

CHAPTER 9 – The Impact of Age and Brain Development on the Decision-Making Systems

Key Points:

- Brain maturation occurs in age-specific times, resulting in predictable challenges to decision-making
- Each age group can have an age-tailored approach to learning better decision-making
- Cognitive rigidity results in increased difficulty in up-regulating and mitigating down-regulation forces.

This chapter explains how changes in the brain throughout a person's lifetime influence their decision-making capacity. By gaining this knowledge, individuals can empower themselves to adapt their use of the DDMP to suit different life stages, fostering understanding and personalization.

Brain Development and Decision-Making

Throughout a person's lifetime, the anatomy and chemistry of the brain undergo changes that influence decision-making. These changes are part of the normal aging process and are predictable for a given age. These consequences of the maturation of cells and systems in the brain are observable and are recognized as age-appropriate behaviors. Children will be great at copying. Young adolescents must step over dirty laundry or walk past dirty dishes for days. In mid-adolescence, it is expected that any heartbreak will seem catastrophic. And that older adolescents seek to get involved in changing the world and righting the wrongs of past generations. Adults will be better at making complex decisions, learning on the go, and mastering specific skills. Entering the senior years, there is more reliance on ways that worked best in the past. As the brain changes, some types of decision-making will be more accessible, and some aspects may become more complex.

The changes in the brain that impact decision-making include:

- Myelination, which involves insulating neurons with myelin, improves electrical transmission speed and efficiency. It increases during adolescence, remains steady in adulthood, and declines in senior years, affecting processing speed and efficiency.
- Synaptic connections, also known as neural networks, increase significantly until puberty, followed by a pruning process during adolescence. These connections strengthen in adulthood and decrease in senior years, impacting working memory and cognitive flexibility.
- Neurotransmitters such as serotonin and dopamine fluctuate across age groups, influencing neuron performance and affecting mood, motivation, and cognitive function. Lifestyle factors, including stress levels, nutrition, exercise, and the use of drugs and alcohol, also impact these.



Cognitive Flexibility

The result of the maturation of the brain into adulthood is cognitive flexibility, the ability to adapt to changing circumstances, new information, or different perspectives. It is crucial for effective decision-making and learning, promoting improved responses to changes in the environment and context of the decision-maker. This ability develops as the brain matures, peaking in adulthood, and can be enhanced through processes and tools that support the actions of the ACC and prefrontal cortex. Cognitive flexibility encompasses several aspects:

- **Adaptability:** This involves adjusting thinking and behavior to new situations or information, specifically through Deliberate decision-making and up-regulation by the ACC.
- **Multiple Perspectives:** Considering various viewpoints and integrating different perspectives promotes improved context that assists the ACC in up-regulation.

- Creative Problem-Solving: Appropriate working memory and the capacity to weigh outcomes support generating and exploring multiple solutions to a problem.
- Shifting Focus: This refers to shifting attention between tasks or aspects of a situation as needed while maintaining the result, and it includes working memory.
- Learning and Growth: Incorporating new experiences and feedback into thinking and behavior to build new capacity.
- Emotional Regulation: Adjusting emotional responses to fit different contexts and providing a stable emotional basis that does not impede the Deliberate decision process.

Associated Behaviors of Cognitive Flexibility

Similar to recognizing when a person is in the Automatic system by their behavior, cognitive flexibility can be recognized through various behaviors:

- Open-mindedness: Being receptive to new ideas and perspectives without immediate dismissal.
- Problem Re-framing: Approaching a problem from different angles to uncover fresh solutions.
- Adaptable Decision-Making: Modifying decisions based on changing circumstances.
- Creativity: Exploring unconventional ideas or solutions.
- Tolerating Ambiguity: Embracing uncertainty or ambiguity.
- Effective Communication: Listen to others' perspectives and engage in meaningful dialogue.
- Self-Reflection: Assessing one's thoughts, beliefs, and behaviors and adjusting.
- Resilience: Bouncing back from setbacks and trying different approaches.

Cognitive flexibility can also be supported through the behavior of curiosity. Sustaining curiosity stimulates the areas of the brain most associated with cognitive flexibility, specifically the frontal cortex.

Regarding age-specific decision-making behaviors, cognitive flexibility improves as the brain develops from childhood to adulthood. Children demonstrate rigid concrete thinking that progresses to more adaptive thinking. As puberty begins,

hormonal changes impact the brain, and the transition from childlike thinking to more advanced adult thinking begins. Each age group will contain specific phases of development that support the successful completion of phases to follow. This supports improving decision-making throughout development into late adulthood and attaining and maintaining up-regulation in response to a struggling moment or novel situation. It is critical for adolescents into young adulthood to successfully up-regulate and maintain the Deliberate system, as this part of life is full of new, unfamiliar experiences. Recall that the Deliberate system is the entryway to successful learning, a critical factor in developing independence and life-building.

The following sections provide a look into age-appropriate decision-making abilities based on specific age groups. The changes in decision-making reflect the changes occurring in the brain. The central theme of the change is preparation for more complex decisions in adulthood. As children become adolescents, seeing what can appear to be self-centered, selfish behavior can be disturbing. However, from a developmental perspective, this is viewed as the adolescent brain changing and beginning to focus on becoming more independent. Taking care of oneself requires more complex decisions than being taken care of. They are also beginning to make more decisions based on their value structure as they explore how to care for themselves and meet their needs. This is most noticeable after the age of 10 years old. Before ten years old, children are focused on learning what is needed to have others care for them.

Ages 10 and under: Learning from Copying

At this age, the child can make daily decisions about what to wear to school, what to eat, and how to stay safe. However, due to the state of brain maturation, it is not an age group that is expected to be able to make complex and deliberate decisions. They are still very reliant on caregivers to decide for them. Many of the behaviors exhibited at this time of life are to maximize attention from others so that the likelihood of being cared for is improved to increase survival. The following changes in the brain characterize this under-ten age group:

- Extensive development of the synaptic connections results in strong memory and observation skills
- Myelination progresses slower, about 50% of adult levels, limiting efficiency and capacity to make complex decisions.

The impact of these changes includes.

- Children copy their parents' actions and build confidence in daily decision-making through observation.
- Children's capacity for complex decisions remains minimal. Still, they can learn to improve daily decision-making, such as picking out clothes to wear and what they want their caregiver to feed them.

Although many childhood memories become less accessible as we mature, developing a general understanding of the process at this stage is essential. Children are adept at imitating and learning from fear-based experiences for survival. They can remember daily events well because a dense network of connections in the brain enhances their memory. They can learn new skills by mimicking and linking information to understand their environment. However, due to the numerous connections in the brain, decision-making can be inefficient, often leading to reliance on habits and routines. It's only after these connections are "pruned" that Deliberate decision-making becomes possible.

Children learn decision-making skills by observing their parents' daily and complex decision-making. Parents are role models, guiding children through decision-making and demonstrating more complex decisions. This collaborative practice has long-lasting benefits, even for 8-year-olds who do not have the brain structure for Deliberate decision-making. This exposure to decision-making processes can help develop brain patterns that will be used in adolescence. While measuring the exact impact is challenging, regular exposure to intentional decision-making practices will stimulate the brain areas involved, leading to cumulative benefits as the child ages. Similar to learning to play an instrument or ride a bike, these decision-making patterns developed at a young age will be beneficial later in life, potentially resulting in improved decision-making in adolescence.

Parents and caregivers can demonstrate functional decision-making by using decision-making tools. These tools allow each family member to express their preferences and values regarding specific family decisions. In daily decisions, tools can include children selecting what they prefer from a group. Using the Pathway with this age group is demonstrated by the parent(s) as an effort to make the best

decision for the child regarding schooling, medical care, childcare, play dates, etc. Children of this age can be included, and it is essential for them to feel involved. However, because of the state of their brains, they are expected to be unable to complete the pathway independently.

Ages 10 to 14: Construction Zone, Use Caution

This age group is in a time of tremendous physical, emotional, and social change. In the brain, the following is occurring:

- The brain is changing from a child to an adult.
- Hormonal changes impact brain chemistry.
- Profound changes in the brain structure, including the progression of synaptic pruning and rapid advancement in myelination.

The behavioral impact of the changes include:

- Adolescents in this age range may struggle with nuanced decision-making due to ongoing brain development.
- They may experience difficulties in weighing options, managing emotions, and evaluating complex situations.
- They tend to have high emotions and will find it challenging to attain Up-regulation without significant structural support.

Between ages 10 and 14, the brain changes rapidly as it begins to rewire itself for the challenges of caring for oneself in the adult world. Like a construction zone, with both building demolition and construction occurring, incredible development is happening alongside significant risks. As a result of these changes, both daily decisions and the capacity to make Deliberate decisions are impacted. Ask a 12-year-old what they want for lunch, and you will likely get an “I don’t know.” This response may seem dismissive; however, it is more likely they are accurately describing their thinking. The initial steps of daily decision-making are often limited due to difficulty with focus and attention. They are unlikely to be able to up-regulate or take the initiative to make Deliberate decisions, instead relying on habits to get them through the day. Habits may include eating the same foods, playing the same games, and watching the same shows. Perhaps distracted by technology or preoccupied with their emotional state, they can find it exceedingly difficult to decide and will need support. Given the incredible change occurring

during this age, reliance on habits may also be seen as something familiar that provides orientation in a confusing world.

Parents play a crucial role in guiding adolescents through their decision-making processes, helping them learn while mitigating the risk of poor judgment. This age seeks more autonomy and is exploring how they can take more care of themselves. Parents can help young adolescents navigate the complexities of decision-making during this critical stage of brain development by providing examples and access to tools for daily activities. Adolescents continue to learn within the context of their family. However, they are also branching out, joining different cohorts, and beginning to follow the innate need for more independence in decision-making. The challenge is providing both a structure that can help them make decisions and do it within a safe environment. Both can be satisfied when families make decisions together.

The DDMP becomes a structure for tweens to learn about and make collaborative decisions with parental support. The DDM tools allow adolescents to make mistakes and learn. Their tendency to have poor judgment due to inexperience and being unaware of dangers can be balanced by parental review and supervision of daily and deliberate decisions. This helps the young adolescent to take steps to develop their independence in a safe, supportive environment. As the DDM Tools and DDMP are frequently employed in collaborative decision-making, learning will take place, which will help to strengthen the connections in the Deliberate system.

Ages 15 to 17: Discovering Values, Developing Self

This is the age of self-discovery, developing an increased capacity for complex decision-making in preparation for real-world challenges. The changes in the brain include:

- Progression of synaptic pruning and myelination, resulting in faster processing and more efficiency. This results in more excellent working memory and the likelihood of handling more complex decisions successfully.

- Mid-adolescence improves decision-making processes due to ongoing maturation of the prefrontal cortex and strengthening of connections between functional areas, resulting in improved cognitive development.

Although progress towards improved decision-making occurs, the brain has difficulty measuring risk and reward. As a result:

- Teens may face impulsivity and emotional regulation challenges, resulting in intermittent poor judgment and further difficulty evaluating risk and reward
- Their peer group defines risk and reward, and as a result, Teens may be influenced by their peer group through peer pressure without a firm understanding of their values.
- They tend to be influenced by groups that want them as a member, even when that group does not reflect their personal values.

By now, daily decisions are well-developed. They have a routine that they follow and still need some guidance, but mostly, they are running their own routines and managing their own habits. Up-regulating to deliberate decisions is more accessible, resulting in more awareness of context, relevance, and the benefits and consequences of getting a result. They can better assess their needs, initiate needed actions, and make decisions to upgrade and modify habits and patterns that are not helpful. However, the full completion of a Deliberate decision can be impaired because they have not established their value structure or become aware of their innate values. In the DDMP, this is most obvious in Step 4, in which outcomes are ranked. Because they struggle with this value structure development, they often ask friends what to do and discuss their values with their cohort. They may use the values of a group, a religion, or a music group as a proxy for their unexplored values. By mastering the value structure creation process, this age group can progress towards learning in new situations faster and begin to improve their capacity to care for themselves in more complex situations.

During this age, the critical task is to confirm and use values when making decisions. This creates a reliable criterion for evaluating risk and reward. Parents offer supervision and advice as teens incorporate a sense of self and values into their decision-making processes. The challenge to this age group is to understand their emerging value structures. Values are acquired from family and social contexts in which one is born, as well as innate, something you are born with. Teenagers begin to consider what matters to them at this age and what they may

want to organize their lives around. During this time, there is typically conflict as the teenager rejects values provided by family or society in favor of values they identify with. They may explore different value structures within the context of groups, joining clubs or groups that share the same music or world views. These relationships become essential sources of growth as the teenager experiences the tension between agreeing with the group and having values that may be inconsistent with the group.

Values can be made explicit and knowable by creating a hierarchy. This could reduce conflict by providing a way for the teenager to feel less confused about their values and the ones they are unsure about. Using the DDMP focuses on developing self-referential rewards and developing the value structure associated with individual needs. At this age, decision-making is becoming more independent. However, there is still a significant role for the parent to be involved in organizing their children's future. With the DDM tools, teenagers can express their values, be heard, and feel they are taking the first steps to build a life. This is complemented by the parents' involvement, allowing them to provide input and guidance with the help of coursework to develop their teens' decision-making capabilities.

Ages 18 to 20: Starting Strong, Society Involvement

The brain is approaching maturation that includes the following:

- Improving overall structure and neurotransmitter stability
- The prefrontal cortex (DLPFC) is approaching maturity, leading to enhanced cognitive control and improved decision-making.
- Individuals in this age group may exhibit advanced questioning and seek more profound understanding, including social causes and macro structures.

This age group has mastered establishing new daily routines and integrating need fulfillment into those routines. They can also make Deliberate decisions about struggling moments and are better at creating value-based decisions around new situations. They may still have difficulty in complex situations and maintaining

long-term change efforts, which require ongoing monitoring of progress and learning and adjusting as needed. Because of the newness of college, career establishments, and the beginning of life-defining relationships, the brain can become overwhelmed, reverting to habits. When these habits are supportive, progress tends to be more accessible. When habits for stress management include drugs, alcohol, and poor health management, then progress is less likely.

Parents provide indirect support and approval through initial financial support for decisions made by young adults. The DDMP and associated tools become part of life-building as the individual can complete the entire pathway independently. Repeated and ongoing use results in the areas of the brain associated with complex decision-making, improving strength and efficiency.

Ages 21 to 60: The Age of Responsibility

The brain has matured at this stage, and optimal decision-making is part of the life-building process. Changes in the adult brain include the following:

- Myelination and synaptic development continue but at reduced rates.
- Lifestyle, nutrition, exercise levels, and stress impact brain chemistry.

The decision-making areas of the brain are mature and ready to work. However, the degree to which they are activated mainly involves understanding decision-making and recognizing environmental influences that lead to up- or down-regulation. As a result, despite the brains of 30-year-olds being neuroanatomically similar, the functional performance of decision-making may be very different.

- Decision-making is based on the knowledge and skills of the individual.
- Increased capacity for long-term planning and pattern recognition

At this age, the brain can learn and remodel through neural plasticity. However, it takes the right stimulus, as provided by the ongoing use of the DDMP and other DDM tools, to consolidate learning and decision-making.

Ages 60 to 100: Cognitive Rigidity and Decline

This age group has unique needs that are important to identify for the seniors and friends, family, and community. As a result, the remainder of this chapter looks at these specific changes and needs. It's important to know that these are age-appropriate changes and are predictable. As a result, a comprehensive program can be readily established to help manage changes in decision-making capacity that may lead to adverse outcomes. The expected changes in this age group include:

- Reduction in myelination progresses, causing decreased cognitive speed.
- Adverse changes in dopamine, serotonin, and other neurotransmitter levels resulting in impaired mood, anxiety, and depression
- Reduction in the number of neurons in the frontal cortex region, impacting the capacity of decision-making and working memory
- Seniors may experience increased cognitive rigidity and challenges in decision-making.
- Adult children may become involved in decision-making for medical, end-of-life, and other senior care decisions.

The overall changes in the anatomic structures and neurochemistry of the brain result in observable behaviors called Cognitive Rigidity.

Cognitive Rigidity and the Senior Decision Maker

Cognitive rigidity is the difficulty adapting to added information or changing circumstances. It is most associated with aging after 60, as changes in myelination, synaptic connections, and brain chemistry reduce the brain's capacity for decision-making, new learning, and adaptation.

It involves:

- **Fixed Thinking Patterns:** Sticking to a particular way of thinking or beliefs despite contrary evidence. Seniors may insist on facts that have been debunked or ways of doing that are no longer functional or safe.
- **Resistance to Change:** Struggling to accept change in routine, opinions, or practices. Seniors will tend to follow the same daily routines, even when a change in health or environmental context makes those ways no longer helpful.
- **Inflexibility in Problem-Solving:** It is difficult to consider multiple solutions to a problem. This can lead to focusing on only one solution, which can exclude other better solutions.
- **Reduced Adaptability:** Challenges in adjusting to new situations and recognizing the need for change. As the pace of technological change increases, seniors have a more difficult time completing daily functions. Consider banks requiring online banking and limiting the availability of teller-supported bank transactions.

Associated Behaviors of Cognitive Rigidity

There is a connection between cognitive rigidity and the Automatic system. Recall that the behaviors of the Automatic system include many of the same behaviors as cognitive rigidity. As anatomical and biochemistry changes reduce the brain's working capacity, the ACC will rely more heavily on the low-energy, easy-to-use Automatic system. It will use the habits and patterns developed over years, sometimes decades, as they are readily and easily accessible. It can also be said that cognitive rigidity occurs as it becomes more challenging to attain and maintain an up-regulated status. The frontal cortex may have increased changes, leading to

increased difficulty completing the Deliberate system, prompting a downregulation due to lack of progress. In addition, the Automatic system can become dominant when the learning areas of the brain are inhibited, as it takes more time and resources to learn something new, resulting in further reliance on the old ways of doing things.

Behaviors associated with cognitive rigidity include:

- **Perseveration:** Repeating the same behavior, thought, or response when it is no longer effective. As discussed in Chapter 3, the areas of the brain that demonstrate significant change after 60 years old include those most associated with perseveration.
- **Stubbornness:** Reluctance to consider other perspectives or change one's mind. This may look like making a decision and not being willing to change it, even when the situation has changed or new information is presented, making it evident that a new direction is needed.
- **Difficulty Accepting Change:** Struggling to cope with changes in routine or environment. Perhaps you have or have heard a senior say, "In my day, we did this or that." This focus on the past often includes a rejection of the present. When trying to use the same habits that once worked after a significant change in an environmental context, the senior will most likely be frustrated and unable to make progress.
- **Black-and-White Thinking:** Viewing situations in extremes without recognizing nuance can be difficult for decision-making, as this provides inaccurate information to the ACC to measure progress. If progress is all or nothing, then determining the way forward and the best actions will be difficult.
- **Repetitive Actions or Statements:** Continuously returning to the same actions, questions, or statements. Unlike perseveration, characterized by a lack of progress, the tendency to repeat statements or actions may also be related to a

lack of confidence and a need for reassurance that the actions are correct and will not lead to negative consequences.

- Depression, Anxiety, and High Levels of Emotional Strain: Due to changes in neurochemistry and the increasing stress of functioning in a rapidly changing world, seniors are likely to experience difficulty in decision-making due to mental health changes. As the frontal cortex changes, it has less control of the brain's emotional areas and the amygdala, leading to a higher likelihood of downregulation during a deliberate decision-making.

Family and friends of a senior may think their parent or relative is just being difficult when they exhibit these behaviors. However, considering changes in the senior's brain, these behaviors are considered age-appropriate and a normal part of aging. Just as exercises and adaptive equipment can help an aging body, the brain can benefit from similar support. As the brain changes, it becomes more challenging to up-regulate and more likely to experience chronic down-regulation.

However, it is essential to note that while it is considered difficult, it is not impossible. The system may be less efficient, but it is still possible to progress through the DDMP and make value-based decisions that lead to change. What is needed is support for the system. This support should be dependable and easy to use, making it more valuable for the senior. As the areas of the brain are supported, they have an overflow impact throughout the system, increasing the likelihood of a successful decision being made.



Assisted Decision Making for Seniors

Walking consists of tasks the brain and body perform to move from one place to another. Canes and walkers are assistive devices that promote safe walking when the leg structure cannot perform adequately. Using a cane facilitates critical walking tasks by providing extra support. Other assistive devices work the same way, supporting the extremity so that it can still accomplish the task of walking even in its impaired state. The assistive devices differ in their support and the part of the walking sequence.

Decision-making tools work the same way to help the brain complete decision-making tasks. Tools can help the brain complete critical tasks to progress the decision-making process even when overwhelmed, unprepared, or diminished. The DDMP and its associated tools can function as an assistive device, promoting the activation of decision-making networks and the completion of critical outputs in the Deliberate system. Consequently, this excites pathways in the brain and facilitates new learning and better recall. This way, seniors can maximize their decision-making abilities and stay involved in life-building.

In addition to using DDMP tools that promote activity in the critical areas of the brain, diet, exercise, and social connections are critical to maintaining and improving seniors' decision-making capacity. Tool use stimulates the specific

areas of the brain, causing them to become excited, strengthening connections, and maintaining their function through use. Just as with muscles, the brain and its decision-making systems are bound by the "Use it or lose it" rule of efficiency. With a decrease in overall hormonal and supportive body chemistry, it is easier to lose it and harder to restore it over time. This is why early intervention and regular decision-making are vital for seniors. Collaborative decision-making with caring family members will be critical for the seniors' long-term safety and quality of life and improve their involvement in life.



Conclusion

Understanding the influence of age and brain development on decision-making can help individuals adjust their cognitive flexibility and rigidity strategies. As we age, our brain's ability to process information may slow down, leading to a need for more time and effort in decision-making. By recognizing these factors, decision-makers can navigate challenges more effectively, allowing them to make thoughtful, well-informed decisions throughout their lives.

Furthermore, parents play a pivotal role in decision-making in younger age groups. Meanwhile, older individuals benefit from a mature brain but may experience challenges related to cognitive rigidity as they age. Research indicates that changes in the brain can be mitigated through lifelong learning, engaging in complex decision-making, and regular exercise.

Family Smith and Chapter 9

John found the chapter on the impact of age and brain development on decision-making particularly enlightening as he reflected on his family's various needs and challenges at different life stages. This chapter provided him with insight into how

age affects the brain's ability to process information and make decisions, which resonated with his experiences with his children and mother.

For Alex, who is 11 years old, John recognized the importance of guiding him through daily decision-making tasks and providing examples of effective decision-making. He understood Alex's capacity for complex decisions was still developing and needed assistance building confidence and ability over time. This new understanding helped John appreciate his son's sometimes confusing behavior as age-appropriate and signs that he was maturing normally.

At 16 years old, Jane faced impulsive and emotional regulation challenges. John realized the significance of offering her supervision and advice as she navigated this transitional stage; helping her incorporate a sense of self into her decision-making processes was the work to be done now. He started looking for ways to help her understand her burgeoning value structure.

Ellen, now 19 years old and in her first year of college, was making decisions about her major, career path, and relationships. John recognized the maturity of her decision-making abilities and wanted to provide indirect support through financial assistance while offering advice when needed. He recognized her need to get involved in social justice causes, which showed her progression in making more complicated life decisions.

John also considered his mother's challenges as she navigated senior years and increasingly complex decisions. He acknowledged his and his siblings' role in assisting her with medical, end-of-life, and other important decisions. He had become concerned about her increasing difficulty with complex decisions but now understands that it is part of aging. He was excited to share what he had learned with her and wanted to know more about what he and his wife could do to improve their decision-making capacity in their senior years.

This knowledge empowered and equipped him with strategies to support his family members in making informed decisions throughout their lives, aligning with his goal of teaching his children how to be better decision-makers.

Review Exercises:

1. Locate the section with your age. Do you recognize the tendencies?

2. Ask a friend or family member of a different age group if they recognize the tendencies in you for your age and in their age