



PREVALENCE OF MOTION SICKNESS IN GENERAL POPULATION

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ABSTRACT:

Motion sickness (kinetosis) is frequently observed among individuals and is a complex syndrome that occurs in response to a perceived or real motion, and presents itself as a wide array of symptoms including gastrointestinal, nervous, and autonomic symptoms (cold sweats, nausea, pallor, mouth-watering, headaches, etc. Low-frequency lateral and vertical motions (e.g. air, roads, space, sea, etc.) and virtual motions (e.g. virtual simulators, video games etc.) can be considered triggers of motion sickness. The main aim of this study was to investigate the susceptibility of motion sickness of general population while travelling in different modes of transportation including cars, coaches, buses, airplanes, round-about, rollercoasters or big dippers, ships and small boats etc. where different types of motions are elicited in different modes including angular, linear motions etc. A total of 152 participants, 100 women and 52 males, were assessed for susceptibility. It was observed that females were more prone to MSS than males. It shows that women are more susceptible to motion sickness than men. It also shows that the prevalence is as high as 75% in the general population. Cars were the most popular mode which provoked symptoms of motion sickness in both childhood and adulthood.

INTRODUCTION:

Motion sickness (kinetosis) is frequently observed among individuals and is a complex syndrome that occurs in response to a perceived or real motion, and presents itself as a wide array of symptoms including gastrointestinal, nervous, and autonomic symptoms (cold sweats, nausea, pallor, mouth-watering, headaches, etc.). It is subjective depending upon the variability and severity of symptoms. Hippocrates stated motion sickness as "sailing on sea proves that motion disorders the body", "Naus" being the Greek word for ship (e.g.: nautical). Low-frequency lateral and vertical motions (e.g. air, roads, space, sea, etc.) and virtual motions (e.g. virtual simulators, video games etc.) can be considered triggers of motion sickness. The most widely accepted theory is 'the mismatched theory' where there are conflicting inputs from visual, vestibular, and somatosensory systems which result from real or apparent motions. These discrepancies in the systems result in a cascade of motion sickness symptoms. ^[1]

Various studies conclude that women and children are more susceptible than men, while the highest incidence was in schizophrenic patients and the lowest was observed in Rowers (individuals with greater spatial and motor control), which explains the acclimatization due to habituation by increased frequency of exposure. The mean age at which acclimatization sets in is said to be 21.98 ± 5.93 years, which was observed in 50% of the population which was more susceptible, gets acclimatized due to habituation. Genetic and environmental factors are predictive for motion sickness episodes as genetic predisposition is correlated to a few genes and environmental situations like a type of transportation, and terrain can induce a response in the form of sickness. ^[2]

The sensory rearrangement theory (see Reason & Brand 1975) was widely accepted as it can be stated in the form of two premises. The first is that all situations which provoke motion sickness are characterized by a condition of sensory rearrangement in which the motion signals transmitted by the eyes, the vestibular system, and the non-vestibular proprioceptors are at variance, conflicting one with another, and hence with what is expected on the basis of previous transactions with the spatial environment. The nauseogenic conflict is between the present sensory information and that retained from the immediate past, or what Held (1961) has called 'exposure-history'. The second premise of this theory is that irrespective of what other spatial senses are part of

these conflicts, the vestibular system must be implicated, either directly or indirectly (as in visually-induced sickness), for motion sickness reactions to ensue. Not only does this accommodate the well-established fact that susceptibility depends upon an intact vestibular system (see Money 1970), but it also tells us something about the nature of the effective motion stimulus; namely, that it must involve a changing rather than a constant velocity component since the vestibular receptors are only responsive to angular and linear accelerations.^[3]

This study focuses on the visual-vestibular rearrangements in modes of transportation, including buses, cars, trains, aircraft, small boats, ships, channel ferries, swings on playgrounds, roundabouts in playgrounds, big dippers and funfair rides which characteristically depicts the three types of conflicts observed in different modes of transportation.

Most of the studies have derived the susceptibility in females more than men and in the young population more than compared to the adult population. It is either due to increased responsiveness to sickness-inducing agents or they are unable to acclimatize to motion sickness. Acclimatization is achieved in older adults due to habituation or decreased responsiveness to sickness. Various studies suggest that as age progresses, there is increased habituation to linear and angular motions which act as the aggravating factor or the triggers for sensory conflicts.

NEED FOR STUDY:

To assess the susceptibility along general population as there is a need of clarity about its incidence in Indian population. There is need to check the prevalence among the pediatric population and adult population along with varying symptoms and its severity along with type of motion. There are dearth in literature articles and researches present upon the quantity of people who suffer with motion sickness in India, along with the general population residing in all varying terrains, including costal, hilly, plateau etc. There is need to understand the varying trend in the symptoms presented in general population and provide the necessary information for further research in tackling the symptom.

MATERIAL AND METHODOLOGY:

Material required: Motion sickness susceptibility questionnaire (MSSQ)

Study design: Telehealth survey-based.

Sampling method: Random.

Study type: Observational.

Sample population: General population.

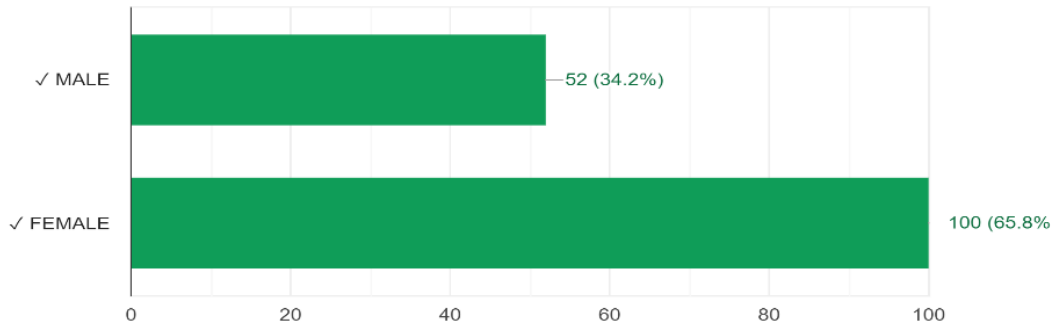
Procedure: Synopsis was prepared and will be presented to the panel for approval of topic for research. Permission will be taken from Institutional Ethical Committee of Tilak Maharashtra Vidhyapeeth, Department of Physiotherapy. General population will be approached and consent will be taken from the participants. Participants will be selected according to the inclusion and exclusion criteria and the aim and methodology will be explained. In case of language barrier, the Marathi version of motion sickness susceptibility questionnaire will be provided [8]. Subjective Motion Sickness Susceptibility Questionnaire will be explained and be answered by the participants to assess the prevalence of motion sickness in general population and its varying severity. The questionnaire will be sent through the google forms format as this study is a telehealth survey. Later, the data will be collected and statistically analysed.

RESULT AND INTERPRETATION:

Gender- among the 152 participants in the study, 100 were females and 52 were males.

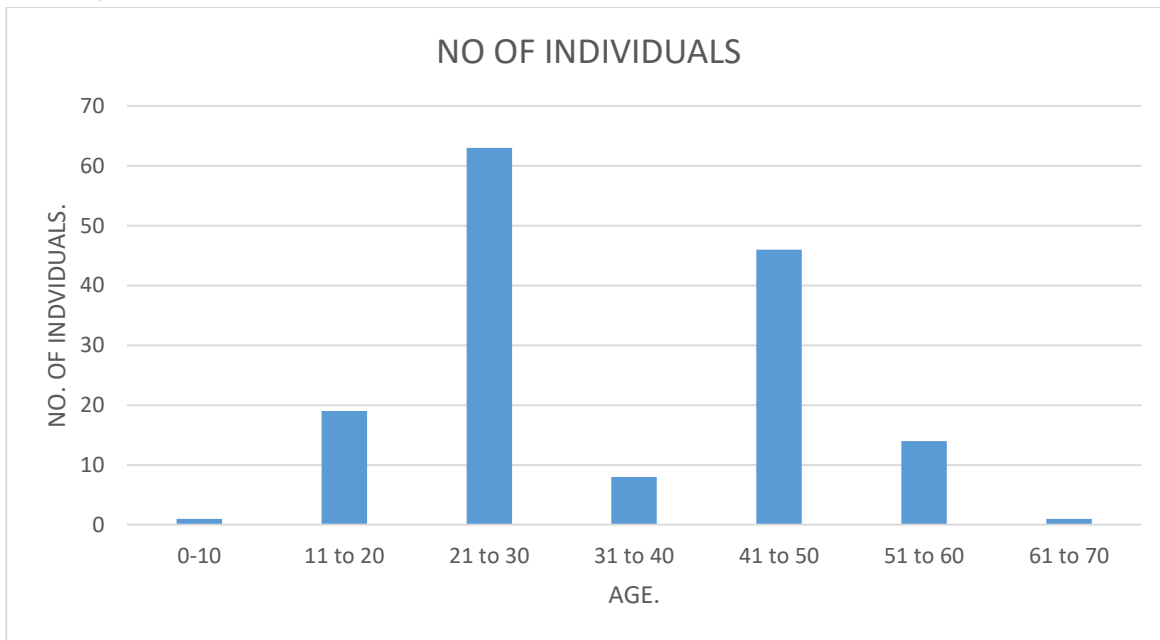
GENDER

152 / 152 correct responses



Graph.1

Age- highest incidence was observed in 21 and 22 year old population, followed by ages 50. Mean age is 37.

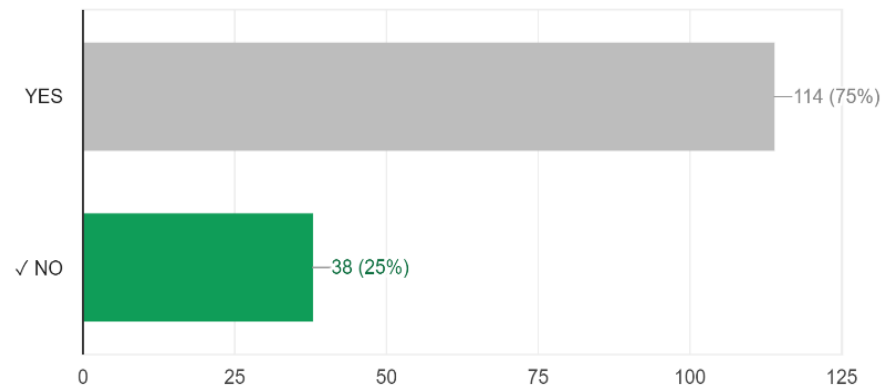


Graph.2

Among 152 people, 114 participants experience motion sickness, while 38 did not.

HAVE YOU EVER EXPERIENCED MOTION SICKNESS? (NAUSEA, VOMITTING, HEADACHE, DRY MOUTH, DIZZINESS ETC)

38 / 152 correct responses



Graph.3

DISCUSSION:

The result of the study follows alternate hypothesis, in correlation to the incidence of motion sickness in general population in India, irrespective of their age, gender, topography of residence etc. The main aim of this study was to investigate the susceptibility of motion sickness of general population while travelling in different modes of transportation including cars, coaches, buses, airplanes, round-about, rollercoasters or big dippers, ships and small boats etc. where different types of motions are elicited in different modes including angular, linear motions etc. A total of 152 participants, 100 women and 52 males, were assessed for susceptibility. It was observed that females were more prone to MSS than males.

As proved by K. Sharma ^[2] in northeastern and northwestern Indians, which impended on the topography of the area, proved that the northeast Indian population was slightly more susceptible than the northwest Indian population. He also proved the mean age of acclimatization to be 21 ± 5.93 years, which happens to correlate in this study where the age of highest susceptibility was found among the age 21 and 22 group. K.sharma indicates that the habituation to certain topographical location changes the rate of acclimatization of a human, and even went on to hypothesize that those individuals whose sensory control fail to initiate adaptive steps in response to stress cause by provocative movements are likely to be more susceptible to motion sickness. Briefings Takahashi et al. definition of motion sickness as “mixture of autonomic nervous symptoms, ataxia, and dizziness or vertigo resulting from impaired spatial orientation” which correctly points out the spatial disorientation while travelling or being exposed to various means of movements including linear and angular movements. Takahashi even describes motion sickness to be a danger or caution signal against irregular or disruptive motions, with spatial disorientation.

Andreas Koch et al. found younger children and women to be more susceptible which includes symptoms ranging from massive vomiting to fatigue. Low frequencies ranging from 0.2- 0.4 Hz were proven to induce symptoms of various intensities. The results acquired by this study also describes the age group affected to be similar to Koch et. al. observations. Along with that, population in their mid-fifties were also found to be susceptible. Women were found remarkably more susceptible than men in all age groups.^[1]

J.F. Golding successfully concluded horizontal motion with patients sitting in upright position was comparatively more nauseogenic than vertical oscillations mathematically, where the primary goal was to assess the effect of motions and its frequency in inducing motion sickness. It also suggested that the intensity of symptoms increases depending upon the exposure time and acceleration intensity. Another study was conducted by Alexander et al following this theory, where Controlled laboratory experiments were performed for 20 min exposure duration, and frequency ranging from 0.22 – 0.53 Hz, by using a modified elevator. It concluded that lesser frequencies,

around 0.167Hz caused increased severity of motion sickness in a closed cabin, suggesting maximum frequency of motion sickness felt around this motion frequency.^[4]

A.C. Paillard et al, in his research about motion sickness in healthy subject and vestibular patients, reported that vestibular patients were less prone to MSS than healthy individuals, which concluded that effective vestibular reaction can only be produced if vestibular system is unaffected and healthy. In our study, focus was on healthy individuals with healthy systems, who did not report of any vestibular issues, GI tract issues and pregnancy, which happened to be its exclusion criteria, due to its variability according to causative condition. But more also stated in this said article, females were more prone to MSS than males, and MSS was more common in childhood than adulthood, which coincides with the results of this study.^[9]

In contradiction with our study, Riccio and Stoffregen proposed a completely new theory which states that “sensory conflict does not exist”, as it stated that the stimulation of a single sense organ can be ambiguous with respect to relative motions of the animal and the environment. However, the pattern of stimulation across sense organ may not be ambiguous with respect to such motions. It suggests that postural instability could be related to the concept of dynamical disease which has been developed in the literature on nonlinear physiological control system. They observed postural instability in various provocative environments such as weightlessness, low frequency vibrations and flight simulators to assess their hypothesis, where low frequency vibrations were considered in the form of travelling in buses or coaches, similar to this study. But since there is an inherent control of humans over postural instability, one can simply adapt to motions by shifting its frequency and acclimatize oneself to predicted outcome. Strategies can be developed to control postural instabilities when there is increased exposure to MS inducing frequencies.^[5]

RESULTS (LAST 10 YEARS)

	NEVER TRAVELLED	NEVER FELT SICK	RARELY FELT SICK	SOMETIMES FELT SICK	FREQUENTLY FELT SICK.
CAR	1.3%	46.7%	16.4%	19.7%	15.5%
BUS	3.3%	51.3%	15.1%	19.1%	11.2%
TRAINS	2%	80%	11.8%	4.6%	0.7%
AIRCRAFTS	16.4%	67.1%	12.5%	1.3%	2.6%
SMALL BOATS	19.1%	58.6%	12.5%	7.2%	2.6%
SHIPS	38.2%	46.1%	5.9%	8.6%	1.3%
SWINGS	13.8%	65.8%	10.5%	5.9%	3.9%
ROUND-ABOUTS	17.8%	54.6%	15.8%	5.3%	6.6%
FUNFAIR RIDES.	21.1%	44.7%	18.4%	9.2%	6.6%

Table.1

RESULTS (AS A CHILD- TILL 12 YEARS)

	NEVER TRAVELLED.	NEVER FELT SICK.	RARELY FELT SICK.	SOMETIMES FELT SICK.	FREQUENTLY FELT SICK
CAR	2.6%	38.8%	18.4%	21.7%	18.4%
BUS	----	38.8%	19.7%	22.4%	19.1%
TRAINS	2.6%	78.3%	11.2%	7.2%	0.7%
AIRCRAFT	40.8%	46.7%	4.6%	5.9%	2%
SMALL BOATS	27%	53.3%	5.9%	7.2%	1.5%
SHIPS	50.7%	35.5%	5.9%	6.6%	1.3%
SWINGS	0.7%	63.8%	17.8%	12.5%	5.3%
ROUND-ABOUTS	1.3%	57.2%	17.8%	12.5%	11.2%
FUNFAIR RIDES	13.2%	40.1%	18.4%	18.4%	9.9%

Table.2

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