

The Role of Humanoid Robotics in Health Care System

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Editor Note

In Japan, new developments in the field of robotics are being received with interest and enthusiasm by the population and used in everyday life. This can be explained on the one hand by a long tradition of stories that report positively on artificial servants for humans. These stories continue into modern manga comics. Robots take on positive roles, expanding the capabilities of humans and being of service to them. On the other hand, Japanese religions and philosophies such as Buddhism and Shintoism influence attitudes towards robots.

Japanese believe that everything has a soul and can be an embodiment of the divine: Humans, animals, plants, stones and even robots are considered to have a soul. Another aspect is the principle of "kawaii". It means that something is designed to be pretty and cute and is applied to the design of robots, making them seem harmless and attractive. Europeans have a much more critical attitude towards robots. Artificially created beings or spirits that threaten or annoy humans can be found in many older and modern stories, e.g. Heincelmännchen, Kobolds, Frankenstein's monster, the Sorcerer's Apprentice. Losing control over these machines or beings seems to be a culturally embedded fear that dominates modern science fiction as well. Religion

and philosophy also plays a role in Western culture. In Christianity, a distinction is made between living and non-living, between man, who has supremacy, and other creatures. According to this, only humans have a soul, while animals, plants and objects have no soul (Lau & van Est, 2009). Belittling objects are not accepted by adults in western cultures; they are considered as children's toys and therefore cannot be convinced by this kind of design. Possibly, however, findings from the application of robotics in rehabilitation could be transferred. There, it has been shown that the combination of entertaining and playful elements appeals to patients and motivates them to practice intensively. Against the background of

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current developments, the use of robots in healthcare is becoming increasingly important. Robots are intended to reduce the need for nursing, care and therapy and to relieve the workload of the occupational groups concerned so that they can care for a larger number of people. Robotics is seen as a key technology for the 21st century. Different types of robots were described in detail: Companion robots have also proven their worth in institutions for the elderly, as they enable social contact with the outside world even in times of social distancing. For example, a startup in northern France has provided about twenty of its companion robots, Cutii, free of charge. Cutii provides nursing home residents with various activities while allowing them to make video calls to their loved ones on the screen. The robots also provide gentle gymnastics, storytelling and a zero-waste workshop. Due to the quarantine measures taken as a result of the COVID-19 pandemic, many people are currently living in social isolation. This can have a detrimental effect on their mental health, both in the short and long term. Two groups, in particular, are vulnerable and in need of protection in this regard: older adults over the age of 65 and children under the age of 16. The use of social robots can potentially prevent or at least minimize these negative consequences. However, it is still unclear what conditions must be met for social robots to be effective in helping vulnerable people mitigate or even reverse the psychological consequences of social isolation. An international collaboration of scientists from the Netherlands, Sweden, Turkey and the University of Hohenheim has now conducted a conceptual study to address the possibilities and requirements, but also

the obstacles and adverse effects of social robots. The researchers identified four main types into which social robots can be divided: The entertainer robot primarily serves to distract. It relieves boredom in the short term, awakens the joy of playing and amuses people. Social interactions are mediated by social pathfinder. Its behavior can closely resemble authentic social contact. Through a screen, people stay in touch with friends, family, or health care providers. A mentor robot can perform tasks in education, psychotherapy, and physical therapy that normally require the presence of a professional service provider. For example, by engaging in regular physical activity with a mentor robot, older adults remain mobile longer and can lead independent lives. So far, however, such robots have been used exclusively in research. The full spectrum of well-being, however, is only covered by the most complex type of robot, the friend. Through quasi-social interactions, it can mitigate the negative consequences of objective or subjectively perceived social isolation and support both short- and long-term well-being through caring and emotional comfort. For example, social robots are perceived as emotional and social actors, especially by children and the elderly, when they exhibit "social behavior," such as touching and emotional responses. They can comfort and cheer, as well as enhance communication skills and learning experiences, thus enhancing people's personal development. However, the research agenda on social robots also includes the aspect of whether and under what circumstances the use of social robots with vulnerable people can also have a detrimental effect on their well-being, Blaurock emphasizes. For example, there is

the ethical question of the extent to which robots can and should replace humans. While social robots can strengthen older adults' sense of autonomy by making them less dependent on care and staff, on the other hand, there are also fears that social robots could replace caregivers, exacerbating loneliness. In particular, service robotics is considered to be one of the most promising and important market segments of this century. A detailed overview of the current use of service robots is provided by the annual study of the International Federation of Robotics (IFR). This distinguishes between the use of service robots for commercial and domestic purposes. The sales for commercially used robots increased by 23.5 percent from 2003 to 2007. In the domestic sector, the increase was as high as 43 percent (International Federation of Robotics, 2008). Current forecasts predict a further increase in sales figures. Robots are already assisting surgeons during operations and therapists during rehabilitation, for example. More than 6.5 million robots are in use worldwide. Experts estimate that the market potential is far from exhausted. Targeted automation can open up major growth opportunities for small companies in particular. The increasing use of robots in our society has the consequence that politicians and other decision-makers are faced with important questions. Rising costs for the care of an aging society raise the problem of the allocation of resources for health care and social care. Decisions must be made based on commonly held norms and values to maintain social peace in society. If robots are to be used to improve the quality of life, it is necessary to discuss what is meant by this. This also applies to the basic

ethical issues and the values of the players. These include the inviolability of human dignity, the protection of life, patient autonomy, the general well-being of the patient and the prohibition of harm, the security of care, justice of care, the right to participate, and care (including direct physical contact). The main goals of robotic use in care and health care are expected positive effects on the care of the population in the following areas: the management of chronic diseases, through telepresence robotics and assistance robotics; safe, efficient, and high-quality health care in the face of demographically induced growing demand, staff shortages, and cost pressures by relieving the burden on health care personnel; support for the elderly and people in need of care so that they can live more independently and participate in social life, through assistive technology and assistance robotics. Prevention and diagnosis of diseases (through devices that analyze movements) and enable examinations in the body (smart medical capsules). Today, impressive sensorimotor and cognitive performance is possible in robotics, and interaction with humans or other devices is constantly evolving. Nevertheless, the goal of mimicking human capabilities and intelligence remains a major challenge. European researchers are currently striving to develop new "soft" and "sentient" robots that can be deployed cost-effectively and flexibly. To this end, new technologies inspired by nature are to be applied. It is still open which results and possible applications can arise from this. Finally, the support of operations is of the utmost importance. In the last months, during the COVID-19 pandemic, the role of social humanoid robotics became more

important to beware of COVID-19 patients from social isolation from their relatives. This is an important and new field of

research in pandemic situations and needs more scientific engagement.

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