Motion Sickness

By Constantine Lygonis

In a country where the communications are governed by the necessity of sea travel, the problem of motion sickness is more acute.

This article was suggested by the Chief Medical Officer for Faroe Islands, Dr. H. D. Joensen, who is interested in ivestigating how the population of a fishing and seafaring community responds to the frequent stress of motion sickness.

Motion sickness is unique amongst all illnesses that are known to humans because it can cause complete temporary incapacitation without any pathological basis, and entirely by reflex mechanisms.

At some time or other, almost every known substance has been tried for the prevention and treatment of motion sickness: Creosote, a mixture of salt and vinegar, horseradish, withered herrings (Brit. Med. J. 1862), a mixture of hydrocyanic acid, nitric acid, Hydrochloric acid, and magnesium sulphate (*Hocken* 1861). Petroleum and nicotine pills were sold in Great Britain, chewing gum was advocated by *Monto* (1947) in a paper.

Brandy, gin, champagne, pilocarpine, ergotamine, belladonna, and phenemal have also been suggested. Various procedures were advised such as salt water baths (*Bennett* 1928), tight compression of the neck, and packing of the ears with cotton wool (*Lemon* 1919).

The reflex of motion sickness.

The subject has been reviewed by *Borison* and *Wang* (1953) and *Chin* and *Smith* (1955).

The receptors from which the reflex of motion sickness originates are undoubtedly the vestibular apparatus of the ear. This was suspected by *Purkinje* in 1820, and much evidence has been collected since.

In the past was some belief that motion sickness was due to maladjustement to traveling conditions and manifestation of psychiatric instability, but this is unlikely as animals are subjects of motion sickness.

Deaf mute people or people with Menieres syndrome do not develop motion sickness, nor are dogs affected after the destruction of their vestibular apparatus. It is also known that the reflex stimulus is linear acceleration, and this was first suggested by *Wilks* (1875) when lifts were brought into use.

Table No. 1.

Age Group	Females	Males	Total
10–20	261	168	429
21–30	336	215	551
31–40	268	174	442
41–50	258	173	431
51–60	196	95	291
61–70	255	140	395
71–75	64	25	89
	1638	990	2628

Subjects and method.

The data were collected during 10 months in 1967—68. All patients who attended the consultation rooms were questioned regardless of their age, profession, or reason for visiting the doctor. The mothers were asked regarding their children.

A total of 2628 people were questioned from 8 villages (Vágur, Sumbøur, Porkeri, Hovi, Miðvágur, Sandavágur, Sørvágur). Each subject was asked if he were seasick, what medicin he preferred and how effective it was. The ages of the questioned subjects were from 10 years to 75 years.

The results of the findings are reported here.

In table 1 are the numbers, sex, and age of the people questioned.

In table No. 2 are the numbers of people questioned, age groups, those who are affected by seasickness, and those who are not. Those that are affected are separated into two columns. In the first column are the people who are seasick always, regardless the severity of motion, in the second are the people who are affected only when the motion is severe or prolonged.

Table No. 3 gives the number of the male subjects, their age and their profession. This was divided into two main categories: seamen and non-seamen. In the seamen category are included all who are sailing professionally, and not those who fish occasionally for pleasure. In the other, non-seamen category, are included all other professions.

In table No. 4 is the number of people and the drug of their preference.

Almost all of them would not like to change medication or try another one.

From table No. 4 it appears that various people prefer certain medicine, and the resulting effect of this particular drug may be influenced by psychological factors.

From table No. 2 it is evident that the percentage of females affected (41.7%) is almost twice that of the males affected

Table No. 2.

Age group	Females							Males						
	No questioned	Affected always	%	Affected occasionally	%	Not affected at all	%	No questioned	Affected always	%	Affected occasionally	%	Not affected at all	%
10–20	261	141	54.	90	34.2	30	11.8	168	58	34.5	22	13.3	88	52.2
21–30	336	125	37.2	116	34.6	95	28.2	215	65	30.2	78	36.3	72	33.5
31–40	268	80	28.5	95	36.4	93	35.1	174	71	40.8	32	18.4	71	40.8
41–50	258	108	42.8	76	29.2	74	28.	173	39	22.5	52	30.4	82	47.1
51–60	196	86	43.9	63	32.6	47	23.5	95	15	15.8	30	31.6	40	42.1
61–70	255	109	42.8	84	32.7	62	24.5	140	32	22.8	64	45.7	54	38.5
71–75	64	34	54.	16	25.2	14	20.8	25	5	20.	12	48.	8	32.
Total	1638	683	41.7	540	32.9	415	25.4	990	285	27.1	290	28.1	415	45.8

Table No. 3.

Age group	Total number questioned	Seamen							Not Seamen						
		Number questioned	Affected always	%	Affected occasionally	%	Not affected at all	%	Number questioned	Affected always	%	Affected occasionally	%	Not affected at all	%
14–20	120	72	26	36.1	38	52.7	8	11.2	48	15	33.3	27	56.2	6	10.5
21–30	215	129	24	18.4	72	56.	33	25.6	86	31	38.4	33	37.	22	24.6
31–40	174	102	22	21.5	36	35.3	44	43.2	72	18	25.	33	45.8	21	29.2
41–50	173	94	17	18.1	36	38 3	41	43.6	79	10	12.6	49	62.1	20	25.3
51–60	95	46	9	19.8	15	32.7	22	47.5	49	9	18.3	24	48.8	16	32.9
61–70	140	86	18	20.9	22	25.6	46	53.5	54	13	24.	27	50.	14	26.
71–75	25	16	2	12.5	3	18.7	11	68.8	9	0	—	2	22.2	7	77.8
Total	942	545	118	21.4	222	47.3	205	41.3	397	96	24.1	195	49.	106	26.9

Preference in Medication. Table No. 4.

Medicine	Females			Males		
	Number of questioned	Satisfied with results	Not very satisfied	Number of questioned	Satisfied with results	Not very satisfied
Postafen	303	250	53	48	44	4
Neptusan	386	300	86	65	55	10
Trihistan	25	22	3	15	14	1
Anautinum	90	62	28	12	8	4
Amidryl	24	20	4	2	2	0
Phenergan	36	34	2	14	13	1
Koffinautin	58	45	13	19	17	2
Marzine	164	116	48	28	24	4
Not particular	110	85	25	78	70	8

(21.1%) regardless of their ages. This is correct for the affected occasionally (females 32.9%, males 28.1%), and the percentage is reversed in those not affected at all (females 25.1%, males 45%).

If this is due to sex susceptibility or to the fact that the females are sailing less frequently can be seen from table No. 3.

From this table it seems that the seamen are affected less than the non-seamen by a ratio of almost 2:1. The percentage of seamen not affected at all, regardless of age, is 41.3%, and of non-seamen in the same category is 26.9%.

During the questioning, some of the seamen (60%) addmitted that although they were seasick the first few days of sailing, afterwards they were not affected and continued to work without use of any drugs. This according to *Glasser* and

Hervey (1952) was due to habituation to wave motion, and it lasted as long as that particular trip.

Discussion.

Motion sickness was so named by *Irwin* in 1881, for he knew that the sickness was the same whatever the initial cause for acceleration. It is now known that the receptors for motion sickness are in the vestibular apparatus, chiefly in the utricle, where the otolith, which resembles a little pebble, rests upon the hairlike receptors. The vestibular apparatus normally serves ordinary postural reflexes, but there is a complex pathway for motion sickness involving the cerebellum and the brain stem. There are also pathways to the cerebral hemispheres transmitting the sensation of nausea. The efferent fibres cause relaxation of the stomach, contraction of the duodenum, and sharp contraction of the abdominal muscles further accompanied by closing of the glottis and opening of the mouth which leads to vomiting. This reflex vomiting is the essential process of motion sickness, but nausea usually precedes vomiting, and this is an integral part of motion sickness. Rarely explosive vomiting may precede nausea, but at some stage or other nausea is always present. Other symptoms, i. e. dizziness, headache, and sleepiness can be caused by anxiety (*Glacer* and *Whittow* 1954). Equally perspiration and diarrhoea, which often accompany vomiting, are not typical signs, but probably the result of generalised central nervous exitation. Smells and anxiety seem to make motion sickness worse.

There is experimental evidence that the reflex pathways are facilitated by usage (*Eccles* 1953), and it is possible that people may acquire the habit of being sick, so that when they travel and use a certain type of transport, they will suffer from nausea and vomiting.

It is also known that reflexes can be conditioned, thus a person who has often been sick from the motion of a ship may become sick again at the sight or smell of a ship.

Fortunately there is a more important mechanism: that of habituation. This consists of diminution of responces to the repeated or continued stimuli, and helps to bring some improvement in most people after repeated or prolonged exposures to wave motion. Habituation must play an important part in reducing motion sickness amongst those who travel much and is probably the reason why children are more prone to motion sickness than adults. However, habituation is highly specific, so that it occurs only with regard to a precise stimulus (*Glacer et al* 1959), which means that habituation to one kind of motion will not necessarily protect against another kind of motion. This explains why people who are used to the short period acceleration in small boats, are sometimes sick in larger ones which oscillate at longer periods and accelerate and descelerate at different rates. Similarly, those who are good sailors in large ships are often sick in smaller boats or aeroplanes.

An understanding of the physiological mechanisms which have been discussed, suggests several ways of inhibiting motion sickness. Obviously those who favour lying down and those who favour standing up on deck, are both right, since lying dawn will reduce vestibular stimulation, while standing up and looking at the horizon will accelerate habituation and reduce visual distortion. Equally, of course, both views are wrong because lying down will prevent habituation, and standing up will facilitate nausea and vomiting. From what is known about the influence of the brain on reflexes, it follows that distracting and interesting activities can help to prevent motion sickness by drawing the person's attention from his symptoms.

Medication.

The first antihistamine substance to be given against motion sickness was antisan (*Mc Evedy* 1949). Since then various antihistamine drugs have been introduced against motion sickness, but they are not all effective.

Certain drugs diminish the liability to sea sickness. The most satisfactory is not decided, but there is a little evidence that hyoscine is better for short journeys in doses 0.5—1 mg 20 minutes before departure, lasting up to 4 hours. Side effects include dry mouth and paralysis of accomodation. For longer journeys antihistamines are preferred. It is not known how they act exactly against motion sickness.

Various people have preference to various drugs. The resulting effect may be influenced by psychological factors.

SUMMARY

Motion sickness is a unique illness affecting humans and animals completely incapacitating the affected subjects without any pathological basis. The receptors for motion sickness are in the vestibular apparatus. Deaf or mute people, or animals with experimental destruction of their vestibular apparatus, are not affected by motion sickness.

It appears that age and sex have no influence on seasickness although the profession and the regular sailing influence the appearance of seasickness with habituation to wave motion. The population of the above mentioned Faroese communities, in spite of generations of frequent seatravel, are still not free from motion sickness.

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ÚRTAK

Ferðaverkur er at siga eindømi um sjúku, sum fólk og djór fáa, og sum ger tey, ið hon ber við, heilt fyri ongum, hóast ongar sjúkligar broytingar eru at finna. Vøgugøgnini í innoyranum taka við ferðaverkinum. Deyv og dumb fólk eins og royndardjór, har vøgugøgnini í innoyranum eru týnd, fáa ikki ferðaverk.

Líkt er til, at aldur og kyn hava einki at týða fyri ferðaverk, hóast yrki og støðug sigling gera fólk vand við sjógvin.

Íbúgvarnir í omanfyri nevndu føroysku bygdunum eru enn ikki slopnir undan sjóverki, hóast ættarlið undan teimum hava ferðast nógv á sjónum.

REFERENCES

1. *Bennett R. A.* (1928) Brit. Med. J. i. 752.
2. *Borison H. L.* and *Wang S. C.* (1953) Pharmacol. Rev. 5, 193.
3. Brit Med. J. (1862) ii. 371.
4. *Chin H. J.* and *Smith P. K.* (1955) Pharmacol. Rev. 7. 33.
5. *Eccles J. C.* (1953). The Neurophysical Basis of Mind. Oxford p. 193.
6. *Gay L. N.* and *Carliner P. E.* (1949). Science 109. 359.
7. *Glacer E. M.* and *Hervey G. R.* (1951) Lancet ii. 749.
8. *Glacer E. M.* and *Hervey G. R.* (1952) ibid. i, 490.
9. *Glacer* and *McCance R. A.* (1959) Lancet i. 853.
10. *Glacer* and *Whittow G. C.* (1954). Clin. Science. 13. 199.
11. *Hocken T. M.* (1881) Lancet ii. 337.
12. *Irwin J. A.* (1881) Lancet ii. 907.
13. *Lemon A. E.* (1919). J. Amer. med. Ass. 73. 104.
14. *McEvedy M. B.* (1949). Lancet i. 825.
15. *Monto R. W.* (1947). J. Mich. Med. Soc. 46. 114.
16. *Wilks S.* (1875). Lancet ii. 576.