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Time will tell – why it is too early to worry

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Sharkey and Sharkey (S&S) raise concerns about the ethics and impact of a new generation of robots designed to socially interact with children. We argue that ethics and impact have always caused concerns whenever a new technology was introduced, but users have equally always adapted to the shortcomings and concerns surrounding new technology. Technology that cannot be accommodated rapidly disappears. As such, if child-minding robots become commercially viable, this will to a large extent be because they pose little or no risk when used appropriately. To this end we consider the creation of false beliefs in children by life-like robots as potentially desirable, and in caretakers by the robot manufacturers as both legally and commercially controlled. Public understanding of the use and limitations of any new technology is always an issue but one that is typically resolved as the technology in consideration either becomes more widespread or fails commercially. Finally we consider the direction of research in human–robot interaction as leading to fruitful interactions rather than stilted and damaging interactions. While we commend S&S for raising important issues in the development of robotic caregiving technologies, our view seems ultimately more positive.

S&S wish to raise awareness about ethical issues when using life-like robots to create false beliefs in children. However, entertaining false beliefs by children and the creation of false beliefs by their caretakers is part and parcel of childhood and persists to a lesser extent into adulthood. Pretend play is ubiquitous, but as mentioned in S&S, children are mostly good judges of knowing whether elements of play are false or not. However, caretakers often create false expectations and beliefs to amuse but also to steer children's behaviour. In Western society, Father Christmas or its American equivalent Santa Claus, is used to pass on values such as caring and generosity to young children, but is also used to guide behaviour (Papatheodorou & Gill, 2002). In France, Belgium and the Netherlands, St Nicholas or Sinterklaas, next to being generous, also wields the threat of punitive action and parents do not hesitate to make use of this to create beliefs in young children. We do not wish to explore the obvious links to religion, but suffice it to say that creating false beliefs is neither new nor necessarily experienced by society as problematic. From this perspective, it is unlikely that a robot conjuring up a fantasy world with

which the child engages will be cause for concern. Of greater concern, as S&S note, is the misinterpretation of the robot's capabilities by caretakers: marketing studies show how commercial pressures lead to overselling of products and there is no reason to believe that this will be any different for personal and domestic robots. While consumers understand the discrepancy between advertising and reality for familiar products, there is a risk that false expectations are created for consumer robots. However, there will be pressure on manufacturers not to oversell the capabilities of robots from a legal perspective, as most consumer protection legislation stipulates that goods need to be "fit for purpose" and as advertised, and from a commercial perspective, as unfulfilled expectations historically often lead to commercial failure. As sales of personal, service and edutainment robots have steadily increased and are expected to grow exponentially (IFR, 2009), it is likely that robots that in some form or other assist with child minding will be adopted as well.

This leads us to the second reason why the scenarios sketched by S&S are unlikely to be of concern: every technology has its cost, but users tend to balance costs and benefits and if the balance is found to be in favour of the benefits, users will readily adapt and work around potential costs. This has been the case since the industrial revolution: every technological development, however small or great, has benefits but also potential dangers. Electricity, gas, cars, microwave ovens, mobile phones, the internet and so on are, when used inappropriately, potentially harmful or even lethal. When microwaves were introduced to the homes in the 1970s, the teething problems with the early models, the marketing that promised more than conventional ovens could do, the limitations on what materials the microwave can take (no metal or closed containers) and the unfamiliar way of heating caused a number of accidents (Geddes & Roeder, 2006). However, the apocryphal cat-in-the-microwave incidents were soon avoided as people understood that microwaves could not do what conventional ovens can, but instead work particularly well for (re)heating and steaming food. Commercial and legal pressures on manufacturers soon take the edge off most potential hazards of new technologies. Any hazards that remain are absorbed by adapting the ways in which technology is used. Again, the premise here is that the public needs to be aware of the risks and hazards of the new technology: if a caretaker believes that a robot is more technologically advanced than it really is – for example, that the robot can mind children for a prolonged period of time while the caretaker is not physically present, – then this is problematic.

A third reason why S&S's doom scenario might never come to pass is that most of their observations and extrapolations are based on the state of robotics today or based on situations in which there is little or no interaction at all. The Harlow (1959) experiments show how young monkeys' development is disturbed when they only

have access to a wire-covered or cloth-covered puppet as surrogate for their mother – a rather unsurprising outcome in the light of current knowledge in developmental psychology. However, while research into social robotics and human–robot interaction is still in its infancy, we have already moved way beyond unresponsive, minimally responsive or predictable automatons. Steady progress is being made in natural language interpretation and production, using a mixture of shallow and deep techniques to work towards robust linguistic interaction with robots (Kruijff et al., 2009). Hardware is continuously being improved, with a recent focus on bipedal robots, compliant actuation, haptic sensing, robotic facial expressions and the principled design of the robot's overall physical appearance to achieve a certain effect for specific demography. We understand enough about bodily expressions and dynamics (e.g. Kozima et al., 2009) and facial expressions (Breazeal, 2002) to make robots that not only briefly entertain, but with which children engage over a prolonged period of time (Kanda et al., 2004). Emotion has been studied extensively, both in how robots can read affect in users, but also how a robot can elicit particular emotions in humans (Smith and Breazeal, 2007; Blanchard and Cañamero; 2005). Multimodal interaction, the simultaneous and coupled transfer of information over a range of communicative channels such as speech, gesture, non-linguistic utterances, pose, and facial expression, is understood to be key to successful human-robot interaction and most social robots are sensitive to multimodal cues in humans and actively use multimodal production. Software architectures exist which support the complexity of programming social robots and middleware is available to build platform-independent software. The monkeys-deprived-of-interaction scenario seems miles away given the progress made in cognitive and social robotics over the last decade. And there is no reason to expect developments in social robotics to stagnate. On the contrary, government and industry continue to invest in the science and the constituent technologies of social robotics. The market for social robots is growing exponentially, mainly powered by the toys industry. And there are early successes, such as the order for over a hundred Paro seal robots by the Danish health services to be used as social companions for elderly people with dementia (Musha et al., 2006, Shibata, p.c.) and the KeepOn robot being explored as a social mediator for psychotherapy (Michalowski, p.c.).

In parallel with the development of socially adept interactions between robots and humans, significant developments are also apparent in the manual dexterity of robots, increasing the range of physical abilities and hence the range of physical tasks that they are able to help us with. As robots become increasingly able, both physically and socially, our naive expectations of their abilities also grow, increasing the risk of false beliefs about robots, but this is the view from our current perspective. As robots become increasingly integrated into our daily

lives, familiarity with them and their capabilities will more than counter this tendency to over-attribute the abilities of robots.

We have to a large extent already devolved childcare onto others: schools, day care centres, holiday clubs, and child minders are all to an extent substitutes for parental care. At the same time children interact with technology on a day to day basis, again the technology is often a substitute for direct physical social contact. Society does not in general consider this to be problematic and, we believe, time will show that our society will, just as it always has with new emerging technology, adapt to embrace robotic care.

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