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'How Do We Understand the Behaviour of Others?' Simulation Considered from the Perspective of Self-consciousness as a Theoretical Cognitive Discipline

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'As currently used, the term 'cognition' refers to the many different processes by which creatures understand and make sense of the world. The term does much the same work as was previously done by the term 'information processing' and is strongly influenced by developments in computing beginning in the 1940s. Perception, attention, memory and action planning would all be examples of cognitive processes. All these processes are important in social interactions and the study of information processing in a social setting is referred to as social cognition.' (Frith, 2008, p. 2033)

Contents

Introduction

Cognition is the crucial word for processes that formulates who we are, what we think and how we interact with the world. In other words, it is a series of many different processes that are parts of bigger mechanisms. Cognition is the decoding, manipulation, recovery, and processing of information or input in the brain, and different mechanisms describe how this input processing is done. Cognitive mechanisms can vary from operating very simple tasks like motoric actions that are mostly unconscious manipulations of our body to very complex tasks like complicated maths calculations. Cognition also helps us to cope with social situations, which is called social cognition.

Theory-theory and Simulation Theory are two main theories that are parts of social cognition. They describe the process of mindreading, which is understanding and explaining (and even predicting) the behaviour of others. My main thesis is that Simulation Theory does not work when explaining mindreading as an unconscious, simple mirroring activity involving self-related information called simulation. Simulation as a mindreading mechanism can work only if this self-related information is a conscious more complex and theoretical process like Theory-Theory proposes. Therefore, Simulation Theory is just a special case of Theory-theory, where we additionally employ self-related questions, but it does not stand alone as a full covering theory.

For the argumentation this paper uses a Dynamic Embodied Cognition Theory. It serves as a theoretical basis in navigation through different cognitive mechanisms and processes. Dynamic Embodied Cognition is the most comprehensive theory and offers not only strictly embodied coupled cognition that treats all mechanisms as online

(connected) with environment, when we operate on immediately available information from the environment, but it also offers decoupled offline (disconnected) cognition when immediate information is not available. The decoupled offline cognition is treated as one of the more complex and more complicated processes. Hence, the argumentation here moves the kind of simulational mindreading as proposed by Simulation Theory from the sea of coupled cognition to the sea of decoupled cognition, where Theory-theory sails.

The second argument modifies the view of Theory-theory in order to move towards broader cognitive theory and making it more suitable for biological sciences as cognitive science should serve as a basis for neuroscientific research. I claim that the theory of folk psychology, as it is a base of the kind of mindreading that Theory-theory describes, is different from theoretical thinking, which is a kind of the more complex cognitive mechanism. Folk psychology is our everyday social navigation, which we use in understanding behaviour of others by ascribing them beliefs and desires they act according to. In the context of cognition we employ theoretical thinking, but we do not especially need to use folk psychology, and we should differentiate between them.

The main aim of this paper is to move mindreading theories from the field of mere theoretical debate into the oceans of science presented by cognitive science and neuroscience. Ideally, in the world of sci-fi this would help us to understand the mechanisms of social cognition, and it would be easily connected with recognition and treatment of disorders, where symptoms can be found in impairment of orientation in social situations.

But keeping our feet on the ground, for now the plan is simpler. The paper starts with a section concerning theoretical and conceptual background. This includes the definition of mindreading and social cognition, explanation the Theory-theory, Simulation Theory, and describing Dynamic Embodied Cognition. The next section discusses Simulation Theory from the perspective of self-consciousness, where the main argument that simulation must be a theoretical decoupled mechanism is presented. The following section describes the distinction between having a theory like folk psychology and thinking theoretically, which modifies Theory-theory. Subsequently, Simulation Theory and mirror neurons are presented in more detail with focus on their difference when simulation is treated as a theoretical and decoupled mechanism. Lastly, possible objection by proponents of Simulation Theory is discussed.

2   Theoretical and Conceptual Background

2.1   Mindreading and Social Cognition

Our everyday life is interwoven with social interaction. In order to be able to navigate through these social events we can employ a mindreading ability. Mindreading is a cognitive capacity to explain and predict behaviour of others (Stich & Nichols, 1992). It means that if I see a person on a street next to a car (let's call her Sara), and Sara is looking for something in her pocket, I assume that she is looking for her keys to open the car. The ability to understand and explain behaviour of someone else presupposes possible verbalization of this understanding because understanding itself consists not only of perception but also of consecutive comprehension. So when I understand a situation (in terms of what and why it is happening), it also means that I am able to talk about it.

When someone is able to verbally describe a situation, it means that the cognitive capacity consists of conscious high-level cognitive processes, therefore mindreading is a conscious higher-cognitive activity. When I see someone next to a car, who is looking for something in her pocket, I am able to understand the situation that she is looking for her car keys. And when I understand this scenario, I am also able to explain it verbally to my friend standing next to me: 'Look, she is looking for her car keys to open her car'.

Mindreading is part of a general set of cognitive capacities that are known as social cognition. Social cognition is a very broad part of our cognition consisting of the decoding, manipulation, recovery, and processing of information in the brain, which

relates to social phenomena (Frith, 2008). Social cognition is a term for various cognitive operations on inputs we get from social interaction. Usually these are considered to be lower-level capacities operating on inputs such as facial expressions, eye gaze etc., but they can also be higher-level capacities operating on inputs such as culturally restricted behaviour in different situations and other cultural phenomena.

2.2   Theory-theory and Simulation Theory

There stand two main theories, which explain the social cognitive ability of mindreading. Theory-Theory (TT) proposes that mindreading is done at the level of ascribing mental states like beliefs and desires to an agent by utilizing a folk-psychological theory, which is similar to a scientific theory (Gopnik & Wellman, 1992). Theory-Theory is highly supported by false belief tasks, which have proven that children are able to ascribe other people's propositional attitudes around the age of four (Flavell, 2004). These tasks are done to show that a child at the age of four is able to ascribe a false belief to another person, which a younger child is not capable of doing.

This is interpreted as our need to acquire 'theory of mind' or more precisely the folk-psychological theory (Baron-Cohen, Leslie, & Frith, 1985). Having a 'theory of mind' means that an observer knows that others have propositional attitudes like beliefs, desires, and hopes and that they act according to them. Propositional attitude is a mental state connecting a person to a proposition. Theory-Theory proposes that mindreading is a detached theoretical process concerning propositional attitudes analogous to the one of

scientists, meaning that we theorize about one's propositional attitudes, according to which we believe one acts.

The second, Simulation Theory (ST) proposes that we use our own experience as an internal pattern, meaning that we simulate what the other person is thinking. ST regards mindreading as an ability to projecting ourselves into the other's situations (Gallese & Goldman, 1998). If we understand and are able to project our own behaviour, then by substituting our behaviour into the other's frame, we have to understand it as well. ST is based on the assumption that mindreading involves the process of mimicking. Simply, if we want to know the reason for someone else's behaviour, we imagine our own behaviour in the same situation.

For Goldman and Gallese (1998) to support ST, they put forward the evidence of mirror neurons that are considered as representatives of our mimicking ability. Mirror neurons are a specific class of neurons that are activated during motor activity and also when observing the same activity. Mirror neurons are activated during concrete goal-related motor action. This can be translated as mimicking an action without actually practising it.

Gallese and Goldman (1998) ascribe two possible functions to mirror neurons. The first could be learning by imitation, but they favour (without further explanation) the second possible function, which is the process of mindreading. For Gallese and Goldman (1998) mirror neurons function as a mindreading ability. During this kind of mindreading one does not need to know or embrace any psychological laws (like in TT), but mere simulation executed by the mechanism of mirror neurons is enough.

Hence according to mirror neuron activation, it is more plausible to favour ST over TT (Gallese & Goldman, 1998).

In our already known situation, according to ST, I would put myself into the situation where I would be standing next to a car and looking for something in my pocket. And this mimicking does not have to be explicit because in our experience we do not imagine ourselves in 'other's shoes', but this process is done on a neuronal level, so the same neurons are activated when I see the car scene, and when I am actually part of the scene. For Gallese and Goldman (1998) this is the process that is automatic, unconscious and that helps us understand the behaviour of others.

2.3 Classical Cognitivism vs Enactivism

The definition of social cognition, as it is usually described, is mainly based on the idea that the mind is an information processing system, which manipulates symbolic representations, therefore cognition is seen as a mere computational process (Bruin & Kästner, 2011). This approach is called Classic Cognitivism and stands opposite Enactive Cognition, which considers cognition as a process that lets emerge a sense from the dynamic online (meaning connected) interplay between an agent (or organism) and the environment, in which it is embedded (Varela, Thompson, & Rosch, 1991).

These two approaches are different in their treatment of cognition (and sometimes mind). For Classic Cognitivism cognition is an internal decoupled offline (disconnected) process that takes place inside our body, especially in the brain. Environment does not play a crucial role in cognition. On the other hand, Enactivism

involves the environment as an important aspect of the cognitive processes that is not only internal, but also involves bodies. Therefore Enactivism proposes embodiment, where cognitive aspects are shaped by the aspects of the body. Enactivism stresses the mode that organisms organise themselves by bodily dynamical interaction with their environment. Hence, cognition is grounded in sensory behaviour and motor actions as two representatives of embodiment.

For example Enactivism would treat a calculating task differently from Classical Cognitivism. If we are multiplying two large numbers, it is easier to write them down and use a paper and a pen. This is an embodied aid that makes tasks cognitively easier by using our bodily capacities. We use the environment in order to reduce the cognitive load. As Classical Cognitivism explains our cognitive capacities as an internal mechanism manipulating representations, it either treats multiplying on paper as the same task as multiplying without the help of a pen and a paper. That means the pen and paper are actually not an aid, or it treats it as a number of separated cognitive processes separated into more multiplying subtasks leading towards the result. But Classical Cognitvism still fails to explain why it is easier for us to use the help of our environment, and why we do not split the multiplying task in our head. This is why Enactivism is becoming a stronger theory.

2.3.1 Dynamic Embodied Cognition

Bruin and Kästner (2011) separate Enactivism further into two conceptions. The first one, Broad Conception of Enactivism explains cognition as: 'the relational process of sense-making emergent from the agent's dynamic coupling to her surroundings and autonomous process that self-sustains the agent' (Bruin & Kästner, 2011, p. 548). In Broad Conception of Enactivism the agent is an autonomously self-organizing system, which is continuously coupled with its environment, and therefore it neglects offline cognitive processes. By denying offline cognitive processes Broad Conception of Enactivism (as represented by Varela et al., 1991) also refuses cognition as a computational process.

In that light, Bruin and Kästner favour the second version Narrow Conception of Enactivism (as represented by O'Regan & Noë, 2001), in which cognition is a process depending on perceptual consciousness. We do not deal with internal representations, instead we pick necessary perceptual information straight from the environment when needed. Narrow Conception of Enactivism still regards cognition as a computational process, even though it heavily relies on environment, and that helps Bruin and Kästner build their proposition of Dynamic Embodied Cognition.

Dynamic Embodied Cognition treats cognition not only as a coupled state, but also involves a certain degree of decoupling. Therefore, there are two possible cognitive states in which an agent can process information. The first one, coupled online cognition represents a high degree of involvment with environment mainly in terms of perception and perceptual experience. The second one, decoupled offline cognition in

which cognitive computational processes are done when the agent is disconnected from the environment.

This paper considers ST and TT in the perspective of Dynamic Embodied Cognition because it provides the most comprehensive explanation of our cognitive processes. It involves not only offline decoupled processes like Classical Cognitivism, but it also involves embodied cognition that is necessary for our coupling with the environment. I use the frame of Dynamic Embodied Cognition in order to argue that ST is a theoretical discipline, meaning that it stands in the decoupled offline part of cognition as does modified TT. Dynamic Embodied Cognition allows me to put both theories under decoupled cognition without necessarily denying the aspect of embodiment. Therefore mindreading can be the cognitive capacity that is offline and decoupled, but it can be based on previous embodied perception.

3   Simulation Theory Considered From The Perspective of Self-consciousness

3.1   Simulation Theory and Self-consciousness

Theory-theory presents a theoretical kind of cognitive processing that takes place during mindreading. In order to judge between Simulation Theory and Theory-Theory, we have to ask what kind of cognitive process simulation is? According to Gallese and Goldman (1998) during simulation we take the first-person perspective, even though this perspective is not explicit. Simulation Theory has been supported by the activation of mirror neurons, and also excitation of muscles when the action needed for these muscles was observed (Gallese & Goldman, 1998).

Because the process is operated with the help of a body due to the fact that mirror neurons are part of premotor system, which is considered as a part of embodiment and their activation cause muscle excitation, Simulation Theory is sometimes considered as being embodied and online (Gallese, 2007), (Gallese & Sinigaglia, 2011), (Yeh & Barsalou, 2006), and (Niedenthal, Mermillod, Maringer, & Hess, 2010), hence being a theory of Enactivism.

To understand others using simulation – using our own self in a situation, we have to exploit how we understand ourselves first. Then, we can apply this notion to Simulation Theory. To put it differently, if I want to understand someone else by simulation, I have to understand/know, how I understand myself first. So the next question is how do we understand ourselves?

3.2 Self-consciousness

The answer lies in the concept of self-consciousness. I do understand myself when I am conscious of myself, or when I am aware of myself. The first concept to be considered, which describes the first experience of self-consciousness is the minimal self (Gallagher, 2000) or the biological self (Dennett, 1993). The minimal self is an output of unified organisation that is extended in time. It describes the ability of an organism to know the border between self and non-self. Even though the unified organization is extended in time, the term the minimal self is limited to the immediately accessible experience of self. The minimal self is described as dependant on brain processes and an embedded body, so there is a notion of position in the environment within the minimal self.

The problem with the minimal self is to what extent we can say that an organism with the minimal self actually is self-conscious? Being able to mark a distinction between self and non-self does not seem to be sufficient for self-understanding. The minimal self describes mere implicit bodily information, therefore 'being able to mark a distinction' means feeling rather than knowing or understanding, and refers to very simple lower-level cognitive processes. Understanding of the self and the ability to refer to oneself is more complex and demands higher cognitive abilities than those required for the minimal self, therefore anther concept to be considered is necessary.

3.2.1 The Ability To Think 'I'-thoughts

To understand ourselves and be self-conscious we have to have an ability to think 'I'-thoughts, meaning that the ability provides us with thoughts that are about ourselves, and that the subject having these thoughts is aware that they are about oneself. 'I'-thoughts are immune to error through misidentification because there is a first-person perspective bound to the subject. Meaning that every time when I refer to an experience as mine I cannot be wrong in that judgement. I am the one who feels pain, and as Wittgenstein noted (1965), it would be non-sense to ask if it is really me who has a pain. Hence, the subject cannot be mistaken with respect to the notion of her self-ascriptions (Musholt, 2012). Self-consciousness requires a conscious notion of oneself that is not only aware of self and non-self distinction, but also can refer to self as a conscious subject of thoughts.

More complex self-consciousness is sometimes put under the concept of reflective self-consciousness. Its implicit object of observation is our previous experience, the kind of experience that bears the attribute of first-person perspective. Reflective self-consciousness reconsiders this first experience with our environment, which is always done from the first-person perspective (Gallagher & Zahavi, 2008). So we have an immediate input in the form of pre-reflective self-consciousness, and then we later employ inference making reflective self-consciousness.

In the process the first primitive notion of self being distinctive from non-self, in phenomenological tradition also called pre-reflective self-consciousness, is subsequently upgraded into reflective-self-consciousness that is decoupled offline

higher cognitive capacity. Here, it is important to note that pre-reflective self-consciousness or similar form like the minimal self cannot be considered as cognitively fully able to bring the notion of oneself in terms of ability to think 'I'-thoughts. As it has already been stated that the minimal requirement is the ability to think 'I'-thoughts, and employ cognitive mechanisms that work within the more complex structure of inputs, inferences and outputs.

In simpler words, our awareness of our own experience has two stages and also conditions. First, the experience is mine, which is the first and more primitive stage at the level of mere perception or input. Second, I am able to see the experience from some perspective, I am able to reflect upon it, meaning that I involve higher cognitive capacities that are decoupled. This second stage is on the level of understanding, the mechanism does more and harder tasks; it is able to make inferences, it manipulates with input and is able to modify it. We can grip distanced perspective from our engagement with the environment, in cognitive terminology we decouple from the environment and we process information offline. Also, we are detached from immediate embodiment, so these processes are mainly internal. In the next chapter the connection of reflected self-consciousness and ST will be explained.

3.3 Simulation Theory and Self-consciousness

Going back to the question 'how do we understand ourselves?', using the concept of self-consciousness, the answer is that it is our ability to think 'I'-thoughts that are internal, detached from the immediate environment or decoupled and not embodied, in the sense of dynamical interaction between one self's body and its environment. Self-consciousness in this form of an explicit self-representation as an opposite to implicit self-related information (Musholt, 2012) is the theoretical form that we are looking for, and the one that provides us with self-understanding. Therefore, simulation is also a theoretical discipline because when we put ourselves into someone else's situation in order to understand (perceive and comprehend), we use self-consciousness that reflects theoretical self-representation.

The concept of self-consciousness as self-representation leads to the argument that ST is, as it was proposed by Gallese and Goldman (1998) or Shanton and Goldman (2010), misguided, and therefore the conception of simulation as an embodied activity must be denied. As we are self-conscious when we are able to think 'I'-thoughts, we are also mindreading when we are able to explicitly understand and predict the behaviour of another person, and that is only possible when we detach ourselves from the environment, and when we employ offline cognitive processes. Schematically:

1) Self-consciousness can be ascribed only to explicit self-representation, so we understand ourselves only by reflective (theoretical) process.

2) When we understand ourselves only by theoretical process, then in simulation we employ theoretical process as well.

3) Therefore, simulation is a kind of (offline decoupled) theoretical mechanism of mindreading.

We can keep the concept of simulation, but its notion must be different from the former one, explaining simulation as a theoretical detached cognitive activity. This step leads towards the distinction between mirroring and simulation, where mirroring is still mere activation of specific neurons being an unconscious and automatic process, whereas simulation operates with the conscious notion of the self, and as such is a theoretically decoupled cognitive process, which helps us to understand the behaviour of others by consciously realizing what we would do.

The resemblance between Theory-Theory and Simulation Theory that are both based on the same decoupled theoretical processing can provide us with new information for possible neuroimaging testing. To date there has not been any data presented that would discriminate between ST and TT (Apperly, 2008), so this favours the argument that Simulation Theory and Theory-Theory have the same brain structural and procedural basis with a slight modification, where in this modified simulation self-consciousness is involved as well, meaning that we involve 'I'-thoughts as well because I ask 'what would I do in this situation?'. The proposition is such that the same regions of the brain will be activated when the mindreading is done by mere theorizing and by simulation, with the additional activation of regions that are responsible for self-consciousness when employing 'new' simulation.

I conclude that ST is a special case of TT, where self-consciousness in its explicit self-related notion is involved, therefore this 'new' simulation is a helpful tool in mindreading, and it is a theoretically decoupled offline cognitive process as with

other mindreading processes covered by TT. This 'new' simulation is a mechanism that works differently from the one proposed by proponents of ST like Gallese and Goldman (1998) or Shanton and Goldman (2010), but the principle remains the same – I use my own experience to understand and explain the behaviour of another person.

'New' simulation as a process that involves self-related information in mindreading must be different from mere mirroring, therefore in the next chapter 'new' simulation is described as plain simulation and Gallese and Goldman's simulation is referred to as mirroring.

3.3.1 Food Ordering Situation

Goldman and Shanton (2010) present a situation where Sara is ordering her food. In being able to have her perspective one must also know her preferences, tastes, diet, etc. falling under the category of background information. In this example with food ordering I employ my self-consciousness in order to ask myself how do I pick a dish I want to order, and this situation I implement into Sara's ordering with her specific context information. I order my food the way that I consider my diet, taste preferences, price, waiter's recommendations, etc., and I consider the same when ascribing Sara a choice with the difference that I prioritize her taste preferences and her diet.

Being able to include Sara's specific details needed for ascribing her a choice, I have to detach from the environment and employ theoretical decision making because if I stay coupled, and I simulate the way that is proposed by Shanton and Goldman (2010), I would ascribe Sara my choice. Without decoupling from ones environment, one is not

able to reflect that she is not the one who is ordering, but Sara is. In mere mirroring it would proceed as following: 'Sara is ordering her food' mirroring 'ordering food' going to 'I want fish' mirroring into 'Sara wants fish'. This is simplified mirroring, and it is obvious that another detaching inference is needed in order to say 'Sara is ordering, I want fish because it is healthy, Sara might want broccoli because she likes healthy too, but does not eat fish'.

After explaining simulation as a theoretical cognitive process, the next chapter will consider TT and its theoretical character in order to compare it with this 'new' simulation and modified ST.

4 Folk psychology, Eliminativism And Theoretical Attitude

4.1 The Inadequacy Of Folk Psychology

As this paper proposes, mindreading is a theoretical activity and hence favours TT. Nevertheless, it is necessary to clarify what theoretical thinking based on theoretical attitude and a theory means in this context. In this section the purpose is to distinguish between theoretical thinking and already having a theory (particularly folk psychology).

As mentioned, TT is based on assuming that we possess a common theory that is called folk psychology. Folk psychology represents our daily practice in which we assign mental states to others in order to explain and predict their behaviour. Therefore, TT is considered as an exercise in theoretical reasoning as it uses folk psychological theory. Paul Churchland has presented an objection against folk psychology (which also affects TT) leading towards a new view called Eliminativism. According to him folk psychology is false, and therefore should be substituted by more accurate neuroscientific theory.

This passage presents the difference between theory and theoretical thinking, with the help of Churchland´s Eliminative Materialism, in order to further argue that simulation is a theoretical discipline. It also supports the necessity of theoretical thinking that is represented by TT, which also suits Churchland's objections towards folk psychology. TT is presented here in a new light where TT is not based on folk

psychology, but instead it is a theoretical discipline that represents offline cognitive processes as an opposite to online (embodied) cognitive processes.

4.2   Churchland's Eliminative Materialism

Churchland (1981) gives three main arguments why folk psychology is misguided. Firstly, folk psychology, as our capacity to ascribe mental states (especially propositional attitudes) to others, fails to explain some domains of our mental states such as sleep, memory, creativity, and so forth (Churchland, 1981). This means that we are able to explain the behaviour of someone according to ascribing beliefs or desires, but we are not able to explain her behaviour by ascribing, for example imagination. I can explain that Sara desires to open her car, but I cannot explain or understand the situation that she imagines opening her car.

Secondly, folk psychology is not a theory built by science with the help of scientific methodology, so it is highly unreliable (Churchland, 1981). Folk psychology is used in our everyday practice, and even though it bears signs of a theory, it has not been established by science using scientific methodology. Folk psychology has not developed over the years, as scientific theories do, so it does not seem to be adequate.

Thirdly and most importantly, folk psychology cannot be connected with neuroscience and other scientific notions of ourselves. For Churchland (1981) there is no evidence for inner states that are represented by folk psychology. Meaning that we cannot find by means of neuroscientific research beliefs and desires in our brain. Beliefs and desires cannot be translated into concrete brain regions activation; hence according

to Churchland (1981) folk psychology is highly misguided, and as such should be eliminated.

Churchland is correct that folk psychology as a theory should be eliminated in natural sciences[1] and especially in neuroscience because it is not a scientific theory. We are not able to prove the existence of propositional attitudes by scientific methods because we cannot read them from brain scans or brain dissections, which are so far the only possible scientific methods used in neuroscience. Neither can folk psychology explain the mechanism that stands under mindreading ability, meaning that an existence of propositional attitudes and their relations is not sufficient to explan our cognitive ability of mindreading in scientific terms.

But these objections can be considered only if we treat folk psychology as a crucial part of our mindreading ability. I propose that we can dispense with folk psychology to avoid Churchland's objection, but retain Theory-theorits. If Churchland's objections are avoided, it gives TT the possibility to be examined with scientific methods and applied in neuroscience.

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[1] Folk psychology can still be useful in the social sciences because some research is based on social behaviour that is led by propositional attitudes, but that does not affect our discussion that treats mindreading as a cognitive ability that is based on cognitive processes in the bigger scale and on neurological processes on the smaller scale.

4.3 Theoretical Thinking vs. Theory

The possible solution to Churchland's objection against folk psychology is a distinction between mental states represented mainly by propositional attitudes and their theory – the folk psychological theory, and theoretical attitude that does not have to be based on folk psychology. So we have two distinct concepts – **theoretical thinking** and **folk psychology as a theory.**

Specifically, it means that we have to separate others' propositional attitudes such as beliefs and desires and our thinking about them. I employ certain cognitive ability to 'read' Sara's behaviour in a particular situation, and this cognitive ability 'reads' from ascription of her beliefs and desires. This means that my cognitive capacity can 'read' from propositional attitudes and involve folk psychology, but it can also 'read' from different inputs without changing its status as theoretical thinking. First, we will look at different types of thinking that explain the theoretical thinking.

4.3.1 Four Attitudes

In our everyday life we are able to place ourselves into four different attitudes (Mukarovsky, 1970), where attitude means the way we access the world. The practical attitude leads us towards immediate reality, meaning that we are involved with our environment, which we want to influence. In an example of practical attitude we consider a chair as something we can sit on, or something we can rebuild or repaint.

The theoretical or cognitive attitude, on the other hand, serves us to explore our environment. We employ theoretical reasoning that helps us to learn about the reality around us. In theoretical attitude we look at the chair, and we see that it is made of wood, it is 1.3m tall, and it weighs 3 kilos, and we can calculate how to construct a similar chair. The other two attitudes are aesthetical and magical-religious, but they do not concern us here because they are not significant for social cognition.

These attitudes are bound to the object they are intended towards. We can look at one chair in many different ways. If we can look at one chair in four ways, it means that we have to be able to involve different cognitive tasks based on different cognitive processes. Practical attitudes are needed to involve online coupled embodiment, so one is able to cooperate with and influence the environment, which consists of that chair. We are constantly looking at that chair, trying to gain information on how we can use it. We can manipulate it, we can move it in order to use it differently.

Theoretical attitude is on the other hand offline decoupled because it involves theoretical knowledge and memory, which does not need immediate interaction between an agent and environment. Indeed, some primary interaction is needed, but the main cognitive process is done offline in theoretical attitude. We look at the chair at first for example to measure it (which is done in the practical attitude), but then we process all information internally (already switched into the theoretical attitude) in order to involve it into a theory about an endurance of wooden chairs for example. The next part discusses in more detail the distinction between theoretical attitude and theory itself.

4.3.2 Theory vs. Theoretical Attitude

Theory is the output of some cognitive processes, so these processes precede the theory. Meaning that we first think, and then we construct a theory. According to Popper 'scientific theories are universal statements' (Popper, 2002, p. 37). Meaning that theories are linguistic constructs that explain the world with universally applicable characteristics. 'Theories are nets cast to catch what we call 'the world': to rationalize, to explain, and to master it. We endeavour to make the mesh ever finer and finer' (Popper 2002, p. 37). For Carnap (1935) theories are meaningful statements, hence either analytic and grammatically correct or synthetic and verifiable.

In getting universal statements that form a theory, we first employ theoretical thinking that later formulates these statements. Theoretical thinking is based on theoretical attitude that represents offline decoupled cognition as an opposite to online practical attitude. Therefore, theoretical cognitive processes (meaning offline decoupled cognition) can be focused on (or intended towards) for example behavioural patterns, which are not a part of folk psychology because they do not involve propositional attitudes.

I can theoretically explain a situation without ascribing a belief, because my explanation can be based on behavioural patterns. I explain it by my knowledge from observation – because people do it that way. I can explain that a woman standing next to a car searching for something in her pocket is looking for her keys not because she has a belief the keys are in her pocket, but because we usually put our car keys in our pockets.

Therefore, we can abandon the theory of folk psychology, but we can still hold the theoretical attitude that is a characteristic of our cognitive processing. It is a different kind of thinking to the one employed in practical attitude. By this distinction folk psychology can be abandoned and Churchland's objections are satisfied, but modified TT can remain. In this sense, TT does not state that we have a theory about mental states of others, but it states that our mindreading is based on theoretical thinking, which can be distinguished from practical thinking.

Subsequently, specific features of ST will be described and discussed. 'New' simulation is jeopardized neither by mirror neuron nor by the distinction between low-level and high-level simulation, which will be shown in the next part.

5 Simulation Theory In More Detail And Its Potential Evidence

5.1 Low-level Simulation Based Mindreading

Later on Goldman in his new co-written paper, (Shanton & Goldman, 2010) distinguishes between low-level simulation-based mindreading and high-level mindreading. For low-level mindreading mirror neurons represent a base, in which an observer has the same experience of motor intentions as its target of observation. This activation of mirror neurons, Goldman and Shanton (2010) explain, are an interpersonal simulation process, which is described as an automatic, unconscious, and pre-reflective process. Activation of mirror neurons is therefore described as an automatic action that leads to understanding of motor intentions. In other words, when we observe someone's motor action like a hand grasping or eye gaze, by activation of mirror neurons we unconsciously understand these actions (Shanton & Goldman, 2010).

The mirroring system is primarily connected with motor systems in brain, but also other systems execute mirroring. These systems are neuronal areas associated with pain (Singer et al., 2004), touch (Keysers et al., 2004), happiness (Jabbi, Bastiaansen & Keysers, 2008), and disgust (Wicker et al., 2003). Low-level mirroring is therefore not only associated with motor actions, but also with emotions (which is a superior word to happiness and disgust).

Mindreading on the level of emotions leaves the question 'how much is it understanding and predicting?', in other words if we can refer to it as mindreading. Mere activation of the same regions in the brain when we feel an emotion and when we

see an emotion does not guarantee understanding. Mirroring 'she is in pain' does not cover the whole situation. Maybe Sara is in pain because she stepped on a shard of glass, but she is still looking for something in her pocket, and her pain does not describe if she is successful in finding it or not. This doubt is even more supported by its character. Low-level mirroring is unconscious, therefore there is a gap in explanation between unconscious mirroring and conscious understanding in terms of mindreading.

Mindreading is defined as an ability to explain and predict behaviour of others, and that presupposes possible verbalization of that explanation and prediction, hence it is a conscious activity. There is also a need to distinguish between low-level mirroring as an automatic action that just helps us to navigate through social interactions in the same sense as we navigate through the environment with the help of embodiment, and an action that helps us to understand intentions of others.

I propose that low-level mirroring is an ability of social cognition that helps us to cope with the social environment similar to motor processes and proprioception as position-movement sensation, but it does not constitute mindreading in terms of conscious understanding of intentions or behaviour of others.

5.2 High-level mindreading

Goldman (2009) makes a similar distinction when he includes high-level simulation. According to him mindreading activity involves a belief or judgement about a mental state. Our mirroring capacity would have to involve a judgement or attribution of a mental state, if a mirroring process was a constituent of mindreading. The process would not only mirror 'grasping an object', but also mental states like beliefs or judgements. Therefore, he concludes, mirroring is not a constituent of mindreading, but a mere causation of mindreading.

Even though Goldman (2009) is pointing in the right direction, that further inference is needed in order to refer from mere mirroring to mindreading, his proposition includes too many necessary assumptions, and is therefore more complicated than indispensable. Our mindreading ability that is conscious and could be verbalized does not necessarily have to be based on mental states, here particularly propositional attitudes. Even in understanding 'grasping an object', which can be mirrored, there is a need of a conscious mental act if we want to talk about mindreading. So there is no need to go that far for propositional attitudes, but merely showing that unconscious, automatic low-level mirroring is not enough for mindreading is sufficient.

In the example we have to distinguish when we are just mirroring that someone is looking for her keys in the pocket and mindreading when we are able to explain the whole situation. Mirroring points at 'looking for keys', but mindreading points at 'looking for keys, because she wants to open her car' in a version with propositional attitude, which is Goldman's version, or in a version that does not necessarily involve

propositional attitudes 'looking for keys, because people do that in front of their cars'.
Mindreading therefore goes beyond mere mirroring, and as such is explained through
high-level mindreading proposed by Goldman.

5.2.1 Imagination involved

High-level mindreading is also described as more complex and involving
propositional attitudes by Goldman and Shanton (2010), but they add imagination,
which is necessary for high-level mindreading because the authors consider it from the
perspective of ST. For them, to be able to simulate someone else's situation we have to
incorporate imagination as a cognitive capacity that involves memory and future
projection. Taking somebody else's perspective in order to simulate requires adoption
of the mental states of that person using as much information about her as possible.

Here we can also apply the situation presented by Shanton and Goldman (2010)
about Sara's food ordering and my anticipation of her choice. They presuppose my
knowledge of background information consisting of her taste preferences, diet, etc. A
problem arises when we try to describe a different situation to the one provided by
Shanton and Goldman. Background information is not necessarily present in every
situation involving mindreading ability.

Goldman and Shanton say that 'the attribution is based on imagination-driven
simulation' (Shanton & Goldman, 2010, p. 5), where imagination is based on
background information that is described as very specific rather than more general by
the authors. This specificity is needed in order to distinguish high-level mindreading

based on simulation, which are Goldman and Shanton proponents, from theoretically based mindreading.

'Note that the simulation process does not rely on the mind reader's appeal to psychological generalizations (e.g. a generalization about human decision making), which is a crucial part of TT. You do not need such generalizations under ST; you just need the cognitive ability to simulate decision making via pretend rather than genuine inputs' (Shanton & Goldman, 2010, p. 5). But we have to ask when we can pretend and when we have to use genuine inputs, which shape our notion of ST, and that is to be discussed further.

5.2.2 Simulation Theory Is Not A Complete Theory

Pretending can work in situations where we have enough background information, but in a situation where we lack this kind of information generalizations have to be involved, therefore these situations are missed by Shanton and Goldman's high-level simulation. By knowing background information we are able to adopt and simulate the mental states of Sara according to Shanton and Goldman. But what happens when we do not know Sara's food preferences? How can we simulate her decision making via pretend? We have to use more general information, which points towards TT.

The use of general information is even more obvious in the situation where Sara is looking for something in her pocket next to a car. We 'mindread' that she is looking for her keys in order to open the car. Even though we do not know her, and we do not know that the car is hers, we assume just from the situation itself the scenario of opening the

car with keys that should be in her pocket. We read by applying situations we have seen before, knowing that we can open a car with car keys, knowing that people usually put their car keys in their pockets. We pick the explanation that is most probable, in other words, we know what happens most of the time when similar situations take place.

Our theoretical inducing can be based on our own experience, meaning that it does not deny the possibility of some kind of simulation, more specifically the theoretical decoupled 'new' simulation. But this simulation does not apply in situations that we have never experienced ourselves before, and when we have to employ differently gained knowledge. Therefore, simulation is not excluded in all situations, it might even be very helpful in some scenarios, but it does not cover all possible situations and their solving by our mindreading, and thus it is not sufficient for an overall theory.

This is even more evident when we accept Hurley's (2008) distinction that simulation is a reuse of the cognitive processes rather than resemblance of the cognitive processes, even though this distinction is only implicit in Goldman (2009). In unknown situations we are unable to reuse cognitive processes because we have not experienced them before, so we do not possess them, and we cannot apply them in order to simulate.

Also, when Shanton and Goldman (2010) involve propositional attitudes their high-level simulation is closer to TT than to ST because in the most common TT (Gopnik & Wellman, 1992), TT is described as a theoretical activity based on the ascription of propositional attitudes, therefore ST does not stand as a complete, exhaustive theory, but can be considered as a part of TT, which means theoretical decoupled offline processing based on propositional attitudes or other objects. What do

we mean by a complete theory, and when is theory complete is the question for succeeding subchapter.

5.2.3 A Complete Theory

Here by the term complete theory, or exhaustive theory, we mean one that is verifiable and meaningful in terms of Carnap's verificationist theory (1935). Science and its scientific theories are verifiable statements, which have the condition of being meaningful. Meaningful statements are those that are analytical and also grammatically correct. Or meaningful statements can be those that are synthetic and empirically verifiable, meaning that its truth conditions are specified and those conditions can be empirically proven (Carnap, 1935). So every statement proposed by a theory that is synthetic must be empirically verifiable by some specific conditions.

If those conditions do not provide an empirical verifiability for synthetic statements, then they are not complete and sufficient. ST, in this case, has conditions that are not sufficient for its synthetic statements. This is the case where I want to predict her behaviour in a situation I have never experienced myself. Placing myself in Sara's situation does not help because I do not know what the situation involves, and therefore simulation here does not empirically verify ST because simulating seems useless.

To sum up here, low-level mindreading is not a mindreading as we define it, an ability to explain and predict behaviour of others. Low-level mindreading is an ability to navigate oneself in social situations, but it is not sufficient for mindreading. Therefore,

only high-level mindreading can be considered as a proper form of a social ability that requires the involvement of more complex cognitive mechanisms. If we accept this, the last phenomenon we have to deal with is the activation of mirror neurons, and that is a subject matter of the next chapter.

5.3 Mirror neurons

To further argue and support that ST is just a part of TT, even though both are in modified versions, it is necessary to discuss the evidence that has been brought to the subject of mindreading by the discovery of activation of mirror neurons. As has already been said, mirror neurons (located in premotor area F5 of monkeys, and Brodmann´s area 21, 40, 45 in humans) (Gallese & Goldman, 1998) are activated when action is performed and also when the same action is only observed. Mirror neurons are stimulated only in the case when there is a target object and actual physical manipulation present (Gallese & Goldman, 1998). According to Gallese and Goldman (1998) activation of mirror neurons serves as proof that our mindreading is done through the capacity to simulate, therefore activation of mirror neurons prove ST.

However, their argument is too weak. They propose:

1) that mirror neurons play the role of simulation (in terms of replicating/reusing), and

2) that this simulation (replicating/reusing) causes mindreading.

3) Hence, mirror neurons serve as evidence for simulational mindreading.

Even though we accept that mirror neurons replicate or reuse the situation because they are activated in executing an action and in mere observation of that action, it is rather problematic to accept that mirror neurons cause mindreading. As I have already argued mirroring does not necessarily mean understanding. When we mirror someone 'grasping an object', it does not involve inference of why she is doing it and what she is

going to do next – which would include understanding and predicting as features of mindreading ability. Mirroring would have to be completed with the explanation of how we come to an understanding from merely repeating or reusing.

Therefore Gallese and Goldman's argument is not valid because mirroring or as they call it simulation does not necessarily cause mindreading, which violates one of the premises making it not valid. The next concern is 'what mirror neurons actually tell us about mindreading'.

5.3.1 Mirror Neurons As Either Learned Or Innate

The next question for mirroring is if it is an acquired ability or an innate one. Being a learned or an acquired ability would place mirroring more on the side of TT. TT considers mindreading as a learned capacity of notion of causal laws that are theoretically applied in order to understand others (Gopnik & Wellman, 1992). Experiments in developmental psychology called elicited response false belief test (ER-FBT)[2], in which infants are asked about a behaviour based on a belief from another subject, do serve as proof that TT is a learned capacity that develops at the age of 4.

The test is also called the Sally-Anne test, where Anne hides a toy in front of Sally, then Sally leaves the room and Anne moves the toy and hides it again. The tested

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[2] Elicited response false belief task requires the examined child to verbally answer a question: 'Where will Sally look for her toy?' There is another monitoring option that is not required to respond verbally, but violation of expectation and anticipatory looking are employed, which is called spontaneous response false belief task (SR-FBT). During SR-FBT it has been shown that even 15-month old children do implicitly understand Sally having a false belief (Onishi & Baillargeon, 2005). It is rather controversial on what level of understanding is employed, and since mindreading was described as an ability to potentially verbally explain someone else's behaviour, this task does not fulfil this criterion and is, therefore, omitted from this paper.

child is then asked where Sally will look for her toy. None of the 4-year olds and younger were correct, whereas 57% of 4–6-year olds, and 86% of 6–9-year olds were correct in ascribing Sally's false belief (Wimmer & Perner, 1983). For Baron-Cohen et al. this test also proved the lack of such ability in autistic children, and their missing 'theory of mind' or folk psychological theory (Baron-Cohen et al., 1985).

If TT is mostly learned, and that still holds for decoupled theoretical cognitive process (because it is a more complex and complicated cognitive mechanism, which presupposes learning) either based on folk psychology or on something else, as false belief tasks suggest, and if activation of mirror neurons is learned as well, then mirror neurons could serve as part of a bigger mindreading capacity. In other words, mirroring does not necessarily imply traditional low-level simulation, even though it might be obvious at first glance. Mirroring could serve as a basis for higher capacity that uses mirroring as a source of input information, and then transfers it to higher capacities that produce inferences from such primary information.

5.3.2 Argument From Error

Rebecca Saxe (2005) uses the 'argument from error' to show that ST is mistaken and that mirror neurons are only needed in very basic actions and emotions, but the real understanding covered in predicting or explaining an inference is based on adopting an intuitive theory of mind. According to her, the fact that children at the age of 4 and below are unable to correctly identify false belief of another person implies that they do not possess a naïve theory of psychology. Simulation Theory simply lacks an

explanation why this error in young children occurs. Merely arguing that the observer used the wrong inputs is not sufficient (Saxe, 2005).

Saxe assumes that simulation is an innate ability because she presents only one possible defence of ST. This defence argues that error is caused by inaccurate inputs. Saxe does not consider a possible defence that could treat low-level simulation (mirroring) as a learned ability, and therefore is missing in young children. However, activation of mirror neurons could be acquired, which would allow ST proponents to argue that children make an error because their mirroring capacity is not fully acquired utill the age of 4, but that version would have to answer the question: 'How do we acquire direct understanding by mirroring that is a low-level coupled cognitive mechanism?'

Explaining acquisition of a complex and more demanding cognitive mechanism is more convenient than explaining the acquisition of a capacity that seems to be rather innate like mirroring. Therefore, it is parsimonious for Saxe to assume that mirroring would have to be innate in order to intuitively explain (and according to inference of the best explanation) pre-reflective direct functioning of simulation as an opposite to theoretically reflected TT. And innate mechanism does not successfully explain the error in false belief ascription by young children.

However, as it has been argued, the evidence of mirror neurons activation does not necessarily favour ST, but could also play a significant role in TT if mirroring played a role in mindreading. As Shannon Spaulding (2012, p. 526) says: 'I do not deny that, in the normal case, mirror neurons may play a role in mindreading. I deny that they are the crucial factor in explaining successful mindreading episodes.' I propose that

mirroring is a tool that works like an antenna receiving an input, but the rest that is required to formulate crucial understanding depends on capacities, which enable decoding and further work using that input (higher-level decoupled cognition), and that mirroring does not provide successful evidence for direct online simulation as it is described by Shanton and Goldman (2010).

6 Simulationist Response

Simulationists will likely respond that 'new' simulation be elevated into higher decoupled inference making cognitive process misses the importance of emotion attribution from facial expressions that is linked with 'traditional' simulation based on mirroring. Alvin I. Goldman and Sripada (2005) discuss that 'traditional' TT (and the objection also suits 'new' TT) fails to explain the 'evidence of three emotions indicating that deficits in the production (experience) of an emotion and deficit in the face-based recognition of that emotion reliably co-occur'(Goldman & Sripada, 2005, p. 195). According to them TT does not provide any suitable explanation for this paired deficit.

The response corresponds with the treatment of mirroring. 'New' simulation does not necessarily deny mirroring as a primary input, therefore emotion experiencing and emotion ascription can be based on the mirroring mechanism, but in order to be able to predict and explain behaviour of others higher inference is needed, and therefore simulation has to be treated in the same way as 'new' simulation does. Emotions ascription is just a part of the whole mindreading story, so it does not explain the story fully. We can see that Sara is happy, but that does not mean that it will tell us what food she is going to order. We can see that Sara is angrily looking for something in her pocket, which can tell us that she cannot find what she is looking for, but it still does not finish the story that she is looking for her car keys.

The same story happens when we are mindreading in an emotional state. If we are emotional, it means that our judgement is affected, so we get a different input than when in a non-emotional state. But even though the input is affected and changed, the

inference making mechanism, which I described as offline and decoupled, and which is responsible for explaining and predicting behaviour of others, remains. Therefore, in emotional situations we employ the same mindreading processing, just the output is different because we operate on a modified input.

When I am emotional, unstable and I fear something, then seeing someone looking for something in her pocket can lead towards my explanation that she is looking for a knife because she wants to stab me. I see 'looking for something in a pocket', which leads towards emotionally affected 'looking for a knife', and the next reading is 'in order to stab me'. Emotionally affected mindreading proves mindreading activity to be offline and decoupled even more than non-emotional mindreading.

In emotional situations we use more internal information than information from the environment in deriving the explanation for someone's behaviour because we cannot read from the environment that 'she is looking for a knife'. It is more probable and easier to read from the environment that 'she is looking for her car keys'. Hence, emotions affecting either of the actors in a social situation do not change the offline decoupled mindreading process, which is a higher cognitive ability that further works with input gained from online coupled cognition.

It is important to stress that emotions do not change the structure of mindreading ability, but they can change other factors in social cognition. In this paper I argued that mindreading is a higher cognitive process that is offline decoupled inference making in order to understand and explain, but social cognition consists of other lower-level processes that are most likely affected by emotions. However, these processes cannot be

defined as mindreading because mindreading, defined as an ability to understand and explain, must be a higher-level process for its own sake.

7 Conclusion

Simulation Theory proposes that mindreading is done through the process of simulation, where we put ourselves in another's situation. I argued that the kind of simulation that is proposed by ST by Gallese and Goldman (1998) is not sufficient for mindreading. Mindreading means understanding and explanation of behaviour of someone else, and therefore a process described as unconscious and automatic cannot stand up as this type of understanding, which is a more comprehensive task, but must be of a different kind.

This goes hand in hand with the concept of self-consciousness, which states that we are conscious and aware of self when we employ the ability to think 'I'-thoughts. Simulation as a mindreading capacity is possible, but only in the form of decoupled theoretical thinking, which includes the ability to think 'I'-thoughts in a reflected manner; therefore it is an inference making mechanism that involves self-related information and other information from the social environment and situation.

In the theory of Dynamic Embodied Cognition, which describes cognition as a system of two possible modes – one simple coupled environmentally oriented mechanism, and the other as a more complex decoupled inference making mechanism, simulation has to be put into the realm of the second one in order to serve as a mindreading capacity. This distinction also modifies the notion of Theory-Theory, which can abandon folk psychology, but remain theoretical in terms of decoupled offline mechanisms, and serve as a theory that can be connected with cognitive science

and neuroscience data, which is not possible with folk psychology as Churchland (1981) proposed.

This step allowed both modified theories to fulfil the demands of Dynamic Embodied Cognition, and put them into overall theory of our cognition, where they both stand in the area of more complex decoupled offline cognitive processing. As modified Simulation Theory is just a part of TT and because 'new' simulation is just a special case of theoretical decoupled processing, they should both be active in the same brain regions with the difference of activation of regions that plays a role in self-consciousness. Since ST involves self-related information or self-consciousness.

From the evidence considered earlier on ST, activation of mirror neurons have to be distinguished from simulation as mirror neurons provide us with mere reusing, whereas simulation is a more complicated process that needs additional derivation and added information, in neuroscience leading to activation of other brain regions. Nevertheless, activation of mirror neurons can serve as an input of information that is further processed into higher-order cognition, and that its function has a purpose in our whole cognition. Hopefully, understanding of cognitive processes involved in social cognition will teach us who we are, and in the cases of disease or impairment how to treat them.

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