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Liability of launching state on space tourism

Septira Putri Mulyana [1]*, Putri Raodah [1]
[1] University of Mataram; Mataram, West Nusa Tenggara, 83115, Indonesia.
* Correspondence: septiraputrimulyana@gmail.com

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Abstract
Current use of space as one of the economic factors supporting the country's economic has experienced a very significant increase. The Treaty Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty 1967) stipulate that every activity carried out in space must be in accordance with the United Nations charter and must always maintain peace and security. one of the developing commercial activities is space tourism. This research is a normative legal research with a statutory and conceptual approach. The technique of gathering legal material is carried out by reviewing related literature and analyzing various legal references relevant to the problem under study for further analysis qualitatively and descriptively. This article will examine in depth related to whether the existing space law conventions are still relevant to regulating space tourism activities nowadays? And how the launcher state liability in the event of space tourism accidents?. This article conclude that some the existing space law conventions are still relevant to regulating space tourism activities nowadays. And the launcher state liability are divided into two aspects. Based on liability convention and warswa convention. This is because space tourism activity use two types of aerospace.
Keywords: international law; jus cogens; non-refoulement

1. Introduction

The existence and development of space law was created because of the state's activities on the atmosphere, space, cosmos, and the field of aerodynamic navigation and planetary exploration (Bourbonnière & Lee, 2007; Xu et al, 2020). The culmination was after Uni Soviet launched the Sputnik satellite in 1957 (Kaiser, 2006; Steeves et al., 2009). Since then, empty space began to be filled with hundreds of satellite objects and other celestial bodies (Denis et al., 2020). This space activity was originally only a monopoly of the two superpowers, The Soviet Union and The United States (Froese, 2004; Ringmar, 2002), but subsequently it was also the activity of other countries. Treaty on Principle Governing the Activities of State in the Exploration and Uses of Outer Space, including the moon and other celestial Bodies (OST 1967) was formed to organize activities and exploration in space as the basic regulation of space activities (Dembling, 1979).

Other international agreements in space are the 1968 rescue agreement, 1972 liability convention and moon agreement. Some forms of potentially expanding space utilization activities are telecommunications, remote sensing, space insurance, space mining and space transportation including space tourism. American billionaire Dennis Tito on April 30, 2001, made history by becoming the first space tourist in the world (Cater, 2010). Using a Russian spacecraft, Soyus, he toured space for eleven days and stayed at the International Space Station (ISS) (Clément & Bukley, 2014; Woffinden & Geller, 2007) (O'Sullivan, 2016). This phenomenal expedition received extensive coverage by various media and proved that space is now a new goal that can be developed in the future. Space

tourism was originally a government project that began to be offered to civil society starting in 2001 the Russian space agency offered a price of 45 million dollars.

Now the discourse has been challenged by private operators offering more attractive prices of 200,000 with a minimum deposit of 20,000 offered by virgin galactic (Cokley et al., 2013). So now the space business gets more affordable economic class competitors. So far there have been five people who become space tourists, Dennis Tito (2001), United States Scientist Greg Olsen (2005), US Iranian Entrepreneurs, Anusheh Ansari (2006), and Charles Simonyi software experts from Hungary (2007).

Space tourism, which initially requires very expensive prices, the longer the price can be reached (Penn & Lindley, 2003). Now for those who are bored being ordinary tourists, then by preparing $ 102 thousand or Rp. 919.5 million, people can become space tourists. But what has become the problem lately is whether the existing space law conventions are still relevant to regulating space tourism activities nowadays? And how the launcher state liability in the event of space tourism accidents?. So that tourists or space tourists feel safe to glide on a tour into space. This article will discuss more deeply about these two things.

2. Methods

This research is normative legal research with a normative juridical approach. This indirectly illustrates that the study will use an approach to legislation (statute approach) as a source of existing law. In other words, the method focuses on textual analysis of legal texts. Apart from that, as normative legal research, this research can include research on legal principles, synchronization of laws and regulations, both vertically and horizontally, legal systematics, and inventory of favorable rules, including efforts to find concrete direction.

With a qualitative design, this research collects through primary sources, namely laws and regulations; secondary sources, namely all materials and works that meet qualitative elements as explanations from primary sources; and tertiary sources, data, or supporting materials that help explore research discussions. In general, the research process will go through three stages: formulating a viewpoint.

3. Results and Discussion

3.1. Types of Space Tourism Activities

Space tourism activities if based on space, the distance and ticket prices can be divided into two types of tourist activities. The first type is called orbital space flight and the second is called filght sub-orbital space. In seven space tourists leaving for ISS. While the type of sub-orbital space flight, until now is still in the stage of development and improvement using RLV. T his type is expected to be launched after 2017 by several private companies engaged in this field, including Virgin Galactic and Space Adventures.

3.1.1. Orbital Space Flight

This type of space tourism is the first to be introduced and piloted in the activity of carrying commercial passengers into space. Orbital space flight (Rykova, 2013; Crucian et al., 2016) is a launch using a spacecraft that takes a person to an orbital path at a certain height so that the person can really feel the atmosphere of space for a long time and can even go around the earth many times because the plane he is traveling can evolve around earth. The height referred to is 100 km above the earth's surface and is the height of the closest approach (perigee) so that it can be said at this altitude that someone has reached space. Furthermore, if the aircraft is at that altitude and is located in the orbit path (Moore et al., 2001), then the aircraft only requires an orbital speed of ~ 7.8 km / s. Later, the aircraft that has been located in the orbit path and is getting higher in its orbit, the speed will be smaller. That fact occurs because of the weakness of the earth's gravity when the plane is far or high in its orbit, causing the plane to spin more slowly and in this condition the aircraft does not need fuel at all. This type of space tourism clearly faces many obstacles to continue to do repeatedly, one of which according to many entrepreneurs is the expensive cost that must be borne by someone who wants to experience the sensation of evolving around the earth.

Of the seven people who have felt this type of tourism, on average they spend US $ 20 million. Even so, the price is commensurate with the sensation that will be obtained. Before launching, a tourist is required to attend a training session that is almost the same as a training session for professional astronauts. The difference is that the training session will be shortened to several months with several stages of training and adjusted to his capacity as a tourist, including:

1. Introduction to space, which is the first module given from a series of training stages, which introduces fully about space to its intricacies including the cardiovascular system, the center of the earth, low earth orbit environment, space radiation, and its effects on health.
2. Survival training, consisting of several training conditions such as cold weather surviva, dessert survival, sea survival, and tropical survival. In each situation will be explained in advance the environment and conditions that occur, the dangers that may occur and how to deal with health problems that occur from the most dangerous conditions.
3. Medical Training is the next training model that teaches about first aid when dealing with problems that can be handled alone in space and other health procedures that might be done while in space.
4. Tolerance and High Altitude indoctrination training is training specifically for studying certain heights to heights categorized as space, to learn what anticipatory steps can be done if something happens at an altitude under certain conditions.
5. Space motion and zero-G theory is training a situation without oxygen at all because the spacecraft has arrived at zero-gravity state, so there needs to be an anticipatory step if something unexpected happens.
6. Onboard System orientation and generic vehicle orientation is training when the plane that carries someone has reached a fixed orbital path and how to be taught to be able to survive there with adequate food supplies, adequate clothes, sleep time that is maintained, personal hygiene spacecraft, photographic equipment needed to capture certain moments, water supplies, disposal problems (garbage from spacecraft), and other activities commonly carried out on earth, but need special training to be done while in space.
7. Flight and Emergency procedures are additional training aimed before several days of departure and later return from space, who learn technical matters regarding the departure.

For the beginners to participate in this type of tour, it is necessary to know six stages before launching with orbital space flight, namely:

1. The first step is to find out what companies should be used to help smooth space tourism activities. One of the pioneers of this type of space tourism is the Space Adventures company, which has long experience with being the first company in 2001, which helped launch the first space tourist, Dennis Tito. This company, founded in 1998, clearly became a well-planned company in helping someone in space tourism activities.
2. The second stage is to determine the spaceport, which is where the launch is carried out. Usually it will be adjusted to which company is chosen to assist in space tourism activities. Because of course the company already has a spaceport that is the launching and returning home of someone who goes into space or if it turns out that the company does not have adequate spaceport for this type of space tourism, then there will be a cooperation contract made with launch countries or companies in countries launcher to help launch tourists into space.
3. If you have determined the company and the launch site, then the third stage is to determine what will be done when it is in space within a few days. This includes part of the type of orbital space flight that is chosen, for example the selection of orbital parameters, meeting in habitat orbitals, or just choosing to visit the ISS. This selection is adjusted to someone's desire to be able to choose for themselves which

sensations to feel during visiting space. But usually a space travel company already has its own offer to potential tourists.

4. The next stage is the down payment on the overall price of this type of tour. Usually around 10% of the deposit requested by a space travel service company from the price. So that later someone can take a medical test that is really needed to find out whether the person can or does not visit space because space is a vacuum that requires strong body stamina, so someone who will visit it must have adequate health so that they can feel fully tourist activities.
5. The fifth stage relates to the training schedule that will be faced by those who have passed the health test. Someone who will visit space is required to attend a training session to survive in the space space for a period of six months. In this latiham session it will be truly shown how a professional astronaut roams in space. Also trained, someone will already use astronaut clothes and helmets that are estimated to cost US $ 1 million.
6. The last stage before departure is space, for about four to five days, all families of prospective space tourists will gather in the spaceport. This is done because later in 96 hours, people who take part in space tours will be quarantined before finally being launched.

Another problem faced in every space tour is how much of a danger a space traveler can say with this type of tourism. With seven people exploring the space using this type of tourism, what can be concluded is that the risk assessment must be scrutinized by the company that regulates the trip to space. It can be said, everyone who participates in the selected space tourism activity is orbital space flight. But in fact, all precautionary measures need to be taken, so that training is clearly an important thing to follow in addition to the costs that must be released.

Later, risk factors can be minimized in such a way without having to have a very serious accident. Thus, any private company, especially those that focus on this type of space tourism, need to pay attention to safety insurance that must be made by prospective tourists, even though they have conducted training in accordance with the standards of professional astronauts. The insurance needs to be stated correctly and distinguished between insurance owned by the company and the tourist. Thus, the type of orbital spaceflight tourism is the most expensive type of tourism because the destination visited is ISS, it needs to be taken seriously and follow the training stage as well as possible. ISS is used as a tourist destination because it is the most adequate place to accommodate space tourists during tourism activities in space.

3.1.2. Sub Orbital Space Flight

The second type of space tourism activity, which is currently populating in the general public, is said to be cheaper than the sacefliht orbitals, which are sub-orbital spaceflight. Sub-orbital spaceflight is a detachment by using a spacecraft that takes a person on an orbital path that cuts the earth so that the person only feels space at a certain height above the earth's surface, then in a relatively short time it will return to earth using the force earth's gravity. This type of space tourism only aims to bring one to feel the zero-gravity sensation and the view of space in a shorter time, so that when it reaches a certain height, the spacecraft that carries it will return to earth.

The mechanism of this type of tourism that is only recently introduced by some companies is that a space tourism service company assisted by a company that technically knows the ins and outs of space, will make relatively small orbits compared to orbitals space. The orbit path will cut the earth so that the plane cannot rotate around the earth. So, the most important of these types of tourism is to bring potential tourists to feel the sensation of space in a zero-gravity state and be able to see the earth from space without having to circle the earth or stay at the ISS as a tour of the space space offered.

Therefore, this type of space tourism can be used as an excuse to use the RLV for repeated use. Besides being economical, the RLV is also able to reduce the cost of spacecraft production because a company only has to buy the RLV and then use it for sapceflght sub-

orbital space tourism activities. This has been done by several private companies that use such technology so it is not surprising that the price of travel to space with sub-orbital spaceflight is much cheaper compared to saceflight orbitals. Private companies, such as Virgin Galactic and Starchaser Industries, charge US $ 200,000 to US $ 500,000 for a single trip into space. However, for prospective tourists who are interested in this type of space tourism must be more careful in choosing which private companies are used as a means to assist space tourism activities. Because there is a possibility, the price offered for a single trip does not include the cost of training before space tourism and when the tour takes place, the astronaut's full clothing, and other obvious costs are part of the preparation for traveling into space.

Given that this type of tourism has not yet begun, it is only limited to trials, so training becomes an important part that must be considered by every prospective tourist. Actually, during training sessions for types of space tourism with sub-orbital spaceflight there is not much difference with the type of orbital spaceflight. It's just that the training time is much shorter, around 5 days. Another difference lies in the type of training being eliminated, such as the onboard system orientation and the deneric vehicle orientation, considering that this type of tourism only aims to make one feel the sensation of zero-gravity at a certain height and in a short time, then return to earth after the goal is achieved.

As with the type of orbital spaceflight space tourism, there is a need for risk assessment from private companies that are more responsible for space tourism activities. This is one of the problems associated with insurance owned by tourists. Insurance is made because of these challenging tourism activities, tourists voluntarily take part in space tourism activities before they already know the risks they will face. As an example of the existence of an informed consent principle at CSLAA, the United States national interest is related to space tourism activities. Through informed consent, a prospective space traveler must make a question of himself about the risks he will face during his travel activities and therefore the problem of responsibility for himself as a tourist becomes his own personal business. So, it is not surprising that life insurance that guarantees safety or self-protection to tourists is very important.

Thus, the type of ankasa space tour with sub-orbital spaceflight is a new thing in space tourism activities. Private companies that focus on developing this type of tourism are still continuing to carry out technical trials. Scheduled after 2017 , this type of space tourism will soon operate in several spaceport from several companies that have seriously developed this type of tourism. For example, Virgin Galatic, XCOR Aerospace , Orbital Sciences Corporation, and Interorbital System which chose Mojave Airport in California as a spaceport. Rocketplane Limited Company Ine., And Kistler Aerospace chose the Clinton-Sherman Industrial Airpark, also known as Oklahoma Spaceport, as the launch site. The following is a picture that explains the continuity of the type of sub-orbital spaceflight tourism.

3.1.3. Legal Status of Space Travelers

Based on the current space law, there is no single convention that refers to the term space tourist (sace tourist), but it is only known that travel in space is done by an astronaut and a member of space spacecraft. Can be said, the Outer Space Treaty of 1967 does not explain in detail about astronauts, but only regulates that astronauts are envoys of mankind and therefore must have all possible assistance (all passible assistance) if it occurs accident in danger or make an emergency landing on the territory of a country or on the high seas. This obligation continued to the Agreement on the Rescue of Astronauts, the Return of Objects Launched into Outer Space (Rescue Agreement 1968). Although in the title and preambule the agreement uses the term 'astronaut', but refers to the substantive provisions in terms of salvation and return to earth, the agreement pertains to the term ‘personnel of a spacecraft. In addition, in the Agreement on Activities of states on the Moon and Other Velestial Bodies (Moon Agreement 1985) states that every person (any person) in a month must be referred to, as agreed by the countries in the agreement, as an astronaut.

These provisions are still ambiguous, especially regarding space tourists who will or must enter and refer to the envoy of mankind (envoy of mankind) as the status addressed to astrounaut. Nevertheless, it is possible to include the term space traveler as regulated by the 'personnel of spacecraft', after a tourist has previously conducted a series of training that supports his journey into space, bringing tourists in terms of rescue and returning to earth is the obligation of the 1968 rescue agreement This condition is indicated that if an accident has happened to space travelers. So, on a human basis (proumpted by sentiments of humanity) which is regulated in the 1968 Rescue Agronomy Preambule, it should be interpreted to implement all people, including tourists in space tourism activities into the agreement.

However, to support legal certainty, the legal status of space tourists needs to be clarified. In fact, in 2001, among the 1998 IGA members who used ISS as a vehicle for the development and use of space, an agreement had been made regarding who could visit the ISS. The agreement includes the terms astronauts / cosmonauts and people who participate in activities in space (space fligt pasrticipants), including commercial, scientific, and other programs, cre-members from countries that are not members of the IGA 1998, technicians, scientists , teachers, journalists, directors, and tourists. Of course, the agreement can be used as an international legal model for space tourism activities, especially in the term of space tourists, in the future.

Then, for the jurisdiction problem of a space traveler, which will be related to the problem of accountability (liability, can refer to Article 5 paragraph (2) IGA 1998 which states that:

> '…each Partner shall retain jurisdiction ang control over the elements it registers in accordance wirh paragraph (1) above and over personnel in or on the Space Station who are its national…"

Thus, based on the ISS regime, a 1998 IGA member country can expand the application of its national provisions related to its citizens' activities in space, including crew / personnel or only cover jurisdiction for space tourists (space flight participants / passengers) (Chen & Zhao, 2022). Thus, the jurisdiction for space tourists who take part in roaring sky tours is the responsibility of their home countries based on national law on space regulating this matter. This conclusion, besides being applicable to countries included in the ISS regime, can also be used as a reference for countries that are not member countries in the ISS regime.

Furthermore, related to the visa requirements for a space traveler (Bensoussan, 2010), this is related to which type of space tourism will be followed. For this type of orbital spaceflight tourism, currently, Russia is only capable of using spacecraft to accommodate space tourists (Chang, 2020) participating in a launch that takes itself towards the ISS and feels the atmosphere of space for quite a long time, which is about eight to ten days travel. The Russian-owned aircraft in question is Soyuz, which can be said to be a plane that meets the criteria of carrying passengers for space tourism activities (Sgobba, 2010). That way, if a tourist who is not from Russia and wants to take part in a space tour with this genen, it is necessary to make a Russian visa that supports the tourist's activities while following this type of tour. It should be noted that in the type of orbital spaceflight tourism, a space traveler needs preparation or training before sliding into space for six to 12 months, including the continuity of such space tourism activities. So, there needs to be a company that organizes these trips, including the type of visa that should be used for this type of space tourism.

Whereas, for sub-orbital spaceflight tourism types, currently it has been developed by several companies, both in the United States and Russia (Dasgupta, 2013). That way, related to visa requirements, prospective aerospace tourists can apply for visas for countries that have developed this type of tourism, such as the United States and Russia. However, it should be noted that the type of sub-orbital spaceflight tourism has not yet begun to be implemented because according to some countries it is still being carried out because according to some countries, the development and improvement of space planes is suitable for this type of tourism.

The status of the space traveler law discussed above is important for the continuation of future space tourism activities (Edensor, 2001). As a customer of these tourism activities, prospective space travelers need to understand the legal status of themselves when participating in tourism activities. Because the legal status of space tourists will be very much related to the responsibility for themselves in tourism activities. Article VII (b) Liablility Covention 1972 stipulates that:

> "foreign nationals during such time as they are participating in the operation of the space object from the time of its launching or at any stage thereafter untul its descent, or during such time as the are in the immediate vlicinity of a planned launching or recovery area as a result an invitation by that launching State."

For the regulation regarding the exemption from this responsibility even from a foreign citizen, there is an invitation from the launching country. Space travelers are not included as regulated exceptions, because space travelers usually only aim to take part in tourist destinations rather than participate in a country's self-research activities. However, things depend on certain functions of a space traveler. Because, there are times when a space traveler, in addition to aiming for recreation in space, also participated in a study, as Mark Shuttlewirth had done for his AIDS and human genome travel trips, considering that South Africa, the country of birth, needed research results he did. Regarding accountability, it will be explained more in a separate sub-chapter.

3.2. State Responsibility and Private Parties in Space Tourism

The 1967 outer space treaty stated that the influence of the government in every activity in the space space was still very large and important (Runnels, 2023; Disantara, 2021; Gruner, 2004). One of them is related to the registration of objects to be launched into space. The Convention on Introducing Into Outer Space (Registration Convention 1975) was an elaboration of Article VIII Outer Space Treaty 1967 which states that:

> "A state party to the treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object and over any personel there of, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the earth. Such objects or component parts found beyond the limits of the state party to the treaty on whose registry they are carried shall be returned to that state party, which shall, upon request, furnish identifying data prior to the return."

Based on these provisions this convention was formed to facilitate the mechanism for the registration of space objects, in the form of satellites and space objects owned by a particular country. In article II the 1975 Registration Convention states the provisions of a country in launching its objects into space. In article II registration convention 1975, it was explained that the launching state that would launch its object into space needed to register the object to receive international recognition and notify the Secretary-General of the United Nations. Other objects that might be regulated also in space tourism activities are supporting things for the sustainability of the space tourism business (Gretzel et al., 2015). These supporting things also become something that needs to be considered so that there is no overlapping of ownership of the space object. As already explained that the registration of space objects is related to the jurisdiction of the object relating to article VIII of the Outer Space Treaty of 1967. In the IGA 1998, it also regulates the problem of registration and this jurisdiction. Article 5 paragraph 1 of IGA 1998 stipulates that:

> " in accordance with article II of the registration convention, each partner shall register as space objects the flight elements listed in the annex which it provides, the European partner having delegated this responsibility to ESA, acting in its name and on its behalf."

Then in article 5 paragraph 2 of IGA 1998 the affirmation of jurisdiction matters as stipulated in article VIII outer space treaty 1967 relating to article II registration convention 1975 that becomes the obligation of each IGA member state to guard the space objects that

have been registered and become the responsibility fully answer if there is damage or accident.

In addition, liability and insurance in space tourism activities also regulated in convention on international liability for damage caused by space objects (liability convention 1972) is an elaboration of the 1967 article VII outer space treaty which explains the authority of the state for objects launched into space. space or a country that launches in another country and if an accident or fall occurs causing damage in another country, then the country that owns the object that is launched must be responsible for the damage. The 1972 Liability convention is an international reference related to responsibility for matters relating to accidents or damage to objects launched into space by each member country and also related to activities in space, both public and commercial.

In the 1972 liability convention explained about what is meant by damage terminology (hereinafter referred to as damage) (Boyle, 2005), namely "loss of life" personal injury or impairment of health or loss or damage to property of states of persons, natural or juridical or property of international intergovernmental organizations ". In addition, those responsible for damage to a member country are launching countries. The terminology of the launching state that is used is twofold, namely the country that launches and participates in launching an object into space as well as the country whose territory or facility is used as a place to launch objects into space. For example, country A asks Neo B to launch its space object from a facility belonging to state C which is located in the territory of country D. For the launch of the space object the four countries are launching states and jointly responsible for any damage caused by the space object.

In the 1972 liability convention, the state becomes the main party dealing with other parties (Caplan, 2008), which is also the state, if damage is caused by space objects from a country in another country. Under this convention, there are two types of liability. The first is stated in article 2 of the 1972 liability convention, namely:

> "A launching state shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraftin flight."

This type of accountability is referred to as a fault, that is, if an object is launched into space by a country and falls on another surface of the earth, it is necessary to prove the consequences of the fall of the space object, so that later a country can perform accountability . With the existence of differences in accountability, many countries will be more protected and more aware of accidents caused by objects launched into space. In addition, it is also possible to have a joint liability agreement among countries for possible damage to an object launched (Ziemblicki & Oralova, 2021). This is stipulated in article V of the liability convention 1972. Thus, the responsibility will depend on the agreements made between these countries.

Thus, through an explanation of accountability in general above, it is necessary to specify that space tourism activities include accountability to space tourists and third parties. The responsibility will also be related to the existence of insurance that must be owned by space tourists who will protect all space tourism activities, starting from the training stage, launching spacecraft, tourism activities in space, and returning to earth after completing the tour.

4. Conclusions

Some regulations such as the liability convention, rescue agreement,registration convention, Outer Space Treaty, are still relevant to current space tourism activities, but there are some additions that need to be rearranged due to technological developments. Now, there is new regulation about space station (the international space station intergovernmental agreement 1998). This regulation are formed to regulate the use of outer space through ISS. And according to liability convention when there is space tourism activity, the liability will be taken by the launching states of space objects.

Furthermore in the liability convention there are forms of launching state liability can be formulated and divided into four types of classifications namely: Absolute liability (article 2) (because of the victim, not because of an error), Error based liability (liability

based on fault) (article 3), Shared responsibility between countries and parts of countries (joint and several liability), (article 4): paragraph 1 (absolute liability), paragraph 2 liability based on fault, Exceptions or exemptions from liability (exoneration from liability) (article 6).

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Informed Consent Statement
Informed consent was obtained from all subjects involved in the study.

Data Availability Statement
The data is available upon request.

Conflicts of Interest
The authors declare no conflict of interest.

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