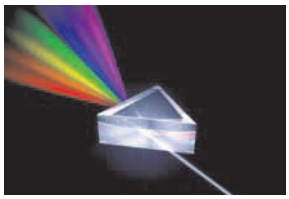

The dark side of the moon

Leonie A Calver, Barrie J Stokes and Geoffrey K Isbister

ABSTRACT

Objective: The belief that the full moon and disturbed behaviour are closely linked is alive and well, despite studies to the contrary. We investigated the possibility that there is an association between only extreme behavioural disturbance and the full moon.

Design, setting and participants: We undertook an observational study of patients with violent and acute behavioural disturbance who presented to the emergency department of Calvary Mater Newcastle and patients with less severe behaviour for whom hospital security calls were made.

Main outcome measure: Proportion of patients for whom presentation or security call occurred in each lunar phase, modelled as a Poisson process.

Results: Of 91 patients with violent and acute behavioural disturbance, 21 (23%) presented during the full moon — double the number for other lunar phases ($P = 0.002$). Sixty (66%) had either alcohol intoxication or psychostimulant toxicity, and five attacked staff (biting [2], spitting [1], kicking [1] and scratching [1]). In contrast, 512 hospital security calls for patients with less severe behaviour were evenly distributed throughout the lunar cycle.

Conclusion: Violent and acute behavioural disturbance manifested more commonly during the full moon.

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The favoured belief that phases of the moon ("Luna") and extreme human behaviour are closely linked is alive and well within the health care system. This folklore, which links behavioural disturbance with the full moon (ie, the lunar phase of the brightest illumination), is not easily explained by modern science but is regularly observed. Ask any seasoned health care worker who deals directly with the more troubled public and they will argue that there is a monthly predictability of behavioural disturbance. Those most enthusiastic about the link between disturbed behaviour and the full moon are mental health care workers, nurses in dementia units, emergency department (ED) staff and university students.[1] In EDs, it manifests as extreme behaviour in drug or alcohol intoxicated patients who assault the department on a regular basis with violent and aggressive behaviour.[2,3] So why do we recognise a link, yet doubt its credibility?

The literature abounds with studies to dispel this legendary phenomenon. Sceptics label it superstition, selective recall, bias and sensationalism.[1] However, attempts to debunk the association between the moon and acts of lunacy have looked only at specific patient groups.[4-8] Perhaps these groups are insufficiently disturbed to establish the association. Other studies have looked at the prevalence of car accidents, crisis centre calls, suicidality, and disturbed behaviour in institutionalised patients with mental illness during the full moon[9] — but are these really the most extreme behaviours? For example, mental health institutions have improved considerably since the days when they were referred to as "lunatic asylums". Improvements include the introduction of artificial lighting, which may dispel effects of the moon, and antipsychotic medication, which modifies behaviour and potentially reduces patient vulnerability to lunar phases. However, patients with less severe disturbance are still used by many researchers to investigate the effect of the lunar phases on disturbed behaviour.

Previous studies have not considered the degree of behavioural disturbance in their study populations, which may range from mild behavioural disturbance to full-blown uncontainable violence. Although defining degrees of behavioural disturbance may be somewhat subjective, this is a particularly important factor in analyses involving human behaviour with all its variability. We therefore postulated that the phase of the moon may be associated with only extreme violence and acute behavioural disturbance and that this association is dependent on the severity of behavioural disturbance.

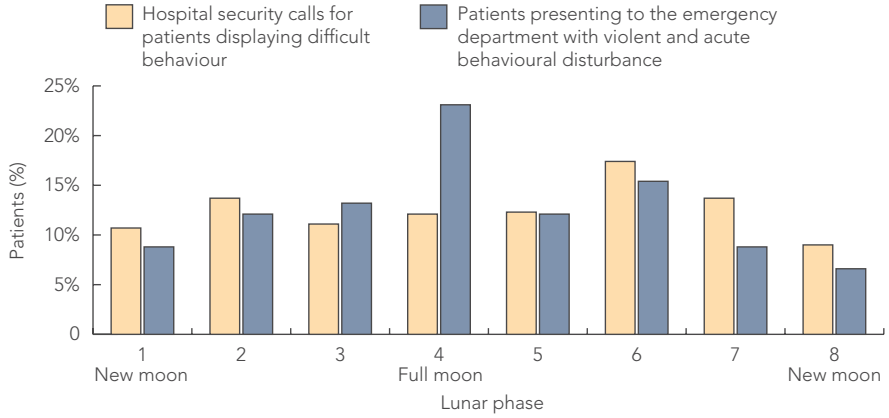
To investigate the possible association between lunar phases and extreme aggression and agitation, we studied a group of patients with violent and acute behavioural disturbance who presented to an ED, and compared these patients to a group with less severe behaviour for whom hospital security calls were made.

METHODS

We undertook an observational study from August 2008 to July 2009 at Calvary Mater Newcastle, which compared two groups of patients with different severities of behavioural disturbance. The first comprised patients with violent and acute behavioural disturbance who presented to the ED, and required parenteral sedation and physical restraint to protect themselves and others. These patients were recruited prospectively as part of a clinical trial. The second comprised patients with less severe behavioural disturbance from the entire hospital. This group was identified retrospectively from records of all hospital security calls made by staff requesting assistance to help manage patients who were displaying difficult behaviour. Approval was obtained for the study from the Hunter New England Human Research Ethics Committee.

The dates of ED presentations and security calls were recorded for all patients, and StarDate Online (http://stardate.org/) was searched to determine the lunar phase for each episode. As there are eight phases of the moon, which succeed each other with a periodicity of 3.69 days, 4 days were chosen out of each month of the study period to represent the full moon. The primary outcome was the proportion of patients for whom ED presentations or security calls occurred during each phase of the moon. The numbers of patients presenting with violent and acute behavioural disturbance to the ED and numbers of hospital security calls during the eight phases of the moon were modelled as Poisson processes, with separate distributions for the full moon phase and non-full moon phases. The posterior probability that the underlying full moon event rate was greater than the non-full moon event rate was calculated in OpenBUGS version 3.0.3 (University of Helsinki, Helsinki, Finland).

Behavioural disturbance in patients at Calvary Mater Newcastle by lunar phase, August 2008 to July 2009



RESULTS

Of 91 patients who presented to the ED with violent and acute behavioural disturbance, 21 (23%) presented during the full moon, which was approximately double the number for other lunar phases (Box). The posterior probability that the event rate during the full moon was greater than during other phases was 0.998. This is equivalent to a one-sided *P* value of 0.002 for a classical test of the null hypothesis that the two Poisson rates were equal, versus the alternate hypothesis that the full moon event rate was greater than the non-full moon event rate. Sixty of the 91 patients (66%) had alcohol intoxication and/or psychostimulant toxicity. Five of the 91 patients attacked staff — biting (2), spitting (1), kicking (1) and scratching (1).

There were 512 hospital security calls for assistance to help manage people who were displaying difficult behaviour; approximately equal numbers of these calls occurred during each of the lunar phases (Box), with no statistically significant increase in number during the full moon. Few of these patients were physically restrained or sedated; when confronted, they had the ability to listen and see reason, take medication if required, and alter their behaviour.

DISCUSSION

We found that violent and acute behavioural disturbance manifested more commonly during the full moon, and most patients with violent and acute behavioural disturbance had indulged in alcohol, recreational drugs or both. In addition, our data confirmed previous findings showing that people with less severe behavioural disturbance present equally throughout the lunar phases.[4-8] In spite of security being required, physical restraint or sedation was rarely required to manage these latter patients. This more controlled group is likely to be of similar temperament and level of agitation as groups in previous studies which have attempted to dispute the validity of a lunar link. It could be argued that such groups are not representative of pure lunacy.

The mechanism that underlies the association between behavioural disturbance and the lunar cycle is open for speculation. It has been suggested that the disturbance arises because full moon nights are 12 times brighter under a clear sky than those during the first and last quarter phases, and therefore it is likely that people stay up later and sleep less.[10] Even partial sleep deprivation over the course of one night can induce mania.[10] It is plausible that sleep disturbance during a full moon may exacerbate a manic episode in a predisposed individual. Another theory for the association between disturbed behaviour and the lunar cycle is that there is a tidal influence on the 70% water content of the human body, similar to the gravitational influence of the moon on the tides.[11,12] Such theories of the moon's influence over the brain, because of the brain's high water content, date as far back as Thomas Aquinas' publication of *Summa theologica* in the 1200s, in which Aquinas discussed the brain being the most "moist" part of the body and therefore most affected by the moon.[13]

However, these theories do not explain the increased frequency of patients presenting to the ED with violent and acute behavioural disturbance during the full moon. Some of these patients attacked the staff like animals — biting, spitting and scratching — and one might compare them with werewolves of the past, who are said to have also appeared during the full moon.[14,15] It has been reported that the practice of rubbing magic ointment on the skin or inhaling vapour from a magic potion by an alleged lycanthrope induces metamorphosis.[16] Not surprisingly, the main ingredients of these ointments and potions were belladonna and nightshade, which are anticholinergic toxins that are known to produce delirium, hallucinations and delusions of bodily metamorphosis.[15] The modern-day werewolf appears to prefer alcohol, which is more readily available. However, the metamorphosis is no less dynamic.

Our study supports the premise that only individuals with violent and acute behavioural disturbance are affected by the phases of the moon. These individuals, with the enlightened need to use alcohol and psychostimulants to manifest their delirium, are far more likely to do so in the light of the full moon. Is it just much more fun to indulge in drugs and alcohol under a full moon? Or is their behavioural disturbance directly influenced by the moon?

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COMPETING INTERESTS

None identified.

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