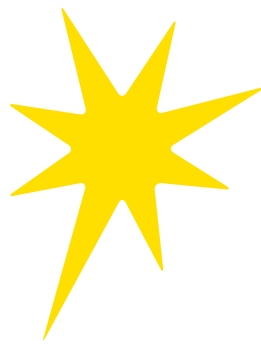


Cognitive  
Differences:  
Inflexibility and  
Impulsivity  
A Guide for Parents



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# General Introduction

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This guide has been developed to help parents understand differences in how thoughts might be processed in children with different neurodevelopmental conditions and offers an insight into what can be done to manage the related difficulties.

**Part 1** describes cognitive differences, specifically impulsivity and inflexibility, which are two types of cognitive difference that children with neurodevelopmental conditions may show, and explains how these may manifest in children.

**Part 2** gives a more detailed description of how these differences can be measured, what specific syndromes they may be more common in, and how they can affect quality of life in children and those around them.

**Part 3** outlines some strategies which may help to reduce or improve impulsivity and cognitive inflexibility. A list of useful resources are provided at the end of this guide.”

## Part 1 - Introduction

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Part one gives a brief overview of how people with neurodevelopmental conditions might think in different ways, explains the concept of cognitive and executive functions and outlines how they relate to cognitive differences. In particular, we will focus on cognitive inflexibility and impulsivity, and describe the difficulties that can arise from these differences.

The term cognition refers to how someone may think, learn and figure things out. Executive functions are specific types of cognitive abilities that control different thoughts and behaviours<sup>1</sup>. They include some quite complex processes like planning and problem-solving, but they also include simpler processes like inhibition and cognitive flexibility. Inhibition involves stopping a thought or behaviour that is well-learned, well-practiced and/or that is a person's usual response to the situation. For example, one common way to test inhibition is to ask people to name the ink colour of words like: **blue**, **red**, **yellow** – this is a challenge because the more practised response is to read the words “blue”, “red”, “yellow”.

Cognitive flexibility involves changing from thinking about something in one way, to thinking about it in a different way. For example, one

common way to test cognitive flexibility is to test their ability to switch between tasks. This involves giving people coloured geometric blocks to sort – and after first sorting shapes into, for example, a blue pile and a red pile, then ask them to task switch and sort the shapes into a round and a pointy pile. This involves cognitive flexibility because the person has to be flexible about sometimes thinking about the blocks as colours, and sometimes thinking about them as shapes<sup>2</sup>.

This guide will focus mainly on the way in which difficulties in inhibition and cognitive flexibility can impact behaviour. When someone's inhibition is impaired, this causes impulsive behaviour (impulsivity). When someone's cognitive flexibility is impaired, this causes inflexible behaviour (cognitive inflexibility).

These differences can result in challenging behaviours, distress or anxiety for individuals with a neurodevelopmental condition, which can make unavoidable everyday demands unpleasant.

# Part 1a – Cognitive inflexibility

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Cognitive inflexibility can lead people to prefer (or insist on) sameness in their routines or their surroundings. This means people can often resist change and show negative responses to change.

Examples could include, but are not limited to:

- Doing things in the same order every day
- Eating the same meal for lunch on specific days of the week
- Distress when things are done differently to usual or to how they were planned
- Checking or arranging things frequently
- Excessive tidying
- Difficulty disengaging attention from things that are no longer relevant.

It is important to understand that if your child is showing inflexible behaviours, it may seem like they are being stubborn or being defiant, but in fact they cannot be flexible possibly due to impairments in cognitive flexibility (task switching) or a protective effort to avoid being overwhelmed<sup>3</sup>.

## When does cognitive inflexibility become a problem?

It is very common for people to have a preference for sticking to routines and schedules and changes to them are typically seen as minor inconveniences. For example, some people have their routine/schedule written down in a diary which they follow strictly. If for whatever reason they have to change that routine, they might have negative feelings about it, but these do not last long and it does not have a huge impact on everyday life functioning.

However, for individuals who show cognitive inflexibility, there can be a stronger dislike to any changes to a typical routine.

When two difficulties interact, there is likely to be a bigger negative impact on the child. For

example, a change to a plan that also leads to a non-preferred option (perhaps going to the supermarket instead of going to the park) is likely to be harder to deal with than a change to a plan that leads to a preferred option (perhaps going to the cinema instead of going to the supermarket). The way these things interact depends on each child's unique preferences, their cognitive differences, and also on other things going on for the child, which may affect their preferences on a moment by moment basis. This is one of the reasons why it can be so difficult to anticipate whether a child will have difficulty with a particular change.

## What impact does cognitive inflexibility have?

- When there is a change to routine or plan, it can lead to increased worry or anxiety which can potentially result in challenging behaviours such as self-injury, aggression and destruction if there is an undesired or unexpected change to an expected routine or plan
- It can limit opportunities, which would require flexibility. For example:
  - ◆ If children are accustomed to a social routine which involves playing with a particular friend, this might limit social opportunities to interact with different friends.
  - ◆ If children are accustomed to learning with a particular teacher in a particular class at school, this might limit learning opportunities with other teachers or classes.

## Effects of age

Generally, cognitive flexibility develops quickly during early childhood (around primary school age). Some researchers have done studies which suggest that when children's routines around this age are very rigid, cognitive inflexibility can become more of a problem over time as children get older<sup>4</sup>. So, encouraging children's flexibility around this age may be beneficial (this is further explained in Part 3). Cognitive flexibility continues to develop and improve as children transition from adolescence and into adulthood, these skills are said to peak between the age of 21 and 30<sup>5</sup>.

## Part 1 b - Impulsivity

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Impulsivity can lead people to act without thinking or to do things at inappropriate times.

Examples could include, but are not limited to:

- Difficulties being quiet or keeping still when in the classroom
- Difficulties in raising a hand to speak instead of blurting out an answer
- Finding it difficult to wait (e.g. for a turn or a reward)
- Needing an instant response

### When does impulsivity become an issue?

Everyone experiences some form of impulsive behaviour, such as saying something without thinking every once in a while, as it is human nature to do so. To some extent, this kind of behaviour is particularly common in children and teenagers as their brains are still developing and so it is typical for them to act impulsively in some situations. However, it can become an issue if a person is often impulsive, and their impulsivity gets in the way of everyday functioning. Examples can include acting without thinking due to the need for an instant response or not being able to 'put the brakes on'.

### What impact does impulsivity have on daily life?

#### Anxiety

Impulsivity can be very distressing to a child, which can lead to anxiety.

#### Eating disorders

Impulsivity can impact a child's relationship with food, which can lead to disordered eating behaviours. Research has found that impulsivity can increase the likelihood that highly appetising foods will attract the attention of individuals if they are also experiencing low mood.

#### Self-injurious behaviour

Impulsivity is widely known as a risk marker for self-injurious behaviour. Research has shown that children who self-injure are more impulsive than children who do not self-injure, and that there is a statistical association between self-injury and impulsivity. These studies have shown that children who are more impulsive, also tend to show more severe self-injury that persists over a longer period of time. This association is thought to contribute to why self-injurious behaviour is particularly common in children with certain neurodevelopmental conditions.

[The link between impulsivity and these conditions/problems will be further discussed in the next section.](#)

#### Effects of age

Similar to cognitive inflexibility, there is limited research around the effects of age on impulsivity in the context of intellectual disabilities. However, there is evidence on the typical development of impulsivity which shows that impulsivity is elevated in adolescents followed by a decline during adulthood.

# Part 2 - Measuring cognitive differences in children with different disorders and/or conditions

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Part 2 will focus on how cognitive difference (including cognitive inflexibility and impulsivity) can affect individuals with different syndromes, and how other problems (e.g, self-injurious behaviour) may co-occur with some of these conditions. This section will also outline how cognitive inflexibility and impulsivity may affect quality of life, how they can be assessed and identified in children.

## How are cognitive differences linked to different neurodevelopmental conditions?

In this section, it is important to note that cognitive differences are not specific to any syndrome and could be present in children without a diagnosis. However, people with some conditions (such as those listed below) may be more likely to show signs of cognitive differences. This guide provides a non-exhaustive list of conditions that have been studied in relation to cognitive inflexibility and impulsivity. Therefore, you might find this guide helpful even if your child does not have any of the diagnoses listed below.

### Fragile X Syndrome (FXS)

FXS is more common in males than in females. The symptoms displayed are also different based on gender, with males often showing symptoms that are clearer to observe (this might be linked to females' often adapting their observable behaviour to fit in with social and environmental expectations). For this reason, the majority of studies on people with FXS have involved males.

People with FXS who are cognitively inflexible may show repetitive behaviour, such as lining up or arranging objects, repetitive actions (especially repetitive hand movements), and preference for routine<sup>7</sup>. Research also shows that once people with FXS have received a reward for paying

attention to something in particular, they find it hard to stop paying attention to that thing. This may be why people with FXS can spend a long time focusing on particular tasks<sup>8</sup>.

Impulsivity in people with FXS may be displayed through aggression, with both males and females showing signs of this behaviour. A child may show more frequent and/or severe aggressive behaviour when they also show hyperactivity, anxiety, or sensory problems, which can be linked to their impulsivity.

### Prader-Willi Syndrome (PWS)

Individuals with PWS can be cognitively inflexible, which can often lead to resistance to change. Some research suggests that children who are exposed to long periods of rigidity at an early age may be more likely to show resistance to change over time<sup>4</sup>.

Cognitive inflexibility can contribute to repetitive behaviour as this behaviour can be used as a coping mechanism for unpredictability<sup>6</sup>. Children with PWS are more likely to ask questions repetitively, rather than more physical behaviours such as body rocking<sup>9</sup>. Research has shown that people with PWS use different parts of their brain compared to people without PWS when they are doing tasks that involve cognitive flexibility (task switching)<sup>10</sup>. This might help to explain the cognitive inflexibility people with PWS show.

Impulsivity may lead to a particular form of self-injurious behaviour in children with PWS - skin picking. We do not know why skin picking is more common in people with PWS than other forms of self-injury. But we know that for many children with PWS who show skin picking, this can be set-off by imperfections in the skin (e.g. cuts) - once the picking starts, it can be difficult to stop.

## Cornelia de Lange Syndrome (CdLS)

Children with CdLS are likely to show cognitive inflexibility. Repetitive behaviours such as rocking, lining up or attachment to objects, repetitive speech or adhering to routine are all examples of cognitive inflexibility common in children with CdLS. However, these behaviours may also be linked to sensory problems, social demands<sup>11</sup>, or anxiety. The behaviours may be particularly common in children who also have a diagnosis of autism spectrum disorder.

Impulsivity, overactivity, and an inability to stop certain behaviours are also apparent in children and adults with CdLS. Research has shown that impulsivity may also be related to pain and discomfort associated with gastro-intestinal difficulties<sup>12</sup>, which are common in people with CdLS.

Children with CdLS may also have more general executive functioning deficits, for example holding things in mind over a brief period, changing what is held in mind as necessary (working memory updating) and planning<sup>13</sup>. These wider executive deficits can lead to difficulties with speech initiation or thought verbalisation. For example, children with CdLS might find it hard to express their opinions. These difficulties may become more prominent as your child becomes a teenager and enters adulthood<sup>1</sup>.

## Smith-Magenis Syndrome (SMS)

Individuals with SMS may show cognitive inflexibility. For example, children with SMS tend to display repetitive or stereotyped behaviour<sup>14</sup>, such as "self-hugging", yelling, teeth grinding or body rocking. These difficulties can affect the child's everyday ability to adapt to different situations.

Children with SMS are also likely to display signs of impulsivity. This may be seen through aggressive or self-injurious behaviour<sup>13</sup>. Although aggressive behaviour is highly prevalent in people with SMS, once it is manifested, it is not likely to be more severe than in people

with other syndromes. In addition, impulsivity may underpin both the development and maintenance of self-injurious behaviour in children with SMS<sup>15</sup>.

Children with SMS might also display broad everyday deficits associated with executive functions, such as difficulties holding things in mind (working memory). For example, they may have trouble following instructions.

## Down Syndrome (DS)

Research shows that children with DS are likely to struggle with cognitive flexibility (task switching). For example, children may struggle to follow a new rule when playing a game. Children with DS may also show signs of repetitive behaviour, such as repetitive use of language, arranging objects or repeating certain actions<sup>17</sup>.

Impulsivity may be seen in children with DS as they have been shown to have a general problem with suppressing undesired responses (i.e., thoughts or actions). This may often be shown through the need for immediate reward (e.g., the child may not be able to stop themselves from touching something that looks appealing).

Children with DS are generally more likely to show broad everyday deficits related to executive functions in comparison to typically developing children<sup>18</sup>. For example, they may have problems with planning, holding things in mind (working memory) or problem solving. Linked to this, children with DS can face challenges when communicating verbally. Other cognitive abilities that are important for goal-oriented behaviour (e.g., manipulating information held in the mind - working memory updating) may also be impaired in children with DS.

## Rubinstein-Taybi Syndrome (RTS)

Children with RTS are likely to show signs of cognitive inflexibility and impulsivity, which can both lead to repetitive speech or behaviour, especially in younger children with RTS. However, research has shown that cognitive flexibility





and inhibition do develop with age in children with RTS, just as they do in children without a neurodevelopmental condition. And as these things develop, there is a decrease in repetitive behaviour and questioning<sup>19</sup>.

Children with RTS are also likely to have broad everyday difficulties with executive functions. This can include difficulties with holding things in mind (impaired working memory abilities) in both visual (e.g., remembering where things were prior to being moved), and verbal tasks (e.g., remembering instructions that have been given out loud). It has been shown that repetitive questioning may actually be a way of coping for children who struggle to hold verbal information in mind (impaired verbal working memory<sup>20</sup>).

### **Williams Syndrome (WS)**

Children with WS often have an insistence on sameness and tend to engage in repetitive behaviours. They may find the sensory world unpredictable and so display more repetitive behaviour in order to regain some predictability

in their environment<sup>21</sup>. Research has found that some repetitive behaviours are more common in individuals with WS, such as hoarding and body stereotypy, for example rocking. These repetitive behaviours along with an insistence on sameness are possible indicators of cognitive inflexibility within Williams Syndrome.

Impulsivity may present itself in WS through hypersociability, which is common in children with WS. Hypersociability can include an apparently excessive drive for social interaction and can lead to challenges with risks of being exploited in social interactions. Impulsivity may contribute to the way this hypersociability plays out (although there are other important factors that contribute to this). Many individuals with WS are also diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), a disorder associated with impulsivity. Individuals with co-occurring diagnoses of WS and ADHD are most likely to have inattentive ADHD, which is linked to difficulties in focus and concentration.

## Tuberous-Sclerosis Complex (TSC)

Studies of self-injurious and aggressive behaviours in children with TSC have linked these behaviours with impulsivity and cognitive inflexibility.

When thinking about cognitive difference, it is also important to be aware of other neurodevelopmental conditions that are associated with TSC. Around half of people with TSC also have a diagnosis of ASD, and around half also have a diagnosis of ADHD<sup>22</sup>. Being aware of this is important because it will help you understand the different behaviours that your child may exhibit related to cognitive difference. For more information on these conditions, continue reading the sections below.

Cognitive inflexibility may be particularly common in children with TSC who also have a diagnosis of ASD. Research suggests that having a diagnosis of ASD alongside TSC might be linked to more repetitive movement behaviours, such as body rocking<sup>23</sup>.

## Autism Spectrum Disorder (ASD)

Cognitive inflexibility is something that autistic individuals struggle with on a daily basis. Situations in which there is a disruption or change to routine can cause stress and anxiety for autistic individuals, and such situations can often trigger challenging behaviours. Autistic children may display cognitive inflexibility through insistence on sameness behaviours as well as repetitive behaviours, as a method to regulate their emotion and reduce stress. Common forms of repetitive behaviours include body movements – such as hand flapping – and the repetitive use of objects – such as spinning objects<sup>24</sup>. Recognising that these behaviours may help the autistic child to reduce stress is very important when considering how best to support the child.

Research has identified impulsivity as a behavioural risk marker for self-injurious behaviours which has been found to persist over a ten-year period for individuals with ASD<sup>25</sup>.

Impulsivity can be displayed by autistic individuals through aggressive behaviour and self-injurious behaviours. Common forms of self-injurious behaviour involve children hitting themselves or hitting themselves against objects. Self-injurious behaviour seems to be more prevalent in autistic individuals aged 12–18 as opposed to older autistic individuals. But although self-injury is likely to decline after adolescence, it often still persists into adulthood.

## Attention Deficit Hyperactivity Disorder (ADHD)

Research has shown that children with ADHD are slower to respond and make more errors in tests which measure inhibition<sup>26</sup>. This suggests that impulsivity is one form of cognitive difference found within ADHD.

Self-injurious behaviour is an example of how impulsivity may be presented in individuals with ADHD. There are different subtypes of ADHD and as a result, each subtype is linked with a different set of cognitive differences. Engaging in self-injurious behaviour also varies according to the different subtypes of ADHD. Research which observed girls into adulthood suggests that self-injury is more likely to be prevalent for girls with combined type ADHD (inattention, hyperactivity and impulsivity) than girls with inattentive type ADHD (inattention). Impulsivity – being a key feature of the combined subtype of ADHD – may explain the increased likelihood of engaging in self-injurious behaviour, which is also likely to persist into adulthood<sup>27</sup>.

Impulsivity is also linked to individuals with ADHD through disordered eating behaviour. Research suggests that there is an association between impulsivity symptoms and overeating and bulimia<sup>28</sup>. Attentional impulsivity, which can be a common characteristic in people with ADHD, has been found to increase the risk for disordered eating for individuals with ADHD that score highly on a measure of depression<sup>29</sup>. Impulsivity can



lead to overeating and the binge eating episodes associated with bulimia, as it may increase the likelihood that highly appetizing foods attract the attention and trigger the eating behaviour for individuals with ADHD<sup>30</sup>.

## Co-occurring Conditions/ Problems

Cognitive inflexibility and impulsivity may also interact with other issues and conditions relevant for a child, resulting in a more severe behavioural outcome. This section will describe some of the common conditions that may co-occur with the cognitive differences explained in this guide.

### Anxiety

Studies suggest that cognitive differences may be a risk factor for developing anxiety<sup>31</sup>. This means that there is a relationship between anxiety and problems with executive functioning (including cognitive inflexibility and impulsivity).

Anxiety may relate to cognitive inflexibility, as high levels of anxiety can make it difficult for a person to stop paying attention to irrelevant

information, meaning that it is harder for them to control what they pay attention to<sup>32</sup>. People with high levels of anxiety may also find it difficult to shift from strategies they have used to deal with things in the past when they are no longer useful<sup>33</sup>.

However, the relationship may also be reversed in that children with cognitive inflexibility may experience higher levels of anxiety compared to typically developing children. For example, a child that is resistant to change may experience increased levels of anxiety following changes to their routine. Social anxiety is also very common in cognitively inflexible children as they often find it more difficult to deal with quickly changing social demands compared to typically developing children.

Impulsivity may be so distressing to a child that it can cause anxiety; a person who is too quick to do things without thinking may be contributing to the development of their own anxiety. For example, a child that is aware of the negative impact of their impulsive/aggressive behaviour towards other children may develop social anxiety leading to social withdrawal. Levels

of impulsivity and anxiety in children are likely to decrease with age as their cognitive skills develop<sup>34</sup>.

Children who are anxious may seek out ways to manage their anxiety, which may often be maladaptive. The presence of both anxiety and impulsivity in a child may increase suicidal thinking<sup>35</sup>. This means that impulsivity may emphasise the negative impact of anxiety in children, which is why it is important to be aware of the co-occurrence of these two conditions. For more information, please see [Anxiety - A Guide for Parents](https://cerebra.org.uk/download/anxiety-guide-a-guide-for-parents/) (<https://cerebra.org.uk/download/anxiety-guide-a-guide-for-parents/>).

## Self-Injurious Behaviour

Self-injurious behaviour is any behaviour that results in someone causing physical or potential harm to themselves. A large proportion of individuals who engage in self-injurious behaviour have cognitive differences which are related to executive functioning.

A finding which is consistent for individuals with neurodevelopmental conditions is that those who engage in self-injurious behaviour have high levels of impulsivity<sup>36</sup>. In such research, if certain characteristics are more likely in participants that self-injure, researchers say that these are risk markers for self-injury. Impulsivity is one of the primary examples of this. High levels of impulsivity not only predicts that an individual will engage in self-injurious behaviour, but that this behaviour will persist over time<sup>37</sup>.

Self-restraint is another behaviour closely associated with self-injury. Self-restraint is when a child attempts to restrict their own movements, for example by wrapping their arms or legs in clothes. Self-restraint can also include showing a preference for imposed restraint, whereby an individual uses and shows a preference for splints or gloves in order to cope with self-injurious behaviour. Whilst it is unclear why children who display self-injurious behaviour also often show self-restraint, it is suggested that because the individual does not have the

appropriately developed cognitive capacity to stop this behaviour (they are impulsive), they try to compensate for this cognitive difference by physically restraining themselves. This is a powerful example of how children can develop ways of dealing with the challenges they face. These solutions may look unusual but may be very helpful for the child. For more information, please see [Factsheet - Self-Injurious Behaviour in Children with Intellectual Disability](https://cerebra.org.uk/wp-content/uploads/2020/09/self-injurious-behaviour-factsheet-Aug19-low-res.pdf) (<https://cerebra.org.uk/wp-content/uploads/2020/09/self-injurious-behaviour-factsheet-Aug19-low-res.pdf>).

## Sleep

There is a well-established relationship between sleep and executive functioning (including cognitive inflexibility and impulsivity), with research showing that even partial sleep deprivation can negatively affect several cognitive abilities<sup>38</sup>.

Lack of sleep has also been linked to higher impulsivity, with studies showing that sleep deprivation can lead to impulsive responses to negative things<sup>39</sup>. This means that your child may find it more difficult to wait or show increased aggression if they hadn't had a good night's sleep, even just for one night. For more information, please see [Sleep - A Guide for Parents](https://cerebra.org.uk/wp-content/uploads/2020/03/sleep-guide-june19-low-res.pdf) (<https://cerebra.org.uk/wp-content/uploads/2020/03/sleep-guide-june19-low-res.pdf>)

**Table 1.** Summary of cognitive inflexibility and impulsivity.

	Cognitive Inflexibility	Impulsivity
<b>Definition</b>	Cognitive inflexibility is behaviour caused by an impairment in cognitive flexibility. Cognitive flexibility (sometimes called task switching), is the ability to think about things differently at different times and in different situations.	Impulsivity is a pattern of behaviour caused by an impairment in inhibition. Inhibition is the ability to suppress behaviours or thoughts that have been practised a lot, or that are the person's typical way of responding in a situation.
<b>Manifestations</b>	<ul style="list-style-type: none"> <li>● Insistence on sameness</li> <li>● Strong adherence to routine</li> <li>● Resistance to change</li> <li>● Negative responses to changes to plans</li> </ul>	<ul style="list-style-type: none"> <li>● Not feeling in control of some of own behaviours</li> <li>● Finding it difficult to wait</li> <li>● Needing an instant response</li> <li>● Difficulty with turn taking</li> </ul>
<b>Impact on everyday behaviour</b>	<ul style="list-style-type: none"> <li>● Doing things in the same order every day</li> <li>● Eating the same meal for lunch on specific days of the week</li> <li>● Distress/challenging behaviour/crying when things are done differently</li> <li>● Checking or arranging things frequently</li> <li>● Excessive tidying</li> </ul>	<ul style="list-style-type: none"> <li>● Self-injurious behaviour (e.g. biting, banging head)</li> <li>● Aggressive behaviour (e.g. towards other people or property)</li> <li>● Behaviour that looks "oppositional" or "non-compliant"</li> </ul>

## Quality of Life

Cognitive inflexibility and impulsivity can both affect a child's wellbeing and quality of life by influencing a range of behaviours. Overall, the extent of cognitive differences your child shows can influence the effect on their wellbeing as more cognitive differences (whether it be cognitive inflexibility or impulsivity) can have a bigger negative impact on wellbeing.

### Cognitive inflexibility

A child with mild cognitive inflexibility may find it difficult to adapt to change and feel distressed in new environments, whereas a child with more severe cognitive inflexibility may react more negatively in unfamiliar situations (e.g., experiencing an emotional outburst).

Being flexible in thinking is an important factor in coping with everyday stressors, meaning a child who is cognitively inflexible may be more likely to struggle with adapting to new situations or replacing maladaptive thoughts with a more useful way of thinking<sup>40</sup>. This may result in your child experiencing more stress. In addition, cognitive inflexibility may lead to your child overthinking certain things, which can potentially be a risk factor for low mood<sup>41</sup>.

Cognitive inflexibility may also affect a child's belief in their ability to achieve things (often called self-efficacy<sup>42</sup>). This could mean that a child who is severely cognitively inflexible may struggle more to reach goals, whether it be academically or in everyday life. This may in turn affect their confidence or mental wellbeing.

### Impulsivity

Severe impulsivity is likely to have a negative impact on quality of life, particularly if it exhibits in self-injurious behaviour or other signs of physical aggression that can affect their physical health.

For example, a child with a tendency for self-injurious behaviour is more likely to suffer long-lasting consequences, which may include having to deal with pain from wounds, such as from

head banging or skin picking. Impulsivity may also drive children to seek immediate pleasure whilst experiencing emotional distress through behaviours that are potentially harmful, such as over-eating<sup>43</sup>.

Your child's academic life may also be affected as a result of impulsivity. It has been shown that impulsive students are more likely to underachieve in school because impulsivity makes it more difficult to focus on long-term, instead of immediate goals<sup>44</sup>.

## Measuring cognitive difference

### Cognitive inflexibility

An individual who has cognitive inflexibility will experience difficulty with shifting the focus of attention between tasks and thinking about multiple ideas simultaneously. These difficulties can influence several aspects of life, including academic performance. So, communicating with your child's teachers to identify the ways in which your child is most affected by cognitive inflexibility in school is important to find the best ways to support your child.

There are several situations in which you as a parent can observe and recognise that your child is displaying cognitive inflexibility. One example could be if they are struggling with a particular problem from a piece of homework which you oversee, pay attention to the way they approach the question. Often children who experience cognitive inflexibility will stick to one strategy or method, this is an example of rigid thinking. If they cannot solve the problem, they may state that it is impossible rather than looking to try and solve the problem using another method. This is just one example, thinking about what cognitive inflexibility is may help you to identify other examples that are relevant for your child.

In coordination with teachers, tracking behaviours which indicate a difficulty with flexible thinking, or a rigid way of thinking, can identify the specific difficulties your child has with cognitive flexibility. Some examples of behaviours

to look out for include difficulty taking on novel, more complicated tasks, difficulty switching from one activity to another, becoming anxious when plans change or arguing the same point over and over.

Once the behaviours linked to cognitive inflexibility have been identified, you can begin to take steps to address them by either implementing strategies to improve cognitive flexibility or seeking out formal interventions.

## Impulsivity

A child who is impulsive will experience difficulties in putting on the “mental brakes”. Impulsivity can affect children differently, some examples of impulsive behaviours may include having trouble following rules, aggressive behaviour towards other children or doing silly things to get the attention of others. These impulsive behaviours may make your child appear younger, as they may show behaviours that younger children often show but tend to grow out of.

If you are concerned that your child may be displaying signs of impulsivity, there are a few key things that you can do to try and measure this, for example by tracking your child's behaviours by using an observation log and noting down the impulsive behaviour that you are seeing. Alongside the previous impulsive behaviours mentioned, note down when your child does not understand the consequences of their actions, how their words or behaviour affect other people, or when they overreact to mistakes or any form of criticism.

Impulsive behaviours are also likely to occur in a school setting, therefore a good rapport with your child's teachers is very important. Health care providers your child is seeing will also benefit from knowing about your child's impulsive behaviour. This knowledge may help give health care providers clues about what influences your child's difficulties. This may help them to provide care, information and advice in a way that considers your child's difficulties with impulsivity and helps to reduce them.



# Part 3 – Supporting children with cognitive differences

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Currently there is research going on into cognitive difference, including the development of treatments and interventions, however this research is new and on-going. There are still things that can be done to help in specific areas your child may be experiencing difficulties in. This section aims to describe research-based strategies - some have been well established, at least in practice, but others are newer and so we know less about how far and in which ways they work. Some of these strategies may not work for your child as each child and family are unique. This is normal and there are other strategies that you can try and implement.

It is also important to note that certain behaviours can co-occur for distinct reasons. For example, your child may display self-injurious behaviour or problems with sleep linked to their impulsivity, however, these same behaviours may also be linked to anxiety. Identifying when and where these behaviours occur will help you to understand the different triggers. (Refer to 'Managing distress and anxiety').

## Sleep

If you notice that your child engages in more impulsive behaviours or appears more inflexible after a difficult night's sleep (perhaps after using an ABC chart), it may be useful to focus on improving their sleep. For more information, please see [Sleep – A Guide for Parents \(https://cerebra.org.uk/wp-content/uploads/2020/03/sleep-guide-june19-low-res.pdf\)](https://cerebra.org.uk/wp-content/uploads/2020/03/sleep-guide-june19-low-res.pdf).

## Managing distress and anxiety

Many individuals who show cognitive inflexibility and impulsivity also experience states of distress that appear to be anxiety. For example, if your child must wait for something, or is asked to do something in a different way to usual, they may become anxious.

Anxiety may lead to challenging behaviour, and possibly emotional outbursts. But understanding more about the cognitive difference and how that can lead to anxiety may help to stop children from becoming anxious or reduce how often this happens.

One way to do this is to keep a behaviour diary or ABC chart to help identify patterns in the situations that are related to your child's anxiety. By understanding the triggers and being able to recognise the first signs of your child becoming anxious, you might feel better prepared to manage your child's anxiety and the behaviours that follow. Paying particular attention to the kinds of situations mentioned above, in which impulsivity or cognitive inflexibility may cause a problem might be helpful. For example, if your child is asked to change their routine before they become anxious, this anxiety might be linked to their cognitive inflexibility.

Avoiding situations in which triggers can occur as well as providing reassurance are common strategies that parents use to manage their child's anxiety. However, there is a risk that this can be counterproductive and in fact perpetuate the anxiety cycle. For example, when a specific situation is avoided, the anxiety around that situation often increases.

There are other strategies that you can use to reduce or manage your child's anxiety<sup>45</sup>. These include:



- Communicating with them when they are facing difficult situations; for more information, please see [Communication with Children with Severe or Profound Intellectual Disabilities - A Guide for Parents](https://cerebra.org.uk/download/communication-with-children-with-severe-or-profound-intellectual-disabilities/) (<https://cerebra.org.uk/download/communication-with-children-with-severe-or-profound-intellectual-disabilities/>) and [Information Sheet - Communication and Challenging Behaviour](https://www.challengingbehaviour.org.uk/understanding-behaviour/communication-sheet.html) (<https://www.challengingbehaviour.org.uk/understanding-behaviour/communication-sheet.html>).
- Having an exit plan.
- Giving your child 'time out to recover' and their own space to do so.
- Relaxation techniques (e.g. breathing techniques – there are many different techniques some of which may work better for your child than others, so it is worth trying a few out).

For more information, please see [Anxiety - A Guide for Parents](https://cerebra.org.uk/download/anxiety-guide-a-guide-for-parents/) (<https://cerebra.org.uk/download/anxiety-guide-a-guide-for-parents/>) and [Emotional Outbursts – A Guide for Parents](https://cerebra.org.uk/download/emotional-outbursts-a-guide-for-parents/) (<https://cerebra.org.uk/download/emotional-outbursts-a-guide-for-parents/>).

Although cognitive differences can contribute to behaviours, such as self-injurious behaviour, aggression or emotional outbursts, [these behaviours are also often influenced by the child learning that these behaviours allow them to get their needs met.](#)

This means that an important first step in any treatment plan for these behaviours is to think carefully about the ABCs (what happened before (Antecedent), during (Behaviour) and after a challenging behaviour (Consequence)). This can help you to see if anything can be done to try to improve the behaviour [by teaching the child different ways to get their needs met.](#)

As this learning process and ABC method of parent intervention has been previously covered in a resource regarding self-injurious behaviour, please see to [Research Summary - Self-injurious Behaviour in Children with an Intellectual Disability](https://cerebra.org.uk/wp-content/uploads/2020/01/Self-injurious-behaviour-2019-low-res.pdf) (<https://cerebra.org.uk/wp-content/uploads/2020/01/Self-injurious-behaviour-2019-low-res.pdf>).

## Balancing routine with flexibility

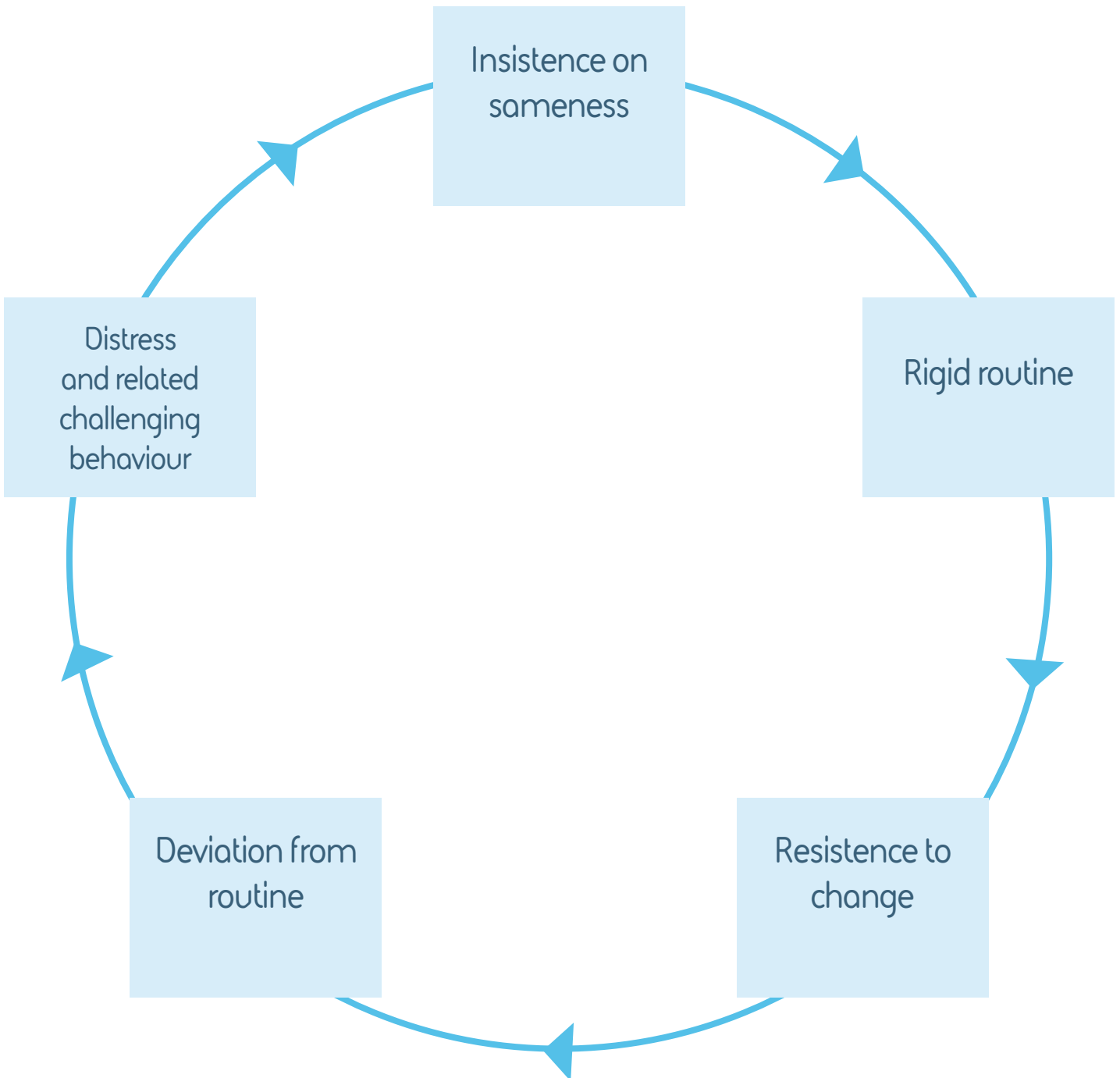
It is very common for individuals with cognitive differences (particularly cognitive inflexibility) to have a routine that they stick to, which helps to manage any anxiety that may arise due to a change in their expectations.

Individuals who are cognitively inflexible may struggle with small changes that we experience in our daily lives. By reducing the likelihood of change, routines act as a barrier against anxiety and so, sticking to a routine helps reduce the risk of distress and challenging behaviours. Additionally, routines around particular things can be helpful, for example, routines around food appear to facilitate diet management and can improve the overall health of an individual.

However, due to the nature of cognitive inflexibility, it is easy for routines to become very rigid. You should be aware that having routines that are very rigid may be counterproductive. Research has suggested<sup>4</sup> that highly rigid routines might be linked to children becoming more resistant to change and less flexible in the future. But because in the here and now, any deviation from a rigid routine can increase your child's distress, it is very easy to fall into a pattern of trying to maintain ever more rigid routines. This can lead to both the child and caregiver becoming reliant on the routine's rigidity.

**Figure 1** on page 18 demonstrates the type of cycle that can occur due to rigid routines.

Figure 1. Cycle of insistence on sameness that can occur within rigid routines.



This balance between routines being helpful and too much rigidity being counterproductive is a difficult one to get right. But testing things out in situations where you and your child feel relaxed is a good way to find out what might work best for you and your child<sup>46</sup>.

You might find ways to encourage your child's flexibility, particularly from when they are young and only just able to understand, for example:

- Reward your child if they do something differently to the previous time (e.g. saying "wow, yesterday you had cereal for breakfast but today you had toast, that's really flexible, well done")
- Give choices within a routine e.g. wash your hands + eat dinner (vegetables first) OR wash your hands + eat dinner (main first) and encourage your child not to always make the same choice
- Offer choices whenever possible.

## Discussing flexibility with your child explicitly

Being explicit in how you engage with your child, especially on topics they may find difficult, is a useful learning opportunity for them<sup>47</sup>. To be explicit means being direct and clear with what you are saying. This is especially important for an individual with a neurodevelopmental condition as things may not be immediately clear to them. So, it may be useful to have a discussion with your child about flexibility and why it is important.

The discussion could look like:

### Explicitly explaining what flexibility is...

*"Flexibility is something that helps us adjust to new things and think of new ways to do something or solve a problem."*

When your child has a better understanding of what flexibility and rigidity is, you could then explain what it means to be a *flexible person*.

*"If a person is flexible, they are able to see different points of view and adjust when things don't go as planned".*

This is very similar to explaining the definition of flexibility, but here you are adding in information that is relevant to your child's life experiences.

### Discussing with your child what it means to be flexible...

Here, you could compare 'flexible' with 'rigid' and ask your child to think of other words or draw things that might relate to them. To help your child understand and engage in this activity, using visual examples and metaphors may be useful. For instance, you might show a picture of a rocky mountain when talking about rigidity.

*"Do you know what the word rigid is? Rigid means... Some other words that are similar to rigid are...Can you think of any more?"*

### ...and why is it important to be flexible.

You can brainstorm with your child on the advantages of being flexible. Some advantages might include:

- having more choices
- helping a person be a better friend because they can consider other people's feelings
- having a bit of what they want instead of not getting anything at all.

You can also demonstrate flexibility in your own daily routine in an explicit way. For example, *"I wanted an apple for lunch today, but we don't have any more apples. I'm going to be flexible and have a banana instead."* This will show your child how flexibility can be applied to real life and how it can solve problems too.

## Change signalling

When a child experiences cognitive inflexibility and changes to their routines and plans cause them distress, change signalling could help<sup>48</sup>.

Change signalling involves caregivers using a novel and distinctive sign to signal to a child that something is going to change in their routine or expectation. It is important that the signal is novel and distinctive to ensure that the child will only ever experience the signal at times when they go on to experience a change to their routine or expectation. Because the signal is always the same, it can increase the child's sense of predictability, even when something is about to change in their routine or expectation. You could choose any distinctive signal that you think would work for you and your child, but you might want to think about a signal that is both visual and verbal. For example, a brightly coloured card with a unique picture on it, and the verbal phrase "something's going to change". Since, in this way, your child can learn that the signal is always followed by a change to their routine or expectation, they will also be able to prepare themselves for the change, which might make it easier to deal with.

### How is change signalling used?

The caregiver uses the signal any time they become aware of a change to their child's routine or expectation. Where possible, the signal is kept with the caregiver. The caregiver approaches the change with their child in the same way as they normally would, but before this happens, they present the child with the signal.

### How is the signal established?

1. Caregivers and child decide on a 'signal' (e.g., a unique picture card and phrase "something's going to change")
2. Caregivers teach the meaning of the signal to their child in low risk, fun settings. For example, you might choose one of your child's favourite games, explain the signal, and then use the signal to indicate times when you impose small changes to the rules or procedure of the game. It's important to only ever use the signal when you impose a change that your child notices. So, it might be helpful to point out the change you impose verbally to your child.
3. Caregivers further establish use of the signal at home by making deliberate small changes to the child's daily routine (after presenting the signal). The key here is that the changes that are imposed are not likely to be difficult for your child, and they might actually be changes to preferred scenarios (e.g. 5 minutes extra iPad time).
4. Once the child has a full understanding of the signal, it may be used when natural changes to their daily routine occur.

The Kate Woodcock Research group at the University of Birmingham has developed some online training and resources to support parents to use change signalling with their child at home. If you would like access to these resources, please get in touch at [kwrg@contacts.bham.ac.uk](mailto:kwrg@contacts.bham.ac.uk).

### Important things to note:

- To maintain consistency, when using the signal, you should always use the same phrase.
- If a change is signalled and the child does not display any distress or challenging behaviours, then you should tell your child that they dealt with the situation very well and praise them for this achievement.
- You will not know in advance about all changes that will happen and therefore cannot signal all changes. What is important is that every time your child sees the signal a change must happen.

Change signalling techniques have been quite widely used as a part of larger packages for supporting children's behaviour. However, to date there is only limited evidence on the effectiveness of change signalling in its own right. So far research suggests that change signalling may be more helpful for some families than others, and also for certain changes but not others. So, if you want to give it a try, spending some time trying to work out what works best for you and your child, might be useful.

## Improving Executive Function

As mentioned above, cognitive inflexibility and impulsivity are both cognitive differences in executive functioning. Executive functioning includes many different cognitive processes, which all play a role in monitoring and controlling behaviour. There is growing research starting to look at improving executive functioning through training.

### Cognitive Skills Training Games

Cognitive skills training refers to a method of developing an individual's cognitive abilities (i.e. executive functions<sup>49</sup>) by engaging in games. These can come in the form of games, puzzles as well as more physical and mental exercises.

Digitalised video games for training cognitive skills are becoming more widely researched<sup>50</sup> but are currently still generally in their early stages of development. While these are not yet available or widely accessible, parents have tried the following games based on the same principles, aiming to improve executive function in their children.

#### "What is this?"

You can take a regular object (e.g. a banana) and see how many different things you and your child can pretend it is (e.g. a phone, a moustache, a finger). This will help your child to learn that there can be lots of different ways of thinking about the same thing.

## Matching and sorting games with changing rules

You could also play matching and sorting games with your child - for this, you could use playing cards, matching cards or sorting sets. The idea is to help your child understand that things can fit into more than one group.

So, for example, you can first ask your child to sort the cards by number (e.g. all the 4s together), then collect the cards back up before asking them to sort the cards again, but this time by colour (all the red ones together).

This can help them practise how to look at a situation using different perspectives.

The Kate Woodcock Research Group has developed a computer game designed specifically for training cognitive flexibility. We developed the game together with children with Prader-Willi Syndrome and autistic children and their families, to design it so that it can meet a wide range of individual needs. We have tested this game in a small research study, but the results did not allow us to make strong conclusions about how far playing the game might be helpful for children. Some families who took part in the test felt that it helped in some ways. The game is best played on a computer tablet or large-screened smartphone. If you would like to give it a try, please get in touch at [kwrg@contacts.bham.ac.uk](mailto:kwrg@contacts.bham.ac.uk).

### Scaffolding

Scaffolding is a broad term for 'providing support'. When learning and practicing any skill, it is important for children to have an effective support system (i.e. a scaffold). If children are asked to practice skills with little or no support, they are more likely to fail, potentially leaving them feeling embarrassed and frustrated. Scaffolding, in this context, means providing your child with the opportunity to practice exercising executive functions, and removing the support when they have learned to perform the skill by themselves. This not only leads to improvement but also increases the child's confidence - the child is able

to have pride that they were able to exercise their executive function and the confidence in knowing that they will be able to in the future. However, there are some important things you need to consider when scaffolding.

For example, using scaffolding to improve a child's ability to wait their turn may involve playing games where they are encouraged to take turns. In the beginning while the child waits, the parent might occupy them with another task during this waiting time. As the child develops this skill, the parent could gradually remove this support by engaging the child less and less in the task during waiting time - until finally, the child is in the position to wait their turn without doing anything else.

### **Model and explain out loud**

It can help your child if you model the skill first before letting them do it themselves. Modelling simply means showing your child how to do something. When you are modelling a skill, it is important to explain out loud what you are doing with each step.

E.g. During the child's turn in a game, the parent may model themselves waiting and explain 'Now while you take your turn, I will wait until you are finished.'

### **Wait to be needed**

When you see your child struggling with a certain task, you should allow them some time and space to solve their problem by themselves. If they ask for help, perhaps verbally or through a look, then it is a good time to step in.

E.g. If the child is saying that it is their turn before it actually is, this is likely to indicate they are having difficulty waiting. So, this is when the parent could step in and provide them with another activity to occupy them while they wait.

### **Provide only what is necessary**

Certain types of physical activity and exercise, specifically those that involve and encourage concentration, planning and holding things in

mind<sup>51</sup>, may help with improving executive functioning. This may include sports or more generally, physical activities with a simple set of rules that you can make up to be more accessible to you and your child (i.e. simple catching games).

The basis behind this is that the activity not only benefits motor functions, but also trains part of the brain that deals with executive functioning. Additionally, physical activities that involve other players give children the opportunity to practice and develop their social skills.

## **Physical activity**

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The basis behind this is that the activity not only benefits motor functions, but also trains part of the brain that deals with executive functioning. Additionally, physical activities that involve other players gives children the opportunity to practice and develop their social skills.

A physical activity intervention was carried out with autistic children in line with the idea that physical activities would improve their executive functioning. The children who took part were involved in a total of 24 sessions of physical activity (table tennis) over the course of 12 weeks. It was found that, in comparison to children who had not had the intervention, the children who did take part showed significant improvements in executive functioning and motor skills.<sup>52</sup>

## Mindfulness

Research has suggested that practising mindfulness may also be a good way to improve executive functioning<sup>53</sup>. Experts have defined mindfulness as what happens when we pay attention to the present moment on purpose, and in a way that does not incorporate any kind of judgement or evaluation. There are many different ways to practice mindfulness, so you should be able to find a way that works for you and your child.

Some examples of ways to practice mindfulness include mindful or conscious breathing, mindful listening (whereby you focus your attention on a particular sound or music) and also mindful postures (such as yoga) - focusing your attention on the way your body feels. There has been some research to suggest that such practices can reduce some of the impairments in inhibition that cause impulsivity in children with neurodevelopmental disorders<sup>54</sup>.

## Storytelling

Storytelling can be useful in improving different cognitive skills, including executive functions<sup>55</sup>. In earlier years of a child's life, telling stories orally can help with attention span (a type of executive function), more so than with pictures or videos as it requires more concentration to follow the story.

Regardless of how a story is told to your child, whether that be through oral storytelling, a picture book or even a film, it is a good opportunity to try perspective taking. This is when you stop and ask your child about how different characters are feeling at different points of the story. This will encourage them to think about the different perspectives of each character, which is an important element of cognitive flexibility to practise. Being able to see different points of view will encourage your child to move away from a rigid mindset.



# Frequently asked questions

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Many parents have commonly asked questions that are mentioned below; however, it is important to note that these answers are not trying to tell you a stringent way of acting or dealing with a certain scenario as every individual and their family are different. The answers are meant as a possible guide, which might help with your own deliberations, rather than a fixed, idealistic way of responding.

## What kind of activities are good for nurturing cognitive flexibility?

It is a good idea to arrange interesting activities that stimulate your child to help learn this skill; however, remember to gradually introduce changes to build up your child's flexibility/tolerance to changes. Activities could include the following (though there are many others):

### Doing new things

Do something that you have never done before such as: trying exotic food together, playing new sports, playing different games instead of the child's favourite game.

### Building alternatives into plans

Some parents have told us that it is useful to build possible alternative options into plans. For example, if your child catches a school bus, they might experience difficulties if their normal bus driver (Sarah) is away. Alternatives might be other bus drivers (Bob, Lucy) you know could stand in, or just a generic "stand-in" bus driver. It might be helpful to communicate the routine to your child in a way that shows clearly that Sarah will drive the bus when she is working, but when she is away, Bob or Lucy or someone else will drive the bus.

## Is there anything that I can ask my child's school to do that may help with their cognitive inflexibility?

It is a great idea to talk to the school and be open with them about your child's cognitive inflexibility as there are things that they can implement in schools to try and reduce problems associated with this. For example, schools can encourage pupils to play games differently to how they normally do, gradually introduce changes throughout the school day or week that pupils need to adapt to and talk through scenarios where pupils explain how to resolve various problems and adjust to their surroundings. Schools will have different approaches to this, so it is best to contact your school directly.

## How can I encourage my child to go with the flow?

Since children are continuously bombarded with new information, it can quickly become overwhelming, particularly when cognitive flexibility skills are under-developed. Children may end up thinking rigidly because this demands less cognitive flexibility. Cognitive flexibility skills can be practiced and developed to encourage your child to go with the flow. Here are a few strategies you can try at home to improve flexible thinking:

### Tweak the routine

Routines are very useful as they let children know what to expect in terms of what will come next and children typically flourish with consistent daily routines, such as family mealtimes, play times and bedtimes. But for children who show cognitive inflexibility, too much dependence on routines



might encourage rigid thinking, which can lead to further struggles with changes. Introducing flexibility into routines little by little might help prevent children from becoming too rigid. For example, asking the child to change their trousers first if they typically change their top first.

## Bending the rules

Rules can be very useful at times but always sticking rigidly to many rules can make it difficult for the family and make it more difficult for children to get along with other children. To give your child practice in using rules more flexibly, you could try changing some rules in fun, relaxing situations. To teach your child that not all rules have to always be completely rigid, it might be useful to pick situations when playing a game and highlight a difference in that situation, which “justifies” a change to a rule. For example: “Because I am wearing a green T-shirt today, it means I only have to roll the dice once now instead of twice”. Doing this many times in many different ways could help the child to learn that when situations change, rules often have to change with them.

## Getting your child a joke book

People who are rigid thinkers often struggle to understand jokes or they may have difficulty in making up their own puns and jokes, but a joke book can be a useful way to discuss the different meanings of words which can help children think about why a change in the meaning of a word, can make it funny.

# Will my other children start to copy my child's cognitive inflexibility and or impulsivity?

Very well-established psychological theories explain how an individual can copy another person's behaviour if they attend to the behaviour, remember it, are able to reproduce it, and have the motivation to want to do it. So, if one of your children is displaying difficult behaviours that reflect cognitive inflexibility or impulsivity, then siblings may observe this behaviour and mimic it. However, you can help to make sure that your child's siblings are motivated to mimic “the right” behaviours (behaviours that are helpful for the child and the family) by explicitly praising these (e.g. you thought about that really flexibly, well done).

# Summary

This guide aims to help parents understand cognitive differences in children with neurodevelopmental conditions, with the hope of offering ways to manage any associated difficulties that may be helpful.

Part 1 explains what cognitive inflexibility and impulsivity is and when they become a problem.

Part 2 explains how these cognitive differences can affect individuals with different syndromes including: Angelman Syndrome, Autism Spectrum Disorder, Cornelia de Lange Syndrome, Down's Syndrome, Fragile X Syndrome, Intellectual disabilities, Prader-Willi Syndrome, Rubinstein-Taybi Syndrome, Smith-Magenis Syndrome, Tuberous-Sclerosis and Williams Syndrome. Part 2 also explains how these syndromes can co-occur with other problems such as anxiety, self-injurious behaviour, sleep disturbances and depression. This section also outlines how cognitive inflexibility and impulsivity can affect quality of life and how these cognitive differences can be identified and measured in children.

Part 3 highlights what parents can do to help their children to manage the implications of cognitive difference. Several possible strategies are described because to the best of our knowledge to date, no single strategy always works best for everyone, so trying out different strategies that might suit you and your child better at different times is important.

**Table 2.** Summary of each part of the Cognitive Differences Cerebra guide.

Part 1	<ul style="list-style-type: none"><li>● Definition and description of cognitive flexibility versus cognitive inflexibility</li><li>● Definition and description of impulsivity</li></ul>
Part 2	<ul style="list-style-type: none"><li>● Looks at how cognitive inflexibility and impulsivity can affect people with different syndromes including: Angelman Syndrome, Autism Spectrum Disorder, Cornelia de Lange Syndrome, Down's Syndrome, Fragile X Syndrome, Prader-Willi Syndrome, Rubinstein-Taybi Syndrome, Smith-Magenis Syndrome, Tuberous-Sclerosis</li><li>● Looks at co-occurring problems that are associated with the above conditions, and the impact that cognitive differences have: Anxiety, self-injurious behaviour, sleep disturbances, depression</li><li>● Looks at how cognitive differences can affect quality of life, how they can be identified and measured in children.</li></ul>
Part 3	<ul style="list-style-type: none"><li>● Describes treatments and interventions that can be implemented by parents to alleviate the associated effects of cognitive differences: Managing distress and anxiety (includes information on understanding your child's learning history using ABCs); balancing routine and flexibility; discussing flexibility with your child explicitly; change signalling; improving executive function (cognitive skills training, scaffolding, physical activity, mindfulness, storytelling)</li></ul>

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# Resources

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1. Anxiety – A Guide for Parents (<https://cerebra.org.uk/download/anxiety-guide-a-guide-for-parents/>)
2. Communication with Children with Severe or Profound Intellectual Disabilities – A Guide for Parents (<https://cerebra.org.uk/download/communication-with-children-with-severe-or-profound-intellectual-disabilities/>)
3. Factsheet – Self-Injurious Behaviour in Children with Intellectual Disability (<https://cerebra.org.uk/wp-content/uploads/2020/09/self-injurious-behaviour-factsheet-Aug19-low-res.pdf>)
4. Information Sheet – Communication and Challenging Behaviour (<https://www.challengingbehaviour.org.uk/understanding-behaviour/communication-sheet.html>)
5. Research Summary – Self-Injurious Behaviour in Children with an Intellectual Disability (<https://cerebra.org.uk/wp-content/uploads/2020/01/Self-injurious-behaviour-2019-low-res.pdf>)
6. Sleep – A Guide for Parent (<https://cerebra.org.uk/download/sleep-a-guide-for-parents/>)





# About the authors

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## Cameron Ghai

Cameron Ghai is a final year BSc psychology student at Cardiff University. Cameron spent his placement year working as an intern at the Kate Woodcock Research Group. He worked on several projects, including helping to create this Cerebra guide. Cameron is planning to begin a career in psychology upon completion of his undergraduate degree.

## Alishah Jameel

Alishah was a student intern at the Kate Woodcock Research Group, who started with the group last September 2020 and left at the start of July 2021. She is a Biomedical Science undergraduate from Aston University who will be starting her fourth and final year soon. She worked with her fellow placement students and PhD students to assist with various research projects such as Brainz and SWEP/DOT. Even though she is doing a degree in Biomedical Science, she is extremely interested in psychology and so she did this placement to give her more clarity of what career she would like to go into in the future.

## Karin Madericova

Karin Madericova is a final year BSc Psychology student at Aston University. As part of her placement year, Karin interned at the Kate Woodcock Research Group from September 2020 to July 2021; during this time, she worked on many projects including this Cerebra guide. Karin is planning to continue her studies at postgraduate level and working on starting a career in psychology.

## Awatif Mohamad Fuad

Awatif Mohamad Fuad is a Psychology student at the University of Warwick. During her intercalated year in 2021, she worked at the Kate Woodcock Research Group as a Research Assistant. She is set to graduate with honours in summer 2022 and is working towards a career into Clinical Psychology.

## Lauren Whyne

Lauren Whyne is a final year Psychology undergraduate at the University of Warwick. She worked as a research assistant in Kate Woodcock's Research Group in 2021 from January to August as an aspiring Clinical Neuropsychologist.

## Dr Kate Woodcock

Dr Kate Woodcock carried out her PhD research at the School of Psychology, University of Birmingham between 2005 and 2008. She worked as a Cerebra Research fellow at the Cerebra Centre for Neurodevelopmental Disorders from December 2008 until February 2011, before taking up an International Outgoing Marie Curie Fellowship, which she had designed under the European Union's seventh framework programme. The Marie Curie Fellowship took Kate to Beijing, China until March 2013 and then brought her back to the University of Birmingham until February 2014. In March 2014, Kate took up her first lectureship position at the School of Psychology, Queen's University Belfast. In September 2017, Kate returned to the School of Psychology, University of Birmingham to take up a senior lectureship.

# About the peer reviewers

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## Dr Caroline Richards

Dr Caroline Richards, Senior Lecturer in Neurodevelopmental Disorders, is a Clinical Psychologist and researcher at the University of Birmingham. Her research focuses on reducing negative clinical outcomes for children. Caroline will lead a programme of sleep research in the Cerebra Network for Neurodevelopmental Disorders. This research will help us to understand why sleep problems occur in children with rare genetic syndromes and help families to find solutions to these sleep difficulties. Outside of work Caroline enjoys spending time with her family, especially her twin boys, who have helped her to understand the critical importance of sleep.

## Dr Hayley Crawford

Dr Hayley Crawford is an Assistant Professor at University of Warwick Medical School. Her research focuses on characterising behavioural difficulties and mental health problems in individuals with neurodevelopmental conditions. As part of the Cerebra Network for Neurodevelopmental Disorders, Hayley will conduct research that improves our understanding of autism and anxiety in children with rare and complex needs.

## Dr Jane Waite

Dr Jane Waite is a Clinical Psychologist and Lecturer at Aston University. Jane's research focuses on understanding, assessing and treating mental health problems in individuals with neurodevelopmental conditions. As part of the Cerebra Network for Neurodevelopmental Disorders, Jane will lead a programme of work to better understand mental health in children with rare genetic syndromes and will develop assessment tools and interventions to be used in clinical services.

## Dr Jo Moss

Dr Jo Moss is a Lecturer in Developmental Psychology at the University of Surrey. Her research aims to improve our understanding of the social and emotional wellbeing of individuals with neurodevelopmental conditions. In the Cerebra Network for Neurodevelopmental Disorders Jo will lead a programme of research into atypical autism. This work will improve our ability to assess autism and related social-communication difficulties in children with rare genetic syndromes and will support the development of targeted interventions.

The findings of this report are those of the author, not necessarily those of Cerebra.

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# Working wonders for children with brain conditions

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