Perception and Cognition

Perception refers to taking cues from the environment, observing what is going on around, moving in a manner based on what the environment allows, and creating new patterns of movement with a change or shift in environment (Smith, 2022a). Cognition is where one preplans what needs to be done in terms of movement patterns. It is a mental procedure of gaining knowledge through thought, experiences, and senses, which in turn helps with movement patterns in developing children. Perception is more of observing and learning, whilst cognition is the development of knowledge, skills, and mental problem solving (What is cognitive development, n.d). For example, perception is when a baby moves around an object to get on the other side of it, or picking that object up if it is something small and placing it to one side, and moving forward if that certain item is in their way. Climbing out of the cradle onto the floor can also be looked at as perceptual development, but the thought process behind the movement, i.e. why they lift their leg, and how are they going to lift it up and support their entire body to get out of that cradle is cognition because there that have to mentally solve the problem of "how" to get their body up and over the barrier of the cradle and get out of it. Distinguishing between familiar and unfamiliar people is also a perceptual skill acquired as development progresses. For example, a baby might see their uncle or cousin for the first few times and not know who that person exactly is, but after seeing the same face over and over again, they gain perception of who that person is (Perceptual and motor developmental domain, n.d). Remembering the alphabet, knowing their own name, age, and gender, are examples of cognitive development (Cherry, 2021).

The traditional approach to perception is usually referred to as the indirect method of perception. The traditional model implies that perception is taking action based on what is observed in the environment, i.e., learning by observing, whilst the ecological approach implies that perception is taking action based on affordances, i.e., the functional utility of an object and its action capabilities. For example, learning how to kick a soccer ball by watching someone else do it, doing a squat with proper form after looking at the trainer demonstrating it, making a meal or a certain dish by watching a video online of how to cook that certain meal, are some examples of indirect methods of perception. However, deciding as to whether or not to catch a baseball directly after it is hit or to let it bounce before catching it depends on the situation and the "catchableness" of the ball in that moment, or, returning a serve in table tennis with backspin or topspin depends on the manner in which the ball is served to the player, and that cannot be learned indirectly, but has to be perceived directly and in the moment of action (Burton 1967).

The information processing model helps understand how humans process information via some kind of stimulus as short-term or long term memory, and act on it. It outlines the sequence of the mental process and helps us look at motor development from a different angle. It begins with a stimulus, or what we are experiencing in the moment, which appeals to or involves different senses. For example, explaining the benefits of a product orally engages the ears known as echoic memory, i.e., remembering something someone has said, showing them a picture or an advertisement of the product conveys information visually, and providing them with a sample of the object allows them to touch or feel the product, hence allowing them to remember the product much better. Information being acquired in multiple different ways allows the brain to process that information in a much more efficient manner, hence increasing the likelihood of retaining that information. Another example would be that someone explaining a presentation

while it is displayed on a large screen with images or visual graphics can help the audience retain that information much better, as they have their hearing and visual senses engaged, as compared to just explaining a presentation without visuals, which would not help retain that exact information for longer periods of time. After the stimulus, we identify the stimulus via three steps: stimulus intensity, clarity, and recognition. Stimulus intensity could refer to the "size" of the stimulus in a way. For example, if someone yelled "stop" at the top of their voice while another person is running, the person running will identify the stimulus easily since it's yelled rather than him or her just saying it normally, or, when you touch a hot stove instead of room temperature, the response to that stimulus will be more explosive or have a quicker motion than otherwise. Stimulus clarity refers to how obvious the stimulus is, for example, when approaching a red light at a signal, a bright red light would instigate a response of pressing the brake pedal much quicker than it would if the light was dull and could barely be seen from inside the car. And stimulus recognition is self explanatory, when a sense is activated via stimulus over and over again and exhibits the same response, the mind tends to recognize that stimulus, so whenever we touch something very hot, we recognize that stimulus and pull our hand away immediately, or after having a good amount of practice in driving on the roads, it becomes easy to recognize the stimulus of the red light and hitting the brake pedal as a basic response to that very stimulus, you won't hit the accelerator when you see the red light because the mind does not recognize that stimulus for that particular response. Followed by stimulus identification is response selection, i.e., choosing a response based on the stimulus received. For example, seeing a rock being thrown at you would cause a response selection of ducking or moving to one side to avoid being hit, or when someone says "catch" and throws a ball at you, you tend to hold your hands up and catch it as a result of response selection (Smith, 2022b). However, Hicks law states

that the time taken to make a decision and exhibit a response is directly proportional to the amount of information to be processed. This law comes in handy when designing items such as remotes, instruction manuals, drop-down tabs, etc. A remote control for a TV that has many buttons and small text will take the user longer to find a button, rather than when the remote is simple and has fewer and clearer buttons to read. An instruction manual with extremely small text and no visual representation that is fifteen pages long will take the user hours to figure out the working of the object, rather than if the manual were concise, had pictures to demonstrate, and was not that many pages long (Soegaard, n.d). After the stimulus is identified and the response is selected, it is followed by the response programming stage, which is the last stage of this model, where the mind and body translate the response selected in the previous stage to specific and realistic commands for the motor system to exhibit a physical response or action (Czyż, 2021).

The first stage of the memory model, known as sensory memory, is the most peripheral level of processing, has an unlimited capacity, and retains information without coding for just one second (Smith, 2022b). From here, the information is filtered into short-term or working memory, where it is processed further, and some of the information in short-term memory is discarded or filtered away, while the massive chunk of that information is stored in long-term memory. Various factors affect the efficiency of short-term memory. Cognitive ability impacts the amount of information that can be stored; an individual might be able to store information more clearly or with more detail compared to another person who might not be able to retain as much information. The amount of information that has to be stored plays a role too; for example, remembering a phone number might be harder than remembering someone's apartment number. How focused a person is and how much attention they can dedicate to understanding information

are factors as well. We tend to use selective processing to retain information that we might deem more important or relevant, and at times use repetition to retain it, for example, paying more attention to memorizing certain formulas in math by repeating them in practice or mentally over and over again instead of listening to instructions being given by the bus driver whilst studying in the bus on their way to class. Since information gets filtered over and over again at different stages of processing, the factors that influence short-term memory have a similar impact on long-term memory. For example, multiple repetitions of information can be easier to remember in the long term. Paying more attention to "relevant" pieces of information can enhance the mental capacity to store things that have been given more attention. Breaking up information into smaller chunks and in a manner where each chunk is like a dot, and one can "connect the dots", in turn focusing on an appropriate amount of information at a time instead of overloading the mind with information, assists with long-term memory. For example, creating tables and charts of separate sections in a particularly large chapter or book, and paying attention to the smaller sections one at a time, can enhance long-term memory (Lawless, 2021).

Schmidt's theory implies that people don't learn movements or actions; instead, they form generalized motor programs by exploring programming rules or constraints and learning how different types of movements are related to each other. They learn how to produce movements by varying the parameters that determine the manner in which the motions are generated. Parameters are features of motion, something that assists a motion and can be manipulated to help assist that motion further. For example, building strength to allow more force exertion of that muscle, building endurance to run longer distances, or practicing a certain skill over and over again in order to master it and perform it easily. Practicing a certain movement, such as writing, drawing, driving, or throwing a ball in different directions and distances, one tends to

learn the relationship between the parameters and the outcome of the motion, and their understanding of the relationship between a movement outcome and their control of the parameters. The theory predicts that people will begin to quickly learn the relation between achieving a desired motion and manipulating parameters via constant practice in different situations, in turn gaining more experience with the same (Schmidt's definition of motor learning, 2022). The relationship between the parameters and the movement outcome is referred to as "schema", further expressed as recall schema and recognition schema. Recall schema represents the relationship between initial conditions, parameters such as time or force, and the movement outcome. It is used for producing movements and computing the parameters necessary to produce that motion. The recognition schema is basically an evaluation of the action produced. It enables the individual to evaluate the outcome or the movement and is a relationship between initial conditions, sensory consequences, and movement outcome. Practice allows one to have an efficient recognition schema along with knowledge of results and performance (Smith, 2022b).

In the pre adaptive period, infants crawl, creep, cruise, or walk to a point or location in the house to explore an item, a toy perhaps, which shows that the child used its cognisance, i.e., planning what needs to be done to get to that location, or try to find a way out of their cradle with a motive or thought of essentially getting themselves out of confinement. In the fundamental period, learning how to use a utensil, such as a spoon or fork, in order to feed themselves by watching their parents or the people around them eat with utensils, by using perception to exhibit a motion. Another example is learning how to write, memorizing the alphabet, or even imitating another person's actions, etc. In the task-specific period, children tend to select a sport or activity, or even a hobby that does not involve physical activity, such as playing video games. If they

have older siblings or friends who can control a joystick console whilst looking at the screen, they tend to observe that person play the video game and might teach themselves how to play it by watching and learning how it is done. Another example can be learning how to perform a certain action in a sport by watching it being performed on television. I personally saw a man juggling a soccer ball on the television with his feet and tried to imitate him whilst watching. In the skilled motor behavior period, teenagers tend to learn the basic skill of driving, with the help of perception by watching someone else drive, taking classes, and using cognizance to be aware of the surroundings, gaining experience by doing it over and over again, and driving with the motive of getting to a certain destination. In the compensation period, as an adult living alone, people tend to learn how to cook, and it is typically done by watching videos on YouTube, pre-planning what needs to be cooked, and cooking often, which improves the skill and awareness of quantities that need to be used.

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