# Position Paper

# The Health, Safety and Wellbeing of Young People Working in Digital Forensics

Commissioned by:

The National Police Wellbeing Service (NPWS) and Forensic Capability Network (FCN)

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# Background

It has been established that working in digital forensics can harm workers' psychological wellbeing (Tehrani, in press). Psychological surveillance has shown that of 702 people working in digital forensics, 21% had clinically significant anxiety levels, 27% depression, 10% PTSD, 11% burnout and 15% secondary trauma/compassion fatigue. Despite the results for Digital Forensics being very high compared with the general public, they were lower than those found in Forensic Collision Investigators and Occupational Health Advisors.

Organisations have a duty of care toward employees working in high-risk roles (Management of Health and Safety at Work Regulations; 1999). The legislation requires organisations to undertake risk assessments for all employees with specific mention of pregnant and new mothers and young people under eighteen. There is no legal responsibility in legislation for young people between the ages of eighteen and twenty-five years or new and expectant fathers; however, if these groups are identified as vulnerable in a risk assessment, consideration should be given to ensure that control measures were in place to remove or control the risk.

There are several protected characteristics in law, and it is against the law to discriminate against anyone because of age, being pregnant or on maternity leave, disability, race, religion or belief, sex or sexual orientation (Disability Rights and Equality Act, 2010). To restrict entry to a role or opportunities to engage fully within the role in terms of training or development would be in breach of this legislation.

Health and Safety Legislation does not require organisations to remove all risks of harm. However, they must ensure that people with protected characteristics are at no greater risk than other workers. Organisations must make reasonable adjustments to enable people with protected characteristics to work in their chosen role or occupation. If an organisation restricts entry into a role, they have a responsibility to provide evidence that there were no reasonable adjustments that could be made to make the role available.

# The Need

There is a need to increase the number of police staff working in digital forensics, which has led to plans to introduce apprenticeship schemes for public members wishing to enter this work area. The training will involve intensive training over two years. It is anticipated that this opportunity will be attractive to young people aged eighteen years and above who have completed their A-level qualifications.

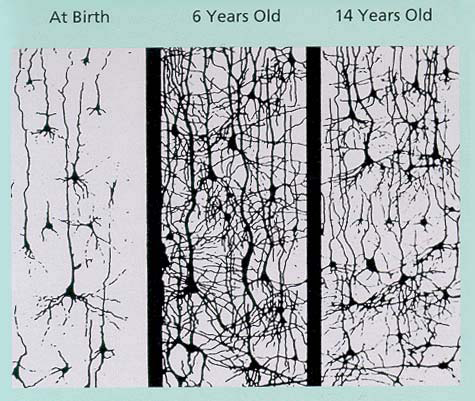
The initial training will focus on building technical IT skills in computer forensics. However, as the apprentices go through the training, they will be exposed to material related to fraud, money laundering, gun dealing, child abuse, domestic violence, torture and terrorism.

Concerns have been expressed relating to the vulnerability of young people to some aspects of digital forensics, which may expose them to visual images of child abuse, bestiality, torture, beheading and other distressing material. However, reading text that includes statements, chat logs and other materials that promote extreme political, racial, and social views and grooming and coercive techniques can also cause problems. Most concerns relate to the brain's capacity to deal with this material when the brain is developing. However, it is equally important to consider the psychological impact of young people being exposed to material that may activate responses to early life traumas or where constant exposure to extremist propaganda may negatively influence their attitudes, beliefs or behaviours.

It is also essential to consider other protected characteristics; for example, there is a need to protect pregnant and new parents undertaking work in digital forensics, which may involve viewing images of child abuse, particularly abuse perpetrated against babies and young children. Identifying apprentices with a neurodiverse condition or high adverse childhood experience (ACE scores) who may be more vulnerable to viewing distressing images is also essential.

# The Brain's Development in Childhood and Adolescence

It is interesting to note that humans have fewer genes than many simple organisms. During evolution, genetically determined stereotypic responses were replaced by greater freedom of choice. This change from nature to nurture was made possible in an evolving process in which the brain's neurons learnt new ways to respond and behave in a way more adaptive to the demands of the physical, social, emotional and psychological environments (Damasio, 2003). This flexibility of response capacity sets humans apart from other animals (Immordion-Yang, Darling-Hammond & Krone, 2019). Whilst the physical structure of the brain and its genetic template create the essential framework, interaction with people, environments and situations provides the opportunity for humans to learn, respond and develop their intellectual, coping and resilience-building strategies (Kolb, Harker & Gibb, 2016).

**Images of neurons at birth, six years and 14 years**

At birth, human behaviour is primarily based on innately determined behaviours designed to maintain life. There are few connections between neurons allowing for behavioural flexibility. However, during the first five years of life, the brain rapidly grows and develops in size and complexity. Whilst the number of neurons is largely fixed at birth, the nerve fibres and synapses grow and connect, allowing learning and cognitive development (Teicher, Samson, et al., 2009).

The human brain goes through major development periods from early life to maturity. A newborn baby has around 10 trillion synapses (neural connections); in a year, this has risen to 1000 trillion. However, this increasing number of synapses prevents effective communication. The unused synapses become trimmed, allowing stronger and more valuable connections to dominate. At 14, there are around 300 trillion synapses which reduce to approximately 150 trillion in adulthood.

The flexibility of human thinking and responding is facilitated by four processes, myelination, connectivity, pruning and executive functioning.

1. **Myelination** is when the nerve fibres of brains are encased in a fatty substance providing insulation to allow neurons to transmit signals quicker and more efficiently. The corpus callosum, which connects the right and left brain hemispheres, is highly myelinated.
2. **Increased connectivity** and the development of neural pathways between brain regions are strengthened, making learning and communication more efficient, leading to better planning and the ability to deal with emotions and problem-solving.
3. **Synaptic pruning** occurs throughout the brain's development but is particularly intense around six years and again at puberty. Pruning reduces unused or obsolete brain connections, allowing for more efficient brain functioning.
4. **Increased Executive functions** or decision-making are facilitated by the development of the prefrontal cortex. The prefrontal cortex is involved in the assessment of risk, the ability to empathise with others, evaluate and set goals, and allow for self-soothing and the regulation of emotions.

The second major phase of brain development begins just before puberty and continues to the mid-twenties. This phase involves a rapid increase in the creation of new synapses followed by a period of synaptic pruning and myelination (Arain, Haque et al., 2013). This period of life provides opportunities to develop new talents and lifelong interests. However, it can be turbulent with increased risk-taking, changes in sleep patterns and the expression of strong emotions. The increasing sex hormones are part of the reason for the dramatic changes that begin at puberty. But this change occurs when the brain is going through a process of synaptic re-generation and re-engineering, with the executive functioning of the prefrontal cortex being one of the last areas of the brain to be reshaped. The delay in developing the prefrontal cortex means that there are very few controls over the young person's passions and desires for much of adolescence.

The prefrontal cortex can moderate adolescent behaviour; without it, a wide range of drives are released, leading to positive and negative outcomes due to the emotional and motivational surges. Adolescent passions can lead to sex, drugs, a preference for loud music, risky behaviour and a need for more sleep. On the other hand, adolescence is a time of creativity with novel ideas and ideals, a passion for art and music, a desire to succeed in sports or occupations and a drive to take action to help others (Dahl, 2003). The adolescent phase slows down after puberty and is largely completed between eighteen and twenty-five years. The boundaries between adolescence and adulthood are blurred, and legislators are frequently faced with the need to decide the age at which a child can start smoking or drink alcohol, view a pornographic film, drive a car, go to war or get married. The law is the framework for considering health risks; imposing restrictions on people between eighteen (the current legal age of maturity) and twenty-five is problematic without evidence of actual health risks.

It is essential to recognise that although the human brain is considered to have reached maturity by middle adulthood, new neuronal connections continue to be created throughout life, allowing for life-long learning and acting as a buffer against age-related cognitive decline (Charles & Carstemsen, 2009)

# The Lifetime Impact of Traumatic Exposure on the Brain

Several brain structures have been found closely associated with the trauma response. The Locus Coeruleus, Amygdala, Hippocampus and Cortex are the most widely studied. When a person becomes involved in a traumatic experience, the sensory information is transported through the central nervous system or directly into the brain. Most sensory information is passed to the thalamus, where some initial processing occurs. From the thalamus, the sensory information travels via the amygdala and the hippocampus to the prefrontal cortex; at each stage, additional processing occurs (Richter-Levin, 2004). When the information reaches the cortex and has been assigned, it is fed back to the locus coeruleus and the amygdala. Connections to and from the locus coeruleus and amygdala to the hypothalamus, hippocampus and prefrontal cortex affect the behavioural, autonomic and HPA response systems, which initiate and control the body's responses (LeDoux, 1992).

Schematic representation of emotional arousal pathways (after LeDoux, 1992)

Sounds

Smells

Tastes

Sights

Hippocampus

Fuse

The Body’s Sensations

The diagram illustrates the relationship between the thalamus, amygdala, hippocampus and prefrontal cortex. Each brain structure is involved in processing and interpreting incoming sensory information. Under normal circumstances, the information passes from the thalamus to the amygdala to the hippocampus, where early processing occurs (Brewin & Burgess, 2014). Where there is extreme arousal, the passage of information from the amygdala to the hippocampus is disrupted by a "fuse" in the dentate gyrus. The fuse is made of fragile neurons, which are destroyed when exposed to trauma-related information from the amygdala. The fuse blocks information from moving from the amygdala to the hippocampus, resulting in traumatic sensations and impressions becoming trapped in the amygdala in an active form. As the dentate gyrus allows new neurons to be created (neurogenesis), the fuse can be repaired but remains vulnerable to neuro-endocrine damage (McNerney, Sheng et al., 2018). At the same time that the fuse blows, there is lateralisation of the brain, with the more intuitive and emotional right hemisphere becoming dominant and the left hemisphere, including the language centres of the Broca and Wernicke areas, being closed down.

### Childhood Trauma

It has been recognised that around 40% of people will have experienced some form of Childhood Adversity Experience (ACE), having a significant impact on the brain and the functioning of the neural and neuroendocrine systems involved in the stress and trauma responses (Anda, Felitti et al., 2006). There is, however, evidence of epigenetic, neuroendocrine, endocrine and neurological changes taking place in children, which can have a long-term negative outcome on the psychological, social and physical wellbeing of children in later life (Van der Kolk, 2020; Anda, Felitti, Bremner et al., 2006). It has been found that there is a delay of approximately nine years before the effects of early child abuse are observed in the victims (Teicher, Samson et al., 2009) which underlines the importance of monitoring young adults during puberty and into their mid-twenties.

A study undertaken with police officers dealing with online child abuse (Tehrani, 2018) identified that adverse childhood experiences were related to higher levels of anxiety, depression and trauma but where there was a supportive manager and peer together with an absence of current personal trauma (e.g. bereavement) police employees with four or more ACE scores were more resilient than their colleagues.

### Adolescent Trauma

The increased malleability of the brain to learning opportunities increases its ability to respond to challenges, including traumatic stressors. Most people experience at least one significant trauma in their lifetime (McLaughlan, Koenen et al., 2013), but most do not go on to develop PTSD or any other mental health condition. Given the increased sensation seeking and reduced influence of the prefrontal cortex control, it is not surprising that adolescents are exposed to higher levels of trauma than other ages and, therefore, more likely to experience trauma symptoms. Landolt, Schnyder, et al. (2013) surveyed around seven thousand Swiss adolescents and found that 56% had experienced significant trauma, and 4.2% met the criteria for PTSD.

There is increasing evidence that when adolescents experience traumatic events earlier in childhood, this experience increases their ability to be resilient when dealing with trauma in later life (Cotella, Nawshaba et al., 2022). This finding was confirmed in a study of female victims of child abuse (Hyman & Williams, 2001), who found that while 52% continued to experience some adverse symptoms, 29% had developed a good level of resilience, and 19% had high levels of resilience. These results appear to be related to hippocampal volume (Gilberson, Shenton et al. 2002), where a reduced hippocampal volume is related to an increased incidence of PTSD.

# Psychological Surveillance Results for Young Adults in Digital Forensics Teams

Many police forces have adopted the NPWS psychological surveillance programme. A total of 2031 responses have been gathered from police officers and staff working in digital forensic teams. Data from the three age groups were compared (young, middle, and mature).

Table 1 examines some of the risks that increase the vulnerability of the younger group to developing mental health conditions, including adverse childhood experiences, stigma, manager support, health beliefs and workability.

Unsurprisingly the young group had been in the role for a shorter time than the middle and mature groups. All the other areas of the younger group had more positive beliefs, less stigma and lower ACE scores than the other two groups.

Table 1: Risk factors for the three age groups

|  |  |  |  |
| --- | --- | --- | --- |
|  | Young (n=167) | Middle Age (n=1359) | Mature (n=504) |
| Age | 18-25 years | 26-50 years | 51-70 years |
| Tenure | 2.6 years | 5.9 years | 7.3 years |
| Intention to leave | 1.1 | 1.2 | 1.3 |
| Health Beliefs | 2.6 | 2.3 | 2.2 |
| Workability | 3.0 | 2.4 | 2.0 |
| Manager Support | 2.9 | 2.6 | 2.5 |
| Stigma | 0.1 | 0.2 | 0.1 |
| ACE Scores | 0.8 | 1.1 | 1.2 |

Table 2 compared the clinical scores for the three groups and the results show very little difference between the scores for the young group compared to the other two groups. They were significantly less likely to experience secondary trauma than the other two groups. However, the young group had slightly higher levels of PTSD

Table 2: Mean Clinical Scores for the three age groups, including clinical cut-off

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Cut-off | Young (n=167) | Middle (n=1359) | Mature (n=504) |
| Anxiety | <5 | 2.4 | 2.4 | 3.0 |
| Depression (0-9) | <3 | 1.8 | 2.3 | 2.1 |
| Burnout | <30 | 23.8 | 25.3 | 24.8 |
| Secondary Trauma | <15 | 8.7 | 10.4 | 10.3 |
| PTSD | <50 | 24.0 | 23.6 | 21.6 |

These results do not support the view that the younger digital forensic staff are at greater risk of mental health conditions than the middle or mature group. Indeed it would appear that they are more resilient and experience fewer symptoms in most respects.

## Psychological Surveillance in NPWS

Where a hazard can not be eliminated or reduced, there is a need to undertake regular health surveillance. Surveillance involves identifying the personal and organisational risks together with any mitigating resilience or coping factors.

The National Police Wellbeing Service has selected a surveillance tool and is resourcing a national programme of psychological surveillance for the high-risk roles identified in the role risk assessment. This programme involves the regular completion of an online psychological screening questionnaire, the feedback of individual results and management information. The NPWS is keen to help Police Forces develop their capacity to undertake effective psychological surveillance, but it is unable to fund psychological surveillance for all high-risk roles.

The clinical results identify those with concerning or clinical mental health problems. It is possible to use simple clinical measures of mental health symptoms; however, using additional questionnaires to identify hazards and resilience factors is very useful. The questionnaires that identify hazards, coping, and resilience help identify interventions and treatments by finding likely causes of issues and the areas where improvements can be made.

The NTAPS Family of Questionnaires

Table

Description automatically generated

Many psychological assessment questionnaires can be used for this purpose (Tehrani & Hesketh, 2018 ), and it would be possible (although highly time-consuming) to undertake pen and paper screening. However, the online surveillance programme is quick, accurate and more economical regarding financial and people resources. The tool provides comprehensive surveillance of large numbers of officers and staff with the added benefits of automatically generated reports and fitness notes, benchmarking, management information and deep-dive analysis of a database with over 40 thousand subjects.

If an Occupational Health Service considers the NPWS-funded psychological surveillance programme unsuited to their needs and introduces a different approach, they will be responsible for demonstrating that their alternative approach is at least as good as the model selected by NPWS.

# Discussion

The human brain goes through several stages from childhood to adulthood. In early childhood, there is a dramatic increase in brain volume and synaptic development. In adolescence, a phase of refining and renewing synapses create a period of rapid change and challenge. The maturation process of the brain is not inherently harmful; indeed, for many, it is a time for intense passions, learning, experiences, development and fun.

For some young people, puberty can activate responses to earlier life traumas as the delayed traumatic stress symptoms emerge; for others, their drives and passions bring them into dangerous relationships with sex, drugs and criminal activity, which may expose them to trauma.

There is a need to provide young people with help and support during this crucial period in their lives to enable them to channel their energies into activities which will provide them with positive experiences and futures.

An apprenticeship in Digital Forensics is an entry into a worthwhile occupation that can lead to exciting career opportunities. With psychological surveillance and support, careful planning of the apprentice experience and the provision of psychological support, there is no reason why a young person with average resilience and coping skills would not find this an enriching experience which would allow them to actively engage their energies.

Young people should be allowed to enter Digital Forensics as an apprentice. Preventing anyone under the age of 25 from becoming a Digital Forensic apprentice would be discriminatory and counter to the Equal Act. Risks to psychological wellbeing should be assessed and managed using the Management of Health, Safety and Wellbeing Legislation procedures and reasonable adjustments made.

# Responses to NPWS/FCN

|  |  |
| --- | --- |
| Q | Is there a heightened level of mental health risk for apprentices between the ages of 18 and 25 years? |
| A | There is no general risk to young people; however, some young people may be harmed by viewing images of child abuse or other traumatising material |

|  |  |
| --- | --- |
| Q | What might make young people more vulnerable to trauma-related mental health conditions? |
| A | Many personal factors can make young people more vulnerable to trauma-related mental health conditions. These include:  Four or more ACE scores, A sensitive personality, alcohol abuse, current high levels of anxiety, depression or trauma symptoms, recent traumatic exposure, poor coping skills, poor lifestyle |

|  |  |
| --- | --- |
| Q | Are there any other risk factors? |
| A | Pregnancy or having a new baby can increase vulnerability, as can other personal problems such as domestic violence or bereavement |

|  |  |
| --- | --- |
| Q | Are there any other at-risk groups? |
| A | It is possible that this role could attract apprentices with low or zero empathy. Whilst they are less likely to be troubled by images, they also have no understanding of the meaning of the abuse. They could pose a risk to themselves and the organisation |

# Recommendations

1. Before joining the scheme, all apprentices should be screened to identify those with existing psychiatric conditions and those who might require additional support.
2. There should be six monthly or annual screenings of all apprentices with a one-to-one session with Occupational Health at least annually.
3. Initially, the training should not involve any exposure to distressing images.
4. Training should prepare apprentices for viewing distressing images by ensuring they understand the purpose and know what they are expected to do with the information. They are competent and capable of undertaking the work.
5. There should be access to resilience-building groups, demobilising and defusing and supervisor wellbeing support
6. There should be accessible general and trauma therapy as required
7. Opportunities to take a gap in the training if an apprentice is experiencing a personal trauma

Please also read the NPWS POLIT/ICAT Guidance

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