

September 2006

HORIZON SCANNING SR001

HSE HORIZON SCANNING INTELLIGENCE GROUP SHORT REPORT HUMAN PERFORMANCE ENHANCEMENT

1. Issue

Human Performance Enhancement (HPE)¹ is the science of enhancing the performance of the human body by artificial means. The pace of advancement in four disciplines - nanotechnology, biotechnology, information technology, and cognitive science - means that we are in the early stages of a new period in human technological potential, which is predicted to accelerate over the coming years and could bring large improvements in human abilities.

| |
|---------------------------------|
| Status: Active Monitoring |
|---------------------------------|

Enhancements can be brought about by many methods, including: bionics, body or brain implants, brain/computer interaction, cognitive enhancing drugs and genomics (including: gene therapy, stem cells, cross-species organ transplantation, and biogerontology; the study of ageing).

Some of these advancements are already with us, including, for example:

- Provigil (modafinil): a brain-enhancing drug that promotes alert wakefulness for up to 48 hours and is increasingly being used as a lifestyle drug in the US.²
- A woman confined to a wheelchair by the condition Dystonia (uncontrollable muscle spasms) is now walking after electrical implants in her brain. This is also being tested on depression, migraine headaches and obsessive-compulsive disorder.³
- A robotic exoskeleton to enhance strength has been produced in Japan.⁴

As an article in New Scientist in May 2006 states 'We're not talking about some distant sci-fi future. This is happening now.'⁵

2. Implications

The potential impact of HPE is large, and there are major ethical and public health issues associated with developments in this field. Any widespread adoption of these technologies is bound to have an impact on the workplace. As these enhancements become more widespread the limits of their use and whether they can and should be regulated in the workplace should be considered.

Many HPE technologies may be seen to focus on the individual and their perceived shortcomings and therefore seek to 'medicalise' issues, which could

¹ Also known as NBIC (nano, bio, information, cognitive sciences), GRIN (genetics, robotics, information and Nanotechnologies) or transhumanism.

² *Get ready for 24-hour living*, NewScientist, 18 February 2006, issue 2539, p34

³ *Walking again the girl with a rewired brain*, The Sunday Times, 5 March 2006

⁴ The Times, 2 July 2005

⁵ *The incredibles*, New Scientist, 13 May 2006, issue 2551, p32

have a lifestyle or social source. Employers could potentially rely on HPE technologies and fail to make reasonable adjustments to the workplace, work environment or organization of work, placing greater responsibility on the individual.

3. Relevance to Occupational Health and Safety

These technologies could be an opportunity in the workplace and beyond to help the disabled, injured or unwell back to work and to support a future ageing workforce. For example the robotic exoskeleton mentioned earlier has been designed to help the ageing workforce in Japan.

In addition, it has been suggested that this robotic exoskeleton could be used by construction workers and warehouse attendants, etc to lift and carry heavier objects more safely.⁶

However HPE could also provide unfair advantage in the workforce and negative health effects. For example benefits conferred by the use of brain enhancing drugs may make individuals feel compelled to use these substances to gain an advantage or to keep up in the workplace. Additionally employers may encourage their use or put pressure on employees to use them. Potential adverse health effects could come from novel chemicals, materials, or devices or potential invasions of privacy. Examples could include: dependency or addiction to brain enhancing drugs or electrode-brain implants that could potentially impair brain function. Long-term use of HPE could have other unknown adverse side effects.

Continued large increases in computing power, and in technological innovation together with publicly proven successes are likely to increase the likelihood of HPE becoming widespread. However, ethical issues, negative public perception, over-regulation or slower rates of technological innovation may slow or prevent the rise of HPE.

4. Recommendations

HPE has the potential to have a significant impact on HSE resources in the medium to long term. As such, HSE needs to keep abreast of developments in this potentially significant area in particular:

- The likely timescales for these developments.
- In terms of HSE strategy we need to consider whether the current health and safety regulatory framework will cope with these technologies.
- HSE's Horizon Scanning team will continue to monitor these developments, working with HSE specialists and other Government departments.

Sam Bradbrook, Horizon Scanning Section, HSL

⁶ <http://www.spectrum.ieee.org/print/1901>