Effect of technology on cognition

A variety of sources have expressed the view that newer technology and the Internet is having an effect on human cognition. Discuss this notion with reference to research in this area, clearly highlighting how the technology individuals are using on a daily basis could be affecting underlying cognitive processes.

Modernisation in the last twenty years has led to broader and more efficient uses within the digital technological field. Developing away from radio usage and television, technology nowadays focuses on instant at hand concepts including smartphones, GPS and the Internet, using largely online methods to provide ease for individuals to function daily (Pettinger, 2012). The Internet, primarily used as a method just to share data, is now used as a method of keeping in contact, researching information, streaming media, playing games and much more (Joinson, 2003). The collaboration between humans and computers, as Rutkowska and Crook (1987) outline, is Human-Computer Interaction, where the technology being used acts as a remedial assistant, a teacher and a cognitive facilitator to advance and aid the individual. However, these technological aids that humans are so adapted to are seen to be affecting human cognition. Human cognition is used as an umbrella term for many mental workings and active information processes, for example memory, perception, thinking and learning (Ashcraft, 2005). Neisser (1967) refers to human cognition as an acquisition of knowledge using perception, recall, retention and problem solving processes. Cognition can be conceptual or intuitive and it deals with the conscious and unconscious regulations of human processes to help humans interact within their daily lifestyles. Technology can provide ease to these demanding

cognitive abilities but has also been debated to cause cognitive issues. This essay is therefore going to determine to what extent daily technological interactions are having on human cognition by exploring the cognitive improvements and limitations from using modern technology.

Human contact with technology and the Internet today is more significant than ever, as immediate information is constantly at hand through smartphones and computers which are commonplace in part of western culture daily living (Nasi & Koivusilta, 2013). As Wertsch and Rupert (1993) suggest, the tools used, such as the Internet, to mediate human cognition are culturally valued, important and impact modern life extensively. This technological impact on human cognition can be seen to be directly influencing memory, for example Sparrow, Liu and Wegner (2011) found that the use of search engines such as Google affected memory structures in individuals. People using search engines tended to forget information they felt would be externally available to them, and only retain information that wasn't. They had used the search engine as an external memory store, which in turn created a more symbolic and connected relationship with the Internet. Wegner (1987) said this external memory placement takes the form of transactive memory, by which many people can access it, creating a social memory system that people rely on. However, research by Rahwan (2014) found that using Internet search engines as an external memory store did not extend or benefit memory, but instead only helped solve cognitive problems when using the search engines by facilitating spread of correct information. Furthermore, Nicholas et al. (2011) studied working memory in the Google generation, born after 1993, and those beforehand. Working

memory was significantly weaker in the Google generation participants, suggesting that the use of Internet search engines as a method of external memory storage again did not benefit actual memory because memory was consequently being underused. The use of technology and specifically search engines that are readily available and used every day can therefore instead narrowing human working memory capabilities instead of extending them.

The underuse of memory due to technological availabilities can be explained by the offloading effect. Cognitive offloading refers to displacement of cognitions onto technology that would otherwise take up room in the human brain (Dror, 2013). This concept is seen to increase brain capacity in terms of learning, where items can be placed into technology for extended use which frees up cognitive resources in the brain. But in the terms of memory, delegating information to cognitive tools leads to an underused working memory. Offloading is a simple method in which cognitive technology can supplement human cognition, and these cognitive tools are becoming cognitive partners (Dror & Harnad, 2008). Online cognitive partners such as Global Positioning Systems (GPS) are used daily and show a prime example of how technology has replaced the simple human cognition of reading a map. There is little effort in punching in a postcode to get to a destination, whereas much more cognitive effort was used in planning out a trip using a map. It seems that in today's modern world there is a greater use and reliance on cognitive technology than ever before. The dynamic function of human cognitive ability makes loosing that ability apparent if it is not used, for example the use of search engines are so heavily replied on that memory is not used as extensively and the effectiveness of working memory could

therefore decrease. However operating with technology may also allow for improvements in cognition and in turn, benefit an easier lifestyle.

Technology can been used to improve cognitive skills such as information processing and perception. Online gaming is vastly popular with the average gamer playing for around 8 hours a week and the impact it is having on cognition is apparent. Green and Bavelier (2012) observed that online computer game playing led to improvements in perceptual and cognitive tasks such as faster information processing. This is suggested to be due to the quick demanding nature of online games to help improve the speed at which game players must absorb information to make a decision. This type of testing during the playing of the game makes users employ their knowledge constructively, so it also benefits cognitive retention skills (Hagman, 1980). Furthermore, Schlickum, Hedman, Enochsson, Kjellin, and Felländer-Tsai (2009) found that playing online computer games increased cognitive performance in medical students and Drew and Waters (1986) found increases in perceptual motor skills with older adults that played computer games. These studies suggest that the interaction with game playing positively affects human cognition because the physical engagement helps promote cognitive learning and maintenance, and sets a marker in which daily use with these items may in fact lead to further improvements in cognitive skills. However some research suggests otherwise. VanRavenzwaaij, Boekel, Forstmann, Ratcliff and Wagenmakers (2014) found that online game playing does not affect information processing and learning because perceptual learning is highly context-specific and transferring this knowledge to everyday life isn't likely. This suggests that the abilities

obtained from technology may not be able to be applied to human cognition in daily situations, which suggests that some daily technologies that are used may not be very useful. Nevertheless, in Van Ravenzwaaij et al. discussion they emphasise that research method disadvantages that may have enthused these findings. Internet use has also been linked to improvements in certain cognitive skills. Johnson (2008) findings outlined a significant difference with frequent internet users and visual reasoning, compared to non-frequent internet users and verbal reasoning. This suggests that selective use of the internet is related to an enhanced cognitive capacity to manipulate visual imagery that could in turn benefit daily lifestyle by increasing visual awareness when finding new destinations and other visual manipulations. Internet users are more equipped to observing visual stimuli and can use this advantage in everyday life.

Because newer technological advances create constant active engagement for users, daily communication is changing. Computers and the Internet now enrich people's personal life because constant communication to friends and family is available, such as instant messaging, emails and phone calls. It is even possible to visually communicate with friends and family over the Internet. However, as Kirschner and Karpinski (2010) suggest, this constant daily distraction causes poor time management skills and a lack of concentration. Social networking service consumers (SNS) use these cognitive tools for procrastination that leads to a deficit in attention offline because attention is distributed across many different internet domains, such as Facebook, Twitter and YouTube. Junco (2012) found that students who multitask with SNS such as instant messaging and texting in classes

generally had a lower grade point average than those who did not. This may be because the cognitive tools used to remain in contact socially are distracting and a ' withdrawal' mechanism from the real world, which in turn affects attention and learning processes. However, Benway (1999) observed how attention can be manipulated when the individual is still online. Benway found that the numbers of signups for employees on a training programme online were low and this was because people couldn't find the relevant link. It was in a colourful banner at the top of the page but the employees failed to notice it. This research demonstrates that even in the confines of the Internet, attention can still be affected and particular areas of the webpage can act as a distractor. However, the use of SNS, can be used as a progressive tool for human cognition. Alloway, Horton, Alloway and Dawson (2013) investigated adolescent use of social media by comparison against tests of working memory, verbal ability and academic achievement. Findings suggests that Facebook users had in fact increased levels of cognition in areas such as verbal ability and working memory, and this suggests that SNS have a positive effect on human cognition because experience with the process of writing and reading statuses and articles and recalling what was seen on socially constructed networks promotes cognitive function. This is not to say that there may not be an overuse of SNS tools in today society, as a lot of relationships and shared information takes place online, it is hard to distinguish to what point social media reliance is too much. Nevertheless, the overlapping use of different Internet domains that individuals use daily presents a wider spread of available individual concepts that can be connected to create cognitive schemas of knowledge, and relates to the idea of transactive memory.

The promotion of cognitive function by using technological tools is seen to be increasing knowledge. Young (2005) suggests that the knowledge gained from the use of tools such as the Internet results from the complex interactions between the individual, the cognitive tool and society. She suggests a model called the Internet-Mediated learning model whereby relations between the daily use of technology and the individual are explained. The Internet is socially constructed to present collected social views on SNS such as Facebook and Google that an individual can either agree with and absorb to form new knowledge, or discredit. More importantly, the technology used in schools every day is also promoting the acquisition of knowledge in students. Kinzer and Leu (1997) found that the use of technology by using multimedia presentations helped students retain a better understanding of lessons, compared to learning from books on their own. Improvements in the student's formations of concepts, ideas and comprehensive writing skills suggest that operating with technological tools can reiterate and reinforce information for learning. Martinez-Lage, (1997) suggests the reasons for the increased knowledge and memory retention the students portrayed was due to the enhancing efficiency of the multimedia demonstrations creating stronger memory links. Digital technologies can also be accessed again immediately through methods such as playbacks to provide the observer with an immediate renewal of the material that can refresh working memory. This research demonstrates the effective use of technological tools for learning and supports the increase of technology within educational settings. Nonetheless, there are issues that relate to the amount of reliance placed on using technology in such fields because a lot of

learning is now conveyed through online methods instead of through books, considerations about where the line shall be drawn should be taken.

Overall, new technology is increasing and it is having an increasing effective on cognition. Technology is serving as a tool for the promotion of cognitive abilities such as memory, learning and information processing. New technology such as Internet search engines can influence memory by playing the part of an external memory store that subsequently frees up room for cognitive processes and allows instant reviewing, termed offloading. However the underuse of the working memory has also led to worries over deterioration and loss of such a function if technology keeps increasing and allowing for such passing off of cognitive abilities. The cognitive functions could become lazy. However, technology such as Gaming has led to faster information processing due to quick decision making on the games which provides cognitive development and maintenance. Promoting knowledge using technology in classes and in educational settings also suggests that technology is encouraging cognitive development. Finally, SNS do serve to a disadvantage to attention as they act as distractors on a daily basis within many settings. Nevertheless, the future of technology is clear in that it will keep increasing and occupying daily lifestyles and therefore, human cognition.