Air sickness in pilot trainees

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ABSTRACT

Objectives: Motion sickness is a common and debilitating response to provocative motion environment, to which a person is unfamiliar and hence unadapted. It poses a particular problem to aircrew in training, degrades performance in the air, and wastes training time. This paper discusses the incidence, attrition rate and to evaluate the therapeutic role of transderm scopolamine system in motion sickness during flight training in the Royal Jordanian Air Force.

Methods: Three hundred and forty one flight trainees were included. Designed form elaborating symptoms, correlating factors and response to therapeutic transderm scopolamine system was prepared, a case definition of motion sickness was developed. Data collected from the medical and squadron records were analyzed to evaluate the incidence of motion sickness and the efficacy of therapeutic transderm scopolamine system in reducing the attrition rate.

Results: One hundred and six trainees out of 341 (31%) developed motion sickness. A total of 11 (3%) trainees were eliminated from flight training due to that reason. Therapeutic transderm scopolamine system was effective in 87% of cases. Familial mediterranean fever and self medication with Retin A (Tretinoin) cream were discovered in two unresolved cases.

Conclusion: Motion sickness continues to present difficulties to flight trainees. Clinical assessment is mandatory to exclude secondary causes of motion sickness. Therapeutic transderm scopolamine system can be an effective drug in reducing the susceptibility to conditioned motion sickness with few and tolerable side effects. Further studies to elaborate on other means like desensitization particularly in qualified pilots is encouraged.

Keywords: Motion sickness, flight trainees, therapeutic transderm scopolamine system.


Motion sickness (MS) has been and continues to be a problem in aerospace medicine and is a particular problem in pilot trainees. Motion sickness has been defined as "a state of diminished health characterized by specific symptoms that occur in conjunction with, and in response to unaccustomed condition existing in one's motional environment, the symptoms progress from lethargy, apathy and stomach awareness to nausea, pallor and cold perspiration, finally the unfortunate victim may retch, vomit or be totally prostrate".1

Response to motion is not limited to aerospace environment, in addition to air sickness, motion sickness has been described in response to the motion of the sea (the origin of the term nausea), cars, trains, amusement park rides, camels, and even in response to motion pictures.2

The current theoretical explanation for motion sickness is the "sensory conflict" or "neural mismatch" hypothesis. The theory states that motion sickness results from the simultaneous presentation of conflicting orientational information, the eyes are telling one thing but the inner ear is telling something quite different.3

However motion sickness is more complex than this, as there appears to be some effect of conflict between the anticipation of orientational information and actual orientational information presented to the sensory organs, for example pilots rarely get sick while they are in control of the aircraft, but they can

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get sick if they fly as a co-pilot the same profile.4
Numerous treatments have been attempted for motion sickness, none of which have proved completely satisfactory or successful.4

Reassurance is the first and most important step, especially in dealing with pilot trainees. “Preparations containing Scopolamine have been used against motion sickness for almost a century”.4 Their main operational limitations are short biological half-life, narrow therapeutic range, and undesirable side effects.3

In order to overcome some of the drawbacks associated with traditional scopolamine administration, while preserving its efficacy, a therapeutic transderm scopolamine system (TTSS) has been developed. It produces a steady plasma scopolamine concentration in the range of 0.17-0.23 nmol/L. The equilibrium is maintained for 72 hours, providing a time for the few flights required for a student to adapt.10,11

This paper aimed to highlight the incidence of motion sickness and the effectiveness of TTSS in its management and reduction of attrition rate among flight trainees in Royal Jordanian Air Force.

**Methods.** Three hundred and forty one male pilot students included in this study had their training at King Hussein Air College over a 3 years period (1994-1996), which consisted of screening, basic and advanced phases.

All students were medically fit and on flying duty. They underwent a thorough medical check-up including auditory and visual examinations, initially at the time of selection and 18 months later. The age group was between 18-24 years.

A case definition of motion sickness was developed that included the occurrence of 3 or more of the following symptoms during the flight: stomach awareness, vomiting, dizziness, sweating, hyperventilation and headache.

Our management protocol for motion sickness in pilot trainees varies accordingly to the phase of training.

In screening phase, students are reassured by instructor pilot and squadron leader for the first episode of motion sickness, they report to the flight surgeon on the second episode to rule out acute illness or possible organic causes predisposing to their symptoms. They are reassured that some motion sickness is entirely normal, and advised that repeated exposures to motion environment over a short time period will cause most people to adapt and that they are likely to adapt also. They are instructed to have flight controls, minimize head movements and not to overventilate. Those who experience motion sickness in 7 or more flights out of 14 will be eliminated from the training program.

In basic and advanced phases the same is applied.
for the first two episodes of motion sickness, a TTSS patch is applied on a dry skin behind the ear on the third episode of motion sickness at 11 PM, allowing the trainee to fly cruise and aerobatics in the next 3 successive days. He is instructed to have normal diet and sleep, not to take any medications, not to consume alcohol or caffeine-containing beverages. Smoking is not restricted. He has to report to the flight surgeon daily for medical check-up and to fill in a questionnaire exploring symptoms, performance, and side effect of TTSS. (Figure 1).

If symptoms continue to recur, the TTSS patch is removed and a new one is applied 24 hours later behind the other ear, and the student will have three more flights within the next three days.

In case symptoms don’t resolve in spite of the above measures, the student is considered disqualified and eliminated from training.

Qualified pilots experiencing motion sickness are not included in this study, they have a different protocol, which includes desensitization, Barany chair and Bio-feedback mechanisms.

Data were collected from the medical and squadron records and analyzed to evaluate the frequency of motion sickness, the main symptoms and the effectiveness of TTSS in reducing the attrition rate.

**Results.** One hundred and six (31%) out of 341 flight students experienced motion sickness, 8 of them were disqualified during the screening phase. One hundred and thirty-eight students were dismissed because of self suspension, poor performance and administrative reasons. One hundred and ninety five trainees succeeded to enter the basic phase. One hundred and three out of 195 trainees were due to causes other than MS and 3 out of 92 trainees were disqualified because of MS. A number of 89 trainees were promoted to the advanced phase.

Table 1 presents the number and percentage of trainees with motion sickness during the screening, basic and advanced phases 106 (31%), 48 (25%) and 12 (13.5%).

A total of 11 (attrition rate 3%) out of 341 were disqualified because of motion sickness.

Among the 60 trainees (48 in basic phase and 12 in advanced phase), TTSS was needed in 31 trainees while other 29 resolved spontaneously.

TTSS was effective in aborting motion sickness symptoms in 27 out 31 trainees, making a success rate of 87%.

Familial mediterranean fever was diagnosed in unresolved case and concealed self medication with Retin A (Tretinoin) was considered responsible for TTSS failure in another case, because the symptoms disappeared spontaneously on withdrawal of Retin A.

Table 2 summarizes the incidence of side effects of TTSS among the 31 trainees. Mouth dryness was the most frequent side effect (42%) while dizziness and allergic dermatitis were the least frequent (3%). No withdrawal symptoms were noted among the whole users of TTSS.

**Discussion.** The frequency of and attrition rate due to motion sickness show wide variations among different institutions, "more recent studies of the incidence of air sickness in the United States and British military flight training reveal that approximately 40% of aircrew trainees become air sick at sometime during their training. In student pilots there is a 15-18% incidence of motion sickness that is severe enough to interfere with control of the aircraft." Most modern air forces have a fairly consistent loss of 1-2 percent of pilot trainees from unresolved motion sickness.

This study showed that 31% of Royal Jordanian Air Force flight students experienced motion sickness, with 3.2% attrition rate.

"The reporting differences in rates depend on definition of motion sickness, the population looked at, and the means used to determine the occurrence of motion sickness".

It is recommended to perform a thorough medical check up to rule out possible predisposing factors such as illnesses or medications.

In summary, motion sickness is a common problem in flying training. TTSS application shows a significant response in relieving the symptoms without causing major side effects or compromising the performance or safety.
References


