

The Impact of Treatment on a Student's Cognitive Development

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Statistics

- Cancer affects approximately 1 in 7,000 children up to 14 years of age
- In 2005 in NSW – 181 children (0-15 yrs) were diagnosed with cancer
- Most common cancer - leukaemia (38%)
- In 1960 - 1 child in 25 (4%) with leukaemia survived
- Now about 20 in 25 (80%) children survive with leukaemia
- Two-thirds of children will experience at least one long-term consequence (late effect) of their cancer and its treatment

Treatments

Treatments for cancer either alone or in combination:

- Radiation
- Chemotherapy
- Cranial radiation
- Intrathecal (brain & spinal cord) chemotherapy
- Surgery
- Bone marrow transplant
- Stem cell transplant

Cognitive Development

- Brain cell development - delayed or failed eg. child at 6 yrs can do simple addition and subtraction, but at 8 yrs brain development necessary for memorising multiplication tables has not occurred
- Deficits are **progressive** in nature
- Model of late effects
 - cognitive abilities prior treatment: minimally affected
 - cognitive abilities after treatment: more likely to be affected

Cognitive Late Effects

- Time since treatment: deficits appear 1-3 yrs after treatment
- Teachers may need to adjust their expectations of the student – past performance may **not be equivalent** to future or expected performance
- Type of deficits will be influenced by number of factors e.g. type of cancer, treatment, other risk factors

'At risk' factors

- Younger age at treatment (especially <4yrs)
- Female
- Pre-existing conditions e.g. neurological conditions, shunt infections, hydrocephalus
- Dose and intensity of treatment

Common Cognitive Deficits

- Research suggests that treatment of childhood cancer may affect the following:
 - Intelligence (IQ)
 - Attention/Concentration
 - Memory
 - Processing Speed
 - Executive functions (e.g. planning, reasoning)
 - Visual-perceptual skills
 - Motor abilities

Changes in IQ

- General decline in IQ over a 3-5 year period
- Decline in IQ not linear: steep then gradual decline
- 12 months post treatment = little notable decline
- 3 years post treatment = lower IQ compared to norms and controls on all index scores (i.e. FSIQ, VIQ, PIQ)
- Rate of decline - about 4 IQ points per year, over a three to four year period

Attention Deficits

- Focusing, simple tracking, automatic shifting
- Complex attentional abilities e.g. active mental switching
- Sustained attention
- Focus encoding : ability to target, recall and manipulate information
- Focus execute: ability to target information efficiently and quickly, and then make an appropriate response based on that information

Memory Deficits

- Deficits observed in
 - Verbal memory
 - Visual memory
 - General memory
- Memory deficits may be associated with problems with executive functions (e.g. strategic planning) and attention.
- Inefficient storage of new information - information processing and attention

Academic Performance

- Poorer academic achievement – decreased skill acquisition rather loss of previously learned material
- Academic development falls behind peers years after treatment
- Significant declines in maths, reading and spelling, but decreases in maths more likely than reading and spelling

Addressing the Problems: Regular Assessments

- Neuropsychological evaluation
- Assessments:
 - before, shortly after, 1-3 years post treatment
 - transition to new school
 - new difficulties emerge
 - planned re-evaluations

Areas to be Assessed

- Intellectual functioning
- Academic performance
- Attention/Concentration e.g. CPT
- Memory
- Processing speed
- Executive functioning – planning, organisational, problem solving ability
- Behavioural checklist

Where to go & who should do it?

- A psychologist – with training and experience in neuropsychological assessment
- Psychologists at the student's hospital
- Australian Psychological Society

Addressing the Problems: Cognitive Remediation

- Combines three elements –
 - Brain injury rehabilitation components
 - Special education/educational psychology
 - Clinical psychology
- Clinical psychology component includes cognitive behavioural approaches such as reframing struggles, acknowledging strengths, and monitoring internal dialogue

Cognitive Remediation

- Brain injury rehabilitation strategies:
 - Alternating focus: 15 minutes on task, followed by interesting/meaningful distraction.
 - 50% - 80% rule: If the child cannot do 50% of the task, revise to make it easier. Once the child can do 80% of the task correctly they are ready to proceed to next level.

Cognitive Remediation

- Special education/Educational psychology:
 - Task preparation
 - Magic/special words – Teacher and child identify approximately 3 words to serve as cues to alert the student that they are to do their best work.
 - World record – A motivational opportunity to promote high levels of performance. Children also should keep a record of their performances so they are able to gauge improvements and track their 'Personal Best'
 - Soup breath – a relaxation exercise to do prior to commencing work.

Source: Spencer (2006)

Cognitive Remediation

- Special education/Educational psychology:
 - On task
 - Mark my place – To reduce opportunity for child to lose their place, student uses tick marks at the beginning and end of rows.
 - Time out/start over – Encourage children to recognise when they are making errors or feeling overwhelmed. In response to their frustration students are encouraged to take a break, ask for help or hints, use a relaxation strategy and then start again.
 - Look at the floor – when distracted, stop and focus on floor or selected spot.

Source: Spencer (2006)

Cognitive Remediation

- Special education/Educational psychology:
 - Post task
 - Check your work – Verbally prompt the child to check their work, with the aim that this behaviour will become completely internalised.
 - Ask for feedback – Encourage the child to look for feedback on their performance and possible strategies for improvement.
 - Reward yourself – Create opportunities to celebrate improved achievement in a way that is meaningful to the child.

Source: Spencer (2006)

Specific Instruction

- Compensatory Memory Notebook (Kerns & Thomson, 1998)
 - Sections on episodic memory, calendar, things to do/assignments, transportation.
 - Train in the acquisition skills for using the notebook, prompt for applying the skills, and adaptation as needed to ensure utility of notebook.
- IEP interventions
 - Determine content through individual assessment.
 - Where possible use skills-based tutorial approach.

Addressing the Problems: Compensatory Interventions

- Where possible consider the following:
 - Are the school personnel involved with the student well informed about the student's needs? If no, what additional training do they need?
 - Can extra time be allocated to the student for the task?
 - Can the task be adapted (e.g. a multiple choice exam rather than an essay format, oral responses)?
 - Can the number of items on a test be reduced?
 - Would preferential seating in the classroom assist the student? Help me monitor the student?

Addressing the Problems: Compensatory Interventions

- Where possible consider the following:
 - Can I decrease expectations e.g. reduce the volume of work expected for homework?
 - Are there technological devices/aids that may assist e.g. voice recognition software?
 - Can I tape my classes so that the student has access to recorded versions for review?
 - Can I provide notes on the classes to reduce the volume of writing required by the student?
 - Would the student be able to complete work more effectively using a computer rather than handwriting?

Suggested Readings

- Armstrong, F., Daniel, B., & Brandon, G. (2004). Childhood cancer and the school. In R. T. Brown (ed.), *Handbook of pediatric psychology in school settings*, Mahwah, NJ: Lawrence Erlbaum Associates Publishers, pp.263-281.
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