PART 2: HEALTH AND WELLBEING

The way that young children interact, engage with and experience digital technologies can have implications for health and wellbeing. This includes their physical activity, posture, vision, sleep and emotions.

2.1 Digital technologies and physical activity

Regular physical activity is important for young children's development (Active Healthy Kids Australia, 2016). Children benefit from physical activity that makes them breathe hard to stimulate their lungs, heart and blood vessels. Physical activity that uses energy from sugars and fats helps encourage a healthy metabolism. It also builds strength in children's muscles, joints and bones; challenges the coordination of hands, eyes and limbs; and delivers cognitive and social benefits.

Physical activity in infanthood starts with activities like 'tummy time', which helps babies build strong neck muscles. These muscles are needed so that babies can sit and reach for objects and develop their trunk coordination. For older children, crawling, walking and running help develop the muscular and nervous systems that promote coordination and physical development.

Some digital technologies can be used to support or provide movement opportunities for young children, which assist with physical development. These can include:

- playing with digital robots or using virtual game devices that require whole-body movement (e.g. playing a dance step game on an electronic dance mat)
- using screen-based devices to research tasks or learning inquiries that involve physical activity (e.g. watching a video-tutorial on how to prepare the soil when planning a vegetable garden)
- using functions on mobile devices to record physical activity (e.g. recording activities such as jumping, skipping or climbing and re-watching these in slow-motion to refine learning of the skill)
- employing wearable technologies to measure levels of physical activity with children (e.g. measuring children's daily activity levels in the classroom when learning about health and wellbeing).

When children use digital technologies for movement opportunities it is important that they develop an awareness of their physical surroundings so they do not bump into other people, or trip over objects in their environment. Children can learn when it is appropriate to use digital technologies and move around at the same time (e.g. avoiding screen use when walking in public places or near roads or transport).

Digital technologies that incorporate gamepads, haptics (that respond to touch or motion), styluses and touchscreens require a certain degree of fine motor skill. There is some evidence that fine motor skills, such as pinching, dragging and pointing, may be developed using touchscreen technologies (Axford, Joosten & Harris, 2018). However, it is important that young children also have the opportunity to develop their fine motor skills by participating in three-dimensional (3D) experiences, such as using utensils or their hands for eating or managing their clothing (Kucirkova & Zuckerman, 2017; Lin, Cherng & Chen, 2017). Traditional activities in early childhood education and care settings that build young children's fine motor skills, such as modelling with clay and using writing, drawing and painting implements, help children to develop strength and control in their fingers.

Children may also feel discomfort if they do the same simple movement repeatedly, such as rapid tapping or swiping on touchscreen devices. Cases have been reported of adults developing inflammation injuries from repeated movements while using digital technologies, such as playing electronic games (Bonis, 2007). Although there is no clear evidence about repetitive strain injuries in early childhood, educators might still consider limiting digital activities that involve children performing rapid, repeated fine movements.

Young children do need periods of sedentary behaviour to rest and recuperate after participating in physical activity. Children routinely engage in sedentary behaviours during the day, for example, when listening to a story, sitting in a pram or travelling in a vehicle. However, too much sedentary time is inappropriate for young children. Consuming digital media on screens or playing electronic games can involve long periods of sitting. High amounts of screen viewing by children have been shown to contribute to poor health outcomes, such as obesity and low bone strength (McVeigh, Smith, Howie & Straker, 2016; McVeigh et al., 2016). However, it has not been established whether these outcomes are due to snacking in response to junk food advertising on television, the displacement of physical activity by screen viewing, or by the actual time spent by children in sitting. Excessive sitting and long periods of uninterrupted sitting have been linked to poor physical and mental health in adults (de Rezende, Lopes, Rey-López, Matsudo & do Carmo Luiz, 2014). It is not yet clear if this link is also evident for children (Cliff et al., 2016).

The *Australian 24-Hour Movement Guidelines for the Early Years* (Australian Government, 2017) advise against long periods of sitting for young children, although they do not specify a maximum time limit. They do suggest that sitting time specifically with screen-based digital technologies by children two years and older should be no more than one hour per day. The guidelines also indicate that toddlers and preschool-aged children should spend at least 180 minutes of their awake-time being physically active every day. For preschoolers, this should include at least 60 minutes each day of energetic play that makes them 'puffed'. Energetic play involves activities such as jumping, leaping, dancing, chasing, swimming, digging, climbing and bike-riding. Encouraging children to be less sedentary and more physically active helps develop lifelong, health-promoting habits.

2.2 Digital technologies and posture

Children's physical flexibility, strength and coordination develop when they use different postures in their everyday activities. Children can use digital technologies in ways that promote different postures. For example, when children lie on their stomach to play with screen technologies they develop strong back and neck muscles. Likewise, playing with digital technologies such as robots involves crawling and moving around on the hands and knees. This can help build strong shoulder and hip muscles. Sitting with legs straight out in front while watching television encourages leg flexibility. Standing at a bench or low table while video-chatting with friends will provide opportunities for children to develop standing balance.

Maintaining the same posture for a long period of time can result in children experiencing physical discomfort. Young children will start to feel uncomfortable more quickly in postures that are extreme or awkward, such as bending their neck while drawing, writing or using a touchscreen device while sitting at a table. It has been shown that school age children use many postures when using laptops, which may alleviate some of their discomfort (Harris & Straker, 2000), but it is not yet known whether young children self-vary their posture to alleviate discomfort when using screens. Research about young children's posture when using screen-based devices is limited (Howie, Coenen, Campbell, Ranelli & Straker, 2017) and there is currently a lack of Australian Government health guidelines on posture for children. However, sustained and awkward postures, along with repetitive movements, are noted risk factors for musculoskeletal disorders in adults (Safe Work Australia, 2016). Educators should therefore remind children to regularly change their physical position when using digital technologies, and create physical environments that prompt postural variety, such as benches or tables at different heights for standing and sitting, combined with large cushions for kneeling or soft carpeted areas for lying.

2.3 Digital technologies and vision

Regular visual stimulation helps develop young children's eyes and brain. Infants develop focus, depth perception, facial recognition and tracking in the first year of life. Young children are also developing eye–hand and eye–body coordination to support fine motor and gross motor skills in the early years of life. Children's use of digital technologies—particularly those that offer a

more two-dimensional (2D) experience, such as computer screens, televisions and touchscreens—may have implications for vision development and coordination. These technologies provide a visual target that young children may find attractive and stimulating. However, the development of depth perception requires coordination of both eyes and interpretation in the brain. This development is supported by regular exposure to 3D objects (Alramis, Roy, Christian & Niechwiej-Szwedo, 2016).

Closely viewing the face of a parent or caregiver helps infants and young children develop vision (Hyvärinen, Walthes, Jacob, Chaplin & Leonhardt, 2014). When children are a few months old, they require opportunities to focus on objects positioned at a variety of distances. Spending too much time focused on something very near may result in discomfort for children and limit opportunities for looking at objects that are different distances away. There is some evidence that too much near-vision activity (such as looking at a smartphone) is linked to eye problems in adolescents (Kim et al., 2016). There is a concern that short-sightedness in children is associated with more frequent participation in near-vision activities (e.g. book reading, using computers, completing writing for school work) (Huang, Chang & Wu, 2015). However, available evidence suggests that short-sightedness is linked to insufficient exposure to ultraviolet sunlight, which can occur when children do not have enough opportunity to play outdoors (Torii et al., 2017).

Educators should also consider the impact of screen glare and reflections when using digital technologies in educational settings. Glare and reflection can make it difficult for children to see what is happening on digital screens and lead to eye discomfort for children.

2.4 Digital technologies and sleep

Sleep duration, quality, timing and regularity are critical for young children's healthy development. Children who have irregular sleep habits, do not get enough sleep every night, or frequently have interrupted sleep, are at risk of health and wellbeing problems. These problems include being overweight and obese, experiencing depression, and/or having poorer emotional regulation than those children who regularly experience sufficient duration of high-quality sleep (Chaput et al., 2017). The *Australian 24-Hour Movement Guidelines for the Early Years* recommends:

- 10–13 hours of sleep per day for three- to five-year-olds
- 11–14 hours per day for one- to two-year-olds
- 12–16 hours per day for babies aged four to 11 months
- 14–17 hours per day for babies aged birth to three months.

(Australian Government, 2017.)

Children's sleep can be affected by screen-based digital technologies. Substantial evidence shows that exposure to television, video games, desktop and/or laptop computers before bedtime results in reduced quality and duration of sleep for children (Carter, Rees, Hale, Bhattacharjee & Paradkar, 2016; Cheung, Bedford, Saez De Urabain, Karmiloff-Smith & Smith, 2017). Evidence indicates this is due to bright light from screens influencing the release of sleep hormones, time spent on digital devices displacing time for sleep, and/or digital media content being overly arousing for children when they are trying to settle to sleep (LeBourgeois et al., 2017).

Bright screen light delays the body getting ready for sleep when children experience exposure to this light in the evening (LeBourgeois et al., 2017). The blue light emitted by digital screen technologies is more arousing to children than other colours of light (Chellappa et al., 2013). Children are more sensitive than adults to both the amount of light, and the blue light specifically. In the hour before bedtime, adults should help children avoid too much light, as well as the blue light of screens, to reduce the impacts on the amount and quality of children's sleep.

There is strong evidence that having digital screens available in sleeping spaces is associated with poorer quality and reduced sleep for young children (AAP Council on Communications and Media, 2016). Using digital technologies during sleep time can displace and interrupt sleep. Sleep quality can also be influenced by the media

content young children consume either shortly before bedtime or during the day. Research shows that content that is violent, confronting, or otherwise arouses children has a negative effect on the quality and quantity of sleep (Garrison & Christakis, 2012). Using interactive digital technologies (such as games or apps) just before bedtime may be more disruptive to children's sleep than viewing digital media (Hale & Guan, 2015). This is because interactive activities can be more arousing and cognitively stimulating for children than watching digital media. It is difficult for children to settle to sleep if they are over-stimulated.

2.5 Digital technologies and emotional wellbeing

Emotional wellbeing is critical to young children thriving. Children experience positive and negative emotions, and learning to recognise and understand their different emotions helps children to manage their behaviour in social situations.

Children may associate using digital technologies with positive feelings. As with any non-digital activity, a child who is engaged with a digital activity is likely to feel happy and/or satisfied. Children can also feel positive emotions when they achieve success with digital games or apps. Depending on the features of the digital game-playing experience, playing can help young children learn to concentrate on one task for an extended period, and can also provide opportunities for children to develop qualities such as persistence, resilience and self-confidence (Warburton & Highfield, 2017).

However, while research shows that using digital technologies can provide children with learning and development opportunities such as skill mastery, concentration and self-regulation, children can become unduly attracted to using digital technologies (Gentile et al., 2017). Designers of digital games, apps and other digital technologies aim to create highly engaging experiences for users. This can include tailored content or built-in rewards, such as digital game money. When children play games with built-in rewards they may experience similar neural responses that adults have when gambling. Educators can consider how games and apps are designed for children's interactions and help children become aware of how these are constructed.

The immediate feedback experienced by children within digital games and activities can be enticing, even without a reward component. When children experience frustration or disappointment within a game, or are invited to move onto another activity, this can lead to some challenging behaviours (Hiniker, Suh, Cao & Kientz, 2016). Sometimes these behaviours are interpreted as being caused by technologies, for example, digital technologies causing tantrums or a reluctance to participate in other activities like outdoor play. However, early childhood educators recognise that leaving an absorbing activity is not always easy. In these situations, young children benefit from adults helping them with time-management strategies and emotional support. Establishing timeframes for technology use, advising how much time remains and helping to plan when they can return to an interesting digital activity helps children to learn how to self-regulate their own use of digital technologies.

Adults can use digital technologies to distract children. This can be helpful in situations where children may need to be calm and patient. At other times, adults may use digital technologies to distract children from their feelings. While this can be a helpful, short-term strategy, distraction from emotion is not the same as experiencing and responding to feelings (Radesky, Schumacher & Zuckerman, 2015). Children may benefit from adult support to manage their feelings without using digital technologies.

Some studies suggest that high use of screen-based digital technologies is associated with anxiety and depression in older children (Maras et al., 2015). However, it is not clear if this occurs because using screen-based technologies leads to negative emotional outcomes for children, or if children who are already unhappy are attracted to using screen-based digital technologies to manage their feelings (Hoge, Bickham & Cantor, 2017). The research is not yet established on this association for young children. However, young children will benefit from adult interaction to help them identify alternative activities that

do not involve screen-based technologies. These may be digital-free experiences, or other digital technology-based activities that provide movement opportunities, such as playing with a robot or having a dance activity on a screen for children to follow along. Digital technologies that promote physical activity can be helpful because there is a known positive relationship between movement and mood (Ludwig & Rauch, 2018).

Principle: Young children's health and wellbeing is actively supported in digital contexts

Practice advice:

1. Provide digital technology experiences for young children that promote movement opportunities.
2. Ensure children participate in both digital and non-digital activities to build strength and skills in their hands and fingers.
3. Ensure that screen-based digital technology use while sitting is only for short periods and does not replace periods of active physical movement.
4. Promote postural awareness and change by providing a variety of spaces and heights for children to use digital technologies.
5. Minimise screen glare and reflection and promote regular breaks with a variety of visual distances when using screen-based technologies.
6. Support families to understand that exposure to disturbing or arousing content and screens in the hour before sleep time decreases the length and quality of children's sleep.
7. Promote screen-free sleeping areas and the use of non-screen-based calming activities with children before nap times and evening bedtimes.
8. Help children develop self-regulation for using digital technologies and support them to transition from digital to non-digital activities.
9. Establish routines and structures that promote access to a variety of digital and non-digital activities in the early childhood education and care setting.