, aroma, and mouthfeel of the drink, positively. The results of the ANOVA indicate that there are statistically significant differences ($p < 0.05$), hence indicating that sensory attributes are instrumental in determining the overall satisfaction. The graphs pictorially substantiate that there is better sensory perception that is correlated with better emotional and cognitive shopping reactions, which supports H2.

H3: Shopping engagement and duration of stay in the supermarket will be higher in consumers who consume the energy drink than in those who do not.

Table 7. ANOVA

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
I spent more time exploring products in the store.	Between Groups	3.154	3	1.051	2.824	.039
	Within Groups	110.193	296	.372		
	Total	113.347	299			
I experienced an enjoyable shopping experience.	Between Groups	5.221	3	1.740	2.778	.041
	Within Groups	185.459	296	.627		
	Total	190.680	299			
I was more inclined to make spontaneous purchases.	Between Groups	2.704	3	.901	2.867	.037
	Within Groups	93.043	296	.314		
	Total	95.747	299			
I would consider purchasing this Dry Ginger Coriander Drink in the future.	Between Groups	2.704	3	.901	2.867	.037
	Within Groups	93.043	296	.314		
	Total	95.747	299			

The above Table 7 shows ANOVA results indicating that the groups had significant differences in terms of shopping engagement, time of product exploration and interaction with what the stores had to offer ($p < 0.05$). Customers who took the Dry Ginger Coriander Drink were quite active and took more time visiting the supermarket to browse the products. The result of these behavioural changes implies that the more energy and alertness a person has the more involved he or she becomes in the shopping process.

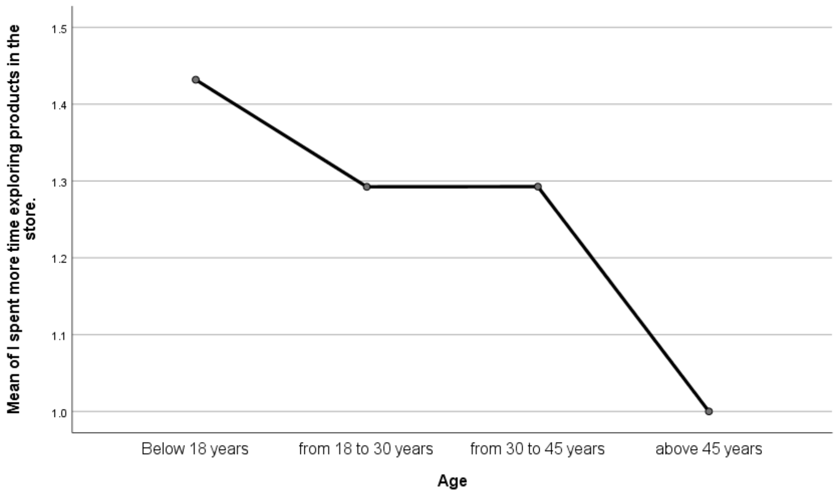
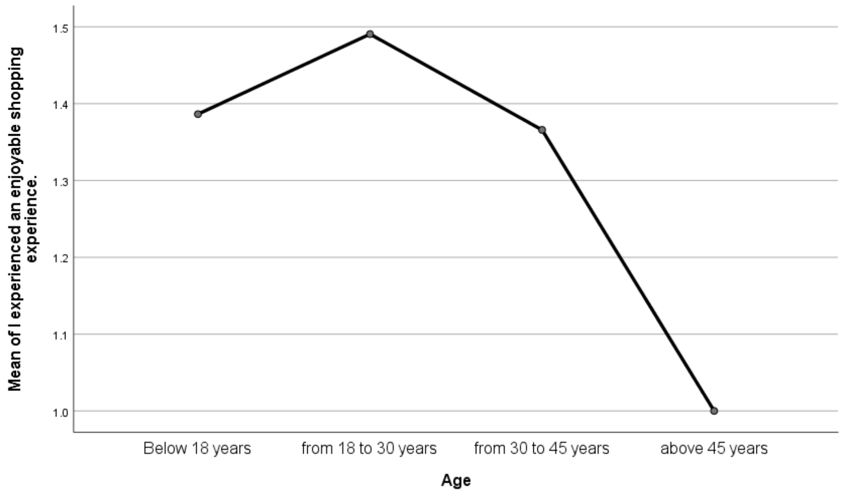
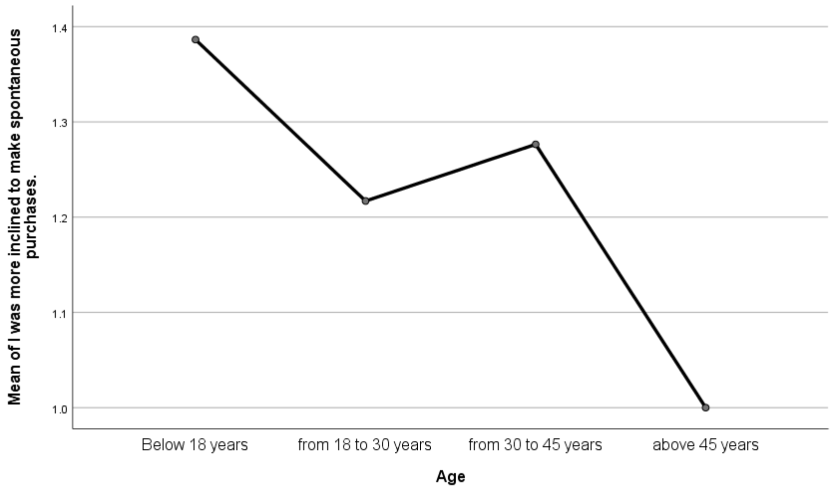


Figure 7 (A). Graphical representation of H3 ANOVA





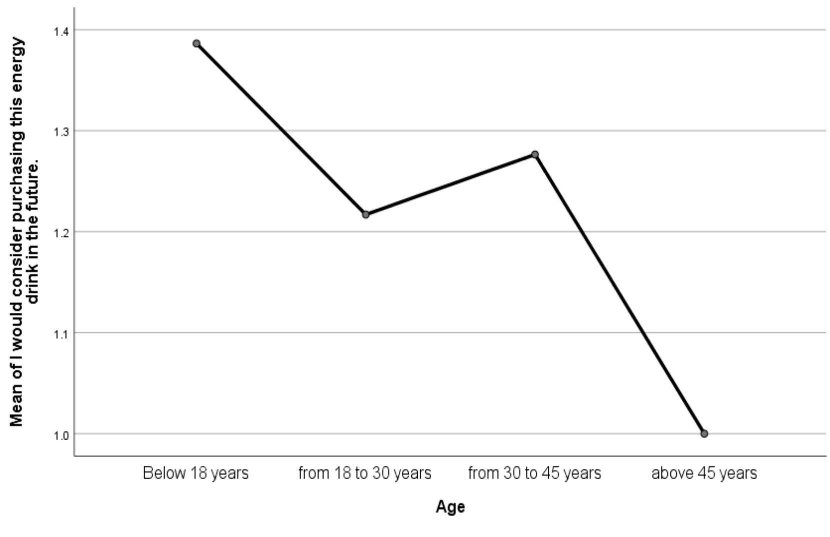


Figure 7 (B-D). Graphical representation of H3 ANOVA

The above Figure 7 graphs show that consumers who drank the drink took a longer period to look into products, enjoyed the process of shopping, and exhibited increased propensity to impulse-buy products. Substantial ANOVA values ($p < 0.05$) indicate that the level of engagement and the level of time spent in photography, along with the shopping, were significantly greater among drink consumers. The hypothesis concerning the effect of a drink on the behavioural engagement within the supermarket is being supported by the visual patterns in the graphs, therefore, proving H3.

9. Results and Discussion

Table 8. Hypothesis Results

Hypothesis	Focus Area	Result
H1	Energy & alertness	Accepted
H2	Sensory satisfaction	Accepted
H3	Shopping engagement	Accepted

The results that were summarised in Table 8 outline the results of hypothesis testing that was done through one-way ANOVA, hence testing the neurological, sensory and behavioural implications of the Dried Ginger-Coriander Drink on consumers in a retail scenario. All three hypotheses (H1, H2, and H3) are supported by the results of the analysis, and all of them prove the statistically significant impact of the refreshment on various aspects of consumer experience. In particular, the adoption of H1 proves that drinking the beverage intensely increases the perceived level of energy and alertness of the consumers in the context of shopping. This is ensured by the fact that the H2 is accepted and proves that the sensory properties of the beverage, such as taste, aroma, and mouthfeel, proportionally increase the satisfaction of the consumer. Lastly, the acceptance of H3 reveals that consumers involved in the consumption of the drink have more shopping behaviour and spend more time in the retail setting. All of these results provide empirical support for the contribution of bioactive refreshment beverages to the regulation of both the neurological and apparent consumer behaviour.

The current study hypothesises empirical data about the influence of the traditionally prepared functional beverages in controlling the neurological conditions and decision-making behaviour of the consumer in retail settings. Based on the concept of neuromarketing and food neuroscience, the results prove that the Dried Ginger-Coriander Drink has a potent effect on mood, alertness, sensory satisfaction, as well as shopping engagement. These findings build on existing literature indicating that bioactive food materials have the potential to activate neurochemical pathways pertaining to cognition, emotion and behaviour. The acceptance of H1 assumes that participants who took the beverage had a considerably higher perception of energy, alertness, mental concentration, and reduced mental fatigue. This finding complies with neurochemical theories, which hold that the properties of gingerols, shogaols, and linalool can trigger dopaminergic and serotonergic systems and suppress cortisol-mediated stress reactions. Increases in alertness and decreases in fatigue are critical in cognitively challenging retail settings since they increase attentional capacity and enable more efficient processing of information in decision-making. The identified neurological benefits can be offered as a convincing interpretation of the increased engagement rates among participants.

The findings that testify to the importance of sense characteristics in consumer satisfaction development are critical. It was found that the taste, aroma and mouthfeel of the drink had a significant mitigation effect on stress and emotional comfort while shopping. In terms of neuromarketing, the sensory pleasure is closely associated with the stimulations of the limbic system, including the serotonin, oxytocin, and endorphin-based pathways. The smell and the warming effects of ginger and coriander must have caused an impressive sensual experience, which led to emotional balance and pleasure. This observation supports the earlier studies, which have revealed that in consumption-related, multisensory food experiences can lead to an improvement in affective responses and the overall satisfaction. H3 was accepted, allowing the conclusion that the neuro-emotional improvements were reflected in the behavioural results. The drinking participants were more engaged in the shopping process, and more time was taken to explore the product. Also, the participants who took the drink said that they had more fun during the shopping process. It is possible to explain these changes in behaviour as secondary consequences of an enhanced neurochemical balance, specifically, more dopamine-based motivation and reduced cognitive overload caused by stress. This, by the neuromarketing definition, implies that positive affective states can prolong the duration of consumer dwell time, as well as inflate interaction with retail stimulus, which leads to purchase-related behaviour.

Overall, the results bridged the gap between biochemical processes and consumer behaviour by demonstrating how a natural, culturally based refreshment beverage can positively impact the consumer's well-being, whilst at the same time, increasing the levels of retail interactivity. The Dried Ginger-Coriander Drink, unlike artificial stimulants, is a non-overstimulating and mild intervention that helps to refresh mentally and sustainably. The research supports the literature on neuromarketing as it brings about facts on the potential application of functional foods in shaping the decision-making process by modulating neurochemicals. Future studies ought to attempt to augment these results with physiological measures of EEG, heart-rate variability or salivary cortisol to directly confirm the hypothesised neurobiological processes.

10. Conclusion

The present research offers good interdisciplinary proof that the traditionally designed refreshment beverages with bioactive phytochemicals can have a significant positive impact on consumer moods, cognition and decision-making in the retail setting. Based on the principles of neuromarketing and neurochemical theory, the study suggests that mild, natural refreshment interventions can suggests a potential association with various neurotransmitter pathways, especially dopamine, serotonin, β-endorphins, and oxytocin, which can govern alertness, emotional stability, engagement, and perceptions of rewards. It can be affirmed that the statistical results obtained on the basis of the ANOVA test which suggested that the consumption of the designed refreshment drink positively influenced the perception of energy, alertness, mental concentration, and decreased mental exhaustion in the consumers (H1 accepted). These mental gains suggest that the drink serves as an efficient way to refresh the brain in the short run during the shopping processes, to overcome the sensory fatigue and attentional weakness that are usually experienced in the shopping areas.

Additionally, the findings also show that the sensory properties of the beverage, including the flavour, smell, and the sedative effect on the body, had a positive correlation with the decreased level of stress, enhanced mood, and satisfaction with the shopping experience (H2 approved). These results are consistent with neurobiological processes when phytochemicals, including gingerols, shogaols and linalool, modulate GABAergic and serotonergic networks to affect emotional stability and psychological ease. The results of behaviour also demonstrated that consumers who drank the refreshment drink demonstrated much more shopping engagement, more time spent exploring products, and enjoyed the process of shopping more (H3 accepted). This suggests that better neurochemical conditions can be translated into apparent behavioural shifts in real-life retail contexts. On the whole, this study addresses the knowledge gap between biochemical reactions of the brain and consumer behaviour by offering a scientifically sound explanation of how ordinary refreshment beverages can be used ethically to increase consumer experience without being manipulative. The results have useful implications among the retailers, marketers, and health-conscious product creators who aim to create an environment that would favour the prosperity of the mind while enhancing engagement and confidence in decisions. This work can serve as a new useful addition to the literature on neuromarketing by combining neuroscience, conventional functional drinks, and consumer behaviour analysis and introduce the opportunities of experimental confirmation of this concept in the future with the help of neurophysiological measures like EEG or biomarkers.

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