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Press Release

3D technologies and eyesight: use not recommended for children under the age of six, use in moderation for those under the age of 13

In view of the rapid development of new stereoscopic audiovisual technologies in 3D (3Ds, commonly referred to as 3D), ANSES issued an internal request to assess the potential health risks related to the use of these technologies, especially on human eyesight. In the study published today, the Agency recommends that children under the age of six, whose visual system is immature, should not be exposed to these technologies and that their use by children under the age of 13 should be moderate. It also provides a series of practical recommendations to reduce the risk of visual fatigue that can be caused by these technologies. However, given the lack of available data on exposure to these technologies, the Agency considers it necessary to conduct further research.

The last ten years have seen the rapid development of new stereoscopic audiovisual technologies in 3D. The substantial increase in the supply of films in 3D at the cinema since the middle of the 2000s has been followed by a growing range of televisions, computers, games consoles, mobile phones and other devices equipped with 3D technology. The development of these technologies raises the question of their possible impact on health, and in particular on human eyesight, in cases of prolonged exposure, especially in children and adolescents. Indeed, several manufacturers of devices with 3D technologies have issued warnings recommending that children should not use these products.

Against this background, ANSES issued an internal request to assess the potential health risks related to the use of all audiovisual 3D technologies.

Visual discomfort that can lead to various symptoms

An analysis of the available scientific literature identified different potential symptoms related to exposure to 3D audiovisual interfaces, resulting from the visual fatigue caused by "vergence-accommodation conflict". In the real world, to perceive depth and relief, the eyes converge (i.e. they are directed at the same object) and accommodate (the lens of each eye changes shape to obtain clear vision) at the same distance, i.e. the distance to the object being observed. The creation of artificial stereoscopic effects by technical means (3D) makes it impossible for the eye to respect this physiological principle. The eyes' accommodation (to a screen, for example) and convergence (on an object located in the foreground or background of the screen) do not therefore occur at the same distance.

Visual fatigue can be reflected in peri-ocular fatigue and pain, the sensation of dry eyes, visual disorders (double vision, reduced sensitivity to spatial contrasts, reduced visual acuity and speed of perception), and extra-ocular disorders (headache, neck pain, aching in the back and shoulders, lower performance in mental activities, loss of concentration).

Other symptoms may potentially appear, including effects linked to postural balance (dizziness) or the appreciation of reality (altered perception of one's surroundings). Although these effects have not yet been sufficiently studied, they could generate a short-term risk of accidents related to dizziness.
In children, especially before the age of six, more severe health effects related to "vergence-accommodation conflict" in the eyes may occur, as a result of the active development of the visual system during this period (accommodation, vergence, maturing of visual paths, etc.), especially as the

quality of 3D content is proving to be very mixed in terms of visual comfort, despite the existence of technical recommendations.

The Agency's recommendations

Against this background, ANSES recommends that:

- children under the age of six should not be exposed to 3D technologies;
- children under the age of 13 should only use 3D technologies in moderation, and that both they and their parents should be vigilant concerning any resulting symptoms;
- persons subject to certain visual disorders (disorders of accommodation, vergence, etc.) and problems with balance should limit their exposure to these technologies, including in the context of occupational exposure.

In view of the lack of data concerning the exposure of the population to 3D technologies, ANSES recommends identifying the various uses of 3D as well as the populations concerned, better characterising the exposure of different populations (adults, children and adolescents, professional users) and setting up a system for monitoring exposure.

The Agency also indicates that it is possible to limit visual fatigue or other symptoms among users of this type of technology. It thus recommends:

- that people feeling symptoms during exposure to 3D interfaces should limit their exposure time and consult an ophthalmologist in order to identify possible pathologies;
- not sitting or standing too close to the screen: this is because the greater the distance from the screen, the lower the constraints on a person's visual system;
- complying with the instructions of manufacturers of 3D devices;
- continuing to wear eyeglasses or contact lenses when watching 3D content;
- and that creators of 3D content should limit the effects produced by observing existing technical recommendations promoting the production of quality content.

Lastly, ANSES strongly suggests that medical and paramedical professionals who deal with young children, and also ophthalmologists, should be made aware of the mechanisms brought into play when viewing 3D interfaces. They will thus be in a position to inform parents of the symptoms and the potential risks and also of the means to avoid them.