

## Social Source Memory: How Do We Remember the People We Have Social Interaction with?

### Sosyal Kaynak Belleği: Sosyal Etkileşimde Bulduğumuz Kişileri Nasıl Hatırlıyoruz?

Pınar Bürhan Çavuşoğlu 

#### Abstract

Source memory is a type of memory that differentiates information from other information, where more contextual properties of that information are stored. Recently, researchers have shown increased attention in the effect of the information obtained from social interactions, which are a part of social life, on source memory. This paper aims to review recent researches into the underlying mechanisms of social source memory. In the first part of this review summarized the assumptions put forward about social interactions. In the next two chapters, the faces of which the behavior details are given and the social information obtained from the social cooperation game (or the prisoner's dilemma) are viewed in terms of how they affect source memory performance. There seems to be a greater tendency towards negative information in the process of monitoring the source of social information. However, it would be a simple explanation. In general, source memory seems to be a categorical remembering process. The fact that the source memory does not point to a remembering process with all the details known causes memory biases. When memory is weak, it becomes difficult to trace the source of information. In such a case, the schemas, beliefs, expectations, or stereotypes are mostly effective in referring to the source of information. For this reason, it is essential to consider source memory biases in order to prevent false information. Understanding the underlying mechanism of source memory will shed light on eyewitnesses, mainly.

**Keywords:** Memory, interpersonal relations, social interaction, bias

#### Öz

Kaynak belleği, bir bilgiyi diğer bilgilerden farklılaştıran, o bilginin daha çok bağlamsal özelliklerinin saklandığı bir bellek türüdür. Sosyal hayatın bir parçası olan sosyal etkileşimlerden elde ettiğimiz bilgilerin kaynak belleği üzerindeki etkisi son zamanlarda araştırmacıların ilgisini çekmektedir. Bu çalışmanın amacı sosyal kaynak belleğinin temel mekanizmalarını açıklamaya yönelik olan çalışmaları derlemektir. Bu derlemenin ilk bölümünde sosyal etkileşim ilgili öne sürülen varsayımlar özetlenmiştir. Sonraki iki bölümde sırasıyla davranış detayları verilen yüzlerin ve sosyal işbirliği oyunundan (tutsak ikileminden) elde edilen sosyal bilginin kaynak belleği performansını nasıl etkilediği incelenmiştir. Sosyal bilgiye ilişkin kaynağın izlenmesi sürecinde negatif bilgiye daha çok eğilim gösterildiği görülmektedir. Ancak bu basit bir açıklama olacaktır. Genel olarak, kaynak belleği kategorik bir hatırlama sürecini gösteriyor gibi görünmektedir. Kaynak belleğinin bütün detayları bilinen bir hatırlama sürecine işaret etmemesi bellek yanlışlıklarına sebep olmaktadır. Bellek bilgisinin zayıf olduğu durumlarda bilginin kaynağını takip edebilmek zorlaşır. Bu gibi bir durumda bilginin kaynağını atfederken daha çok kişinin sahip olduğu şemalar, inançlar, beklentiler veya kalıp yargılar etkili olur. Bu sebeple kaynak belleği yanlışlıklarını araştırmak yanlış bilgi atfını önlemek için önemlidir. Kaynak belleğinin temel işleyiş mekanizmasını anlamak özellikle görgü tanıklığı konusuna ışık tutacaktır.

**Anahtar sözcükler:** Bellek, kişilerarası ilişkiler, sosyal etkileşim, yanlışlık

<sup>1</sup> Süleyman Demirel University, Isparta, Turkey

✉ Pınar Bürhan Çavuşoğlu, Suleyman Demirel University, Faculty of Arts and Sciences, Dept. Psychology, Isparta, Turkey  
pinar.burhan@hotmail.com

Received: 18.01.2020 | Accepted: 05.03.2020 | Published online: 03.05.2020

**QUALIFYING** a piece of information with a situation or an event is called source monitoring (Johnson et al. 1993, Mitchell and Johnson 2009). Mitchell and Johnson (2009) emphasize that complex memories contain different features and that when these memories are remembered after a certain period, these different features provide unique information about the source of mental experience. These features include perceptual, temporal, spatial, semantic, and emotional information that differentiates that memory from other memories. Source memory is the recollection of the qualitative characteristics of episodic memories (Mitchell and Johnson 2009). Item memory and source memory form episodic memory. While item memory refers to a piece of information, the source memory contains answers to questions, such as where, how, by whom, when, or what. Source memory, in other words, is a type of memory that keeps more contextual features of information differentiating it from others. Source memory is a recollection in which context the information presented rather than what it is. The source monitoring mechanism involves retrieving details of such context (Johnson et al. 1993, Mitchell and Johnson 2009).

According to the source monitoring framework presented by Johnson et al. (1993) as an extension of the reality monitoring model, there are three types of source monitoring. These are external source monitoring, internal source monitoring, and reality source monitoring. While the external source monitoring is to distinguish externally emerging sources from each other (e.g., A or B inform me?); the internal source monitoring is to distinguish the sources from each other that emerge internally (e.g., distinguishing between thinking that A is giving this news and having said this idea). Reality source monitoring is also known as internal-external reality monitoring. Reality source monitoring is to distinguish whether the source originated internally or externally (e.g., distinguishing between A telling this story in real life and sharing it virtually).

Johnson et al. (1993) stated that the cognitive processes required to record and retrieve perceptual, contextual, semantic, and emotional information in the memory formation affect source monitoring. In order to identify the source of information, it is necessary to activate the information stored in memory along with other cognitive processes. Decision-making processes are then included in this process, and the source can be determined by attributing the current information to a source. However, in cases where the source cannot be monitored correctly, false memory can also occur (Schacter 1999, Gallo 2010). For this reason, it is crucial to investigate which factors are effective in source monitoring.

There are many methods used to measure source monitoring. In some experiments, in order to identify the source, "In which list, did you see the word? A? or B?" as can be explicitly asked. It can be measured by the following methods, which Mitchell and Johnson (2009) have included in their reviews and are frequently used in other studies:

Remember/know; context, relational or associative memory tests; memory binding tasks; inclusion/exclusion tasks; criterial recollection tasks; list discrimination; cryptomnesia (unconscious plagiarism) tasks; differentiating between presented and not presented semantically related items (DRM paradigm) and so on (Mitchell and Johnson 2009).

Source memory can consist of different types of source information (such as spatial, temporal, perceptual, or emotional). These different types of source information are

located in different areas in the medial temporal lobe (Peters et al. 2007). Besides, depending on the material of the stimulus, the source memory-related neural activity may also change partially (Duarte et al. 2011). This result may indicate that the source memory may refer to different cognitive processes depending on the different characteristics of the information (perceptual, temporal, spatial, semantic, or emotional characteristics). For this reason, it may be necessary to consider different features of information when examining the underlying cognitive mechanism of source memory.

With a similar thought, Mitchell and Johnson (2000) identify that two basic categories of knowledge were used to attribute the source in the recollection. The first of these is qualitative features of information such as perceptual and contextual features. It is mentioned that this process is faster and automatic. The second one is conceptual information, which includes social schemes, beliefs, and general information. This type of process is slower and more controlled. Similarly, Johnson et al. (1993) mentioned that source monitoring or source attribution is sometimes fast and partially unconscious; sometimes, it is more slowly, more analytically in a way more deliberative and more controlled. The fact that source memory uses different categories of information suggests that it may refer to different cognitive processes. For this reason, the aim of this review will only be to understand the basic cognitive mechanism of source memory for social information.

In studies aimed at measuring source memory, there are differences not only in the type of information used but also in experimental methods (Mitchell and Johnson 2009). Researchers working in the field of cognitive psychology have been working on the underlying cognitive mechanism of source memory for a long time. The overall aim of these studies is to uncover the general principles of source memory (for review, see Johnson 1997). These studies have contributed significantly to the current understanding of the basic cognitive structures of source memory. However, in most of the studies, answers to the questions about source memory were sought using artificial materials. This case is one of the issues that evolutionary psychologists often criticize. According to evolutionary psychologists, there should be a functional answer to why the color of the word should be remembered (Nairne and Pandeirada 2008). For example, in the study of Doerksen and Shimamura (2001), words as stimuli (Experiments 1 and 2: pleasant, unpleasant and neutral words) and the color of the words (Experiment1: yellow or blue) or the colors of the frames (Experiment2: yellow or blue) in which they are presented as the context information was asked. In the test phase, to start with, the free recall task was given, and then a source recognition was given. In the source memory test, the participants were asked to remember whether the word appearing in black on the screen was presented during the study phase. And then, if it was presented in the study phase, they were asked to remember in which color or in which frame color they were presented. Many other studies provide essential information about the cognitive functioning of the source memory. However, remembering the color of a word or the frame in which it is presented is a situation that we rarely encounter in everyday life. In the literature, apart from these artificial tasks, there are also experiments in which we are more likely to encounter social life and where social information is presented (Bell et al. 2012a, 2012b). For example, we may learn information about an unknown person about his behavior (e.g., cheating in exams), and then we may need to remember these behaviors correctly to organize our possible relationships with that person. Reviewing the findings of studies in which the performance of the source memory based on social information is examined

will contribute to the current understanding of the basic cognitive mechanism of social source memory.

The main purpose of this review is to examine how the source memory performance changes for social information obtained from social interactions. In other words, this review will examine the factors that affect social source memory. Empirical/experimental studies and literature reviews related to the purpose of the review, available on the internet up to December 2019 and in the past 15 years, have been accessed through PubMed, PsycInfo, Web of Science and Google Scholar electronic databases. The article searches were for empirical researches written in English and Turkish. There are three main titles in this review. In the first title, the assumptions in the literature to explain social interaction and social cooperation were presented in order to provide a conceptual background. In the second title, the factors that affect the source memory performance for individuals whose behavior details are given are examined. In the studies examined under this heading, faces are matched with positive, negative, or stereotypical behavioral descriptions. The participants are then asked to recognize that person and remember what his behavior is. In the third title, it was examined how the source memory performance changes depending on the positive or negative experience obtained from the game.

## **Social interaction and social cooperation**

Blau (1968) explained the basic features of social exchange for the first time in the literature. According to this explanation, it was mentioned that people organize their social interactions according to the reward they get from the interaction, and they continue to interact for these awards offered by others. It was emphasized with this social exchange theory suggests that people focus on the benefits they provide from others in their social interactions. Besides, he thinks that this reciprocity should be based on a moral basis. Individuals accept that they will adhere to an explicit or implicit social contract (Cosmides and Tooby, 2015). For example, if a person benefited from interacting with another person, they should be responsible for the benefits of that person. On the contrary, the people we help should also be liable to repay it. Social exchange can be implicit or explicit, simultaneously or sequentially, immediate or delayed (Cosmides and Tooby 2015). In other words, the social exchange is to cooperate for mutual benefit, which may vary between the two parties or involve actions that follow more complex structures (Tooby and Cosmides 1996, Cosmides and Tooby 2015).

From an evolutionary point of view, people living in a world with limited resources are in constant competition for these limited resources. However, this situation also brings some dilemmas for us who live in an environment full of social relations. Individuals can sometimes be in dilemmas about which of their actions will have different consequences during social interaction. Prisoner's Dilemma, which is frequently used in studies, is the best example of this situation. According to the scenario, two suspects were kept in a separate cell within the scope of an investigation and were questioned. If both suspects remain silent and do not admit the crime, they will receive the least amount of punishment because there is insufficient evidence for the arrest. However, if one of the suspects confesses the crime to be exempt from punishment, the suspect will be released while the other suspect will receive severe punishment. If both suspects confess, both will receive heavy punishment. In situations where it is impossible to know in what direction the other person will make a decision, it is a great dilemma to decide

what to do. Cooperation, in this case, and other similar situations, will often be a risky choice. However, we can often choose to cooperate.

Some theories have been proposed about how cooperation occurs in societies. One of these is the inclusive fitness proposed by Hamilton (1964). According to this theory, although cooperation is harmful to the cooperator, it is a behavior that has not disappeared since it brings benefits to individuals who are related to personal interests. Individuals related to personal interests that Hamilton mentioned in this theory are our relatives. However, we cooperate with individuals other than our relatives, for example, our partners or friends. In the reciprocal altruism theory, Trivers (1971) argued that cooperation is evolved for individuals with no kinship relationship. According to this theory, helping someone who needs help is continued if that person is going to do the same thing for the person who helps him. It is entirely unclear whether mutual relations can continue concerning assistance. Reciprocating a person who only shows an attitude to benefit without showing any sacrifice will affect the behavior of the person who cannot see any help from that person.

The competition simulation, created by Axelrod (1984) on the computer, is an excellent example of reciprocal altruism and cheater detection strategies. It is necessary to apply the tit-for-tat strategy to win. In this game, the player may encounter cheater or cooperative partners. The next move expected from the player is to organize according to his partner's behavior. In other words, if the player has met a cooperative partner, it is expected from the player to increase his earnings by acting cooperatively in his next match. The tit-for-tat strategy seems to be straightforward, but it can be a successful strategy to solve social dilemmas.

People do not only help relatives, friends, or business people. It is not always possible to establish a direct relationship. The indirect reciprocity theory (Nowak and Sigmund 2005) emphasizes that aid may not always be direct. According to this theory, people's reputation affects their help-seeking behavior. In other words, people have a good reputation when they help others, and this will increase their chances of getting help when they need help. On the contrary, a person who refuses to help people will have a bad reputation, and then this will make it less likely to get help. Similarly, the costly signaling perspective firmly assumes that mutual support is a sign that benefits the reputation of that person.

Since people are living creatures, it can often be said that being in cooperation is vital. Cooperation between individuals can sometimes make vital contributions to the beneficiary, and even then, this relationship can turn into mutually beneficial. If one side helps the other, expecting that it will benefit in the future, and then the other side responds, both parties win, and this relationship is maintained. However, this relationship can be disrupted if one of the parties is a cheater or a freelancer. According to Cosmides and Tooby (1992), it is vital to remember cheaters in a reciprocal relationship. A correct and good recall is required for this. In order for the relationship between individuals to bring endless benefits, it is necessary to stay away from cheaters and to carry out a good cheater detection strategy. Cosmides and Tooby (2015) define cheaters as people who accept the benefit specified by the social contract but do not fulfill the requirements of the provision of this benefit and reject reciprocal relationship. In other words, cheaters are those who intentionally violate the social contract. Distinguishing cheaters from others will help us continue to benefit. This case happens with correct recognition. It was thought that we have a memory system that enables information that will increase

survival, such as cheater detection, to be passed on to the next generations. This memory system is called adaptive memory, and this memory is thought to be necessary to produce solutions to our adaptive problems (Nairne et al. 2007).

Similarly, Cosmides and Tooby (2015) mentioned that minds are made up of cognitive modules and that each of these cognitive modules is created to find solutions to adaptive problems. Some researchers (Nairne and Pandeirada 2008, Weinstein et al. 2008) think that the episodic memory, including the source memory, reflects the cognitive survival module. Some studies support this point of view. For example, one study has shown that there is a source memory advantage for meals (Experiment 1) and cars (Experiment 2) that match with survival information (May et al. 2005). However, these cognitive modules and other concept problems, which are essential assumptions of evolutionary psychology, are criticized by the researchers for the lack of sufficient evidence (Panksepp and Panksepp 2000, Barrett and Kurzban 2006). It is also possible to explain the mechanisms underlying the survival process, such as the cheater detection module (Cosmides and Tooby, 2005) with underlying basic memory mechanisms (Weinstein et al. 2008).

The stimulus or information either attract attention perceptually with a bottom-up information processing (with perceptual striking, such as radiance and movement) or the expectations, schemes, stereotypes, goals of the perceiver with a top-down information processing. In terms of suitability, it is evaluated in terms of priority (Mather and Sutherland 2011). Mather and Sutherland (2011) argue that in the arousal-biased competition model, if the action has an intention and the information takes precedence, source memory can be developed with arousal. In other words, if it is an emotional stimulus causing arousal or information is of high priority, it strengthens source memory. If the stimulus or information is prioritized both by arousal and by the information that supports survival, it may affect strengthening source memory. It can be interpreted that if the information has a priority effect, such as protecting the person from harm or providing benefit, source memory advantage can be provided. In other words, when any information and the context of that information develops a priority motivation for remembering, it will be observed that the source memory performance will increase. Also, in the review of Erdfelder and Kroneisen (2013), it appears that the mechanisms underlying this and similar survival processes can be explained by processes that strengthen domain-general memory mechanisms.

In the literature, it appears that the reciprocal interaction, mentioned above, can be examined experimentally. It is important to remember people who benefit from reciprocal interaction but do not reciprocate, to avoid them in subsequent interactions and even to ensure that reciprocal interaction ends. Mealey et al. (1996) made the first study on this subject. In this study, the researchers presented the human faces that matched with different behavioral descriptions. The findings of this study showed that in social interaction, participants remember the freeloader, who are defined as reaping a profit but not reciprocate, better than people who are defined by more gentle behavior. Remembering the face (item memory) and the behavior details that define it (source memory) is essential both in direct and indirect interactions. For this reason, people may think that remembering cheaters is essential or prioritized than others, and maybe looking at them longer (Chiappe et al. 2004). However, how successful they are in this regard will be examined in more detail in other titles of the review.

## Social source memory: faces with behavior details

According to Reisberg (2010), the face has a different recognition system. Assuming that each face has different features, face recognition is almost like a barcode reading system. Getting to know the face of other individuals is a requirement of social life. Being able to recognize or distinguish which individual is a friend and an enemy is an indispensable necessity of social life. For this reason, most of the researchers who researched social source memory have used faces in their studies to attribute social information (Bell and Buchner 2010, 2011, Bell et al. 2012a, 2012b, 2012c, Righi et al. 2015, Bell et al. 2015). In the methods of these studies, there are generally sentences matching the faces. It is informed that these sentences express the behavior of the person appearing on the screen. For example, in the study of Bell et al. (2012a), a face presented on the screen matched with this sentence, “K. S. is a used-car dealer. He regularly sells restored crash cars as supposedly accident-free and conceals serious defects from the customers”. In studies, such behavior details are manipulated, and the effects on source memory are investigated. For example, faces are presented with disgust, pleasant (Bell and Buchner 2010), trustworthy, cheater (Bell and Buchner, 2011; Bell et al. 2012a, 2012b), offender, victim (Bell and Buchner 2011-Experiment 2) and neutral behavioral details or scenes that are emotionally compatible and incompatible (Righi et al. 2015). In most of the studies, stimuli consisting of faces, half of which are new and half of which have been seen before, are randomly presented to the participant. The participants are then asked to distinguish whether the presented face is old or new. In the source memory task for the faces selected as old, participants are asked to choose one of the options with categories related to the descriptions of behavior that match that face during the study phase (Bell and Buchner 2010, 2011, Bell et al. 2012a, 2012b, 2012c, 2015). In general, social source memory for faces with behavioral details are affected by the level of valence and arousal, the difference between stereotypes and expectations, compatibility-incompatibility in schemas and expectations, in-group or out-group biases, the fact that whether the information is self-related or not and detailed or superficial coding processes. These factors are examined in each paragraph below, in more detail, respectively.

It was shown that source memory performance is better for faces with negative behavioral descriptions than faces that match positive and neutral behavior descriptions (Bell and Buchner 2010, 2011- Experiment 2, Bell et al. 2012a, 2012b). When a face matches a negative behavioral description, then it becomes easier to remember the behavior that defines that face. In other words, the faces that match the behavior description that evoke disgust, identify someone who commits a crime, or describe someone who is cheater are better remembered with which behavior description (categorically) matches in the encoding phase when the faces are seen again in the test phase (respectively Bell and Buchner 2010, 2011- Experiment 2, Bell et al. 2012a, 2012b). However, this advantage for negative behavioral descriptions seems to emerge only when compared to positive and neutral behavioral descriptions. It was found that there was no difference in the source memory accuracy regarding the faces matching negative behavioral descriptions with different contents, such as behavior descriptions that evoke disgust and describe cheaters (Bell et al. 2012c- Experiment 1). However, it has been shown that when faces match behavior descriptions that indicate self-aggressive behavior and other-aggressive behavior, the source information is remembered more accurately on the faces

that match the descriptions that indicate other-aggressive behavior (Bell et al. 2012c-Experiment 2). These findings show that faces with negative context information are better coded, and the context can be remembered more accurately during the recognition phase. Besides, the fact that the context information, matching with the faces, expresses both negative and threatening situations provides a source memory advantage. However, the source memory advantage is not only limited to a negative context. Similarly, there is an advantage of source memory for faces that match positive contexts compared to those that match neutral contexts (Bell and Buchner 2010). Although Mattarozzi et al. (2018) did not include source memory measurement in their study, they showed that the faces matching positive and negative behavior descriptions were better remembered not only in the short-term recognition but also in the long-term recognition. The authors emphasized that it is functional to remember people who match with positive and negative behavioral descriptions, and then this regulates our next possible social interactions. However, just remembering these individuals in long-term recognition may not be functional in organizing our social interactions. It also seems necessary that we remember the actions that match them correctly to organize our relationships.

Emotional valence affects source memory, as shown in the studies mentioned in the previous paragraph. However, emotional arousal is also known to be important in encoding and retrieving information (Kensinger 2004, 2009). For this reason, it is crucial to examine the behavior descriptions by manipulating them in this context. In the study conducted by Bell and Buchner (2011), it is found that when the negative behavior description is low in terms of emotional valence and emotional arousal compared to the positive behavior description, the source memory advantage for the faces matching negative actions is eliminated. In other words, when the cheating behavior remains low in terms of emotional valence and emotional arousal from the description of trustworthy behavior, it is found that the source memory performance does not differ for the faces matching these descriptions (Bell and Buchner 2011-Experiment 1). However, it is found that there is a source memory advantage for faces that match the cheating and trustworthy behavior descriptions are considered together, compared to faces that match the neutral behavior descriptions (Bell and Buchner 2011-Experiment 1).

To evaluate the studies so far, they showed that the effect of emotional value and emotional arousal are essential in connecting the face with the behavior description. In other words, the description of a behavior evaluated at a high level in terms of emotional valence and emotional arousal may lead to better recognition in which face that behavior matches. In social interactions, we can learn positive or negative information about another person, as in the experiments mentioned, and remember this information when necessary for our next possible actions. However, apart from indirect or direct experience with a person, judgments or evaluations made from that person's appearance may also guide our actions regarding the person. Most of the time, we form these judgments about people, which is called "the first impression," and we can continue to act by being influenced by the theories we produce as a result of these judgments (Cook et al. 2003).

Studies have shown that people are influenced by the stereotypes that are obtained from people's appearance while trying to remember their behavior—in other words, remembering the source (Cassidy et al. 2012, Kleider et al. 2012, Kuhlmann et al. 2016). It has been shown that people use the clues that are obtained from people's faces automatically and reactively, especially when classifying those (Kleider et al. 2012). However, it can be said that most of the time, this classification can be wrong and indicates a bias.

For example, in the source memory test, while evaluating whether a person is involved in crime or not, it has been shown that decisions can be made based on the clues we have obtained from that person's face without having a reliable recognition (Kleider et al. 2012). Although the participants do not have proper recognition of who said a statement, they monitor the source by using stereotypes about which age group that expression made by (Kuhlmann et al. 2016). Kuhlmann et al. (2016) showed that having a good source memory may result in less stereotypical source monitoring bias in both older and younger participants. When we are asked to remember the details about a person, we seem to be influenced by the stereotypes we have created from the facial features of that person with a weak memory. While stereotypes about a person are sometimes supported, sometimes they are not. In this case, a congruity or incongruity may occur with the expectation we have created about that person. For example, a positive expectation is created about a person with a smiling facial expression. However, positive expectation sometimes is disrupted by that person's negative behavior (e.g., cheating behavior). In this case, a situation that does not match expectations occurs.

Suzuki and Suga (2010) have shown that incongruity has a positive effect on the source memory performance when the expectation, be formed with the clues obtained from the face, is violated. Besides incongruity, it has also been shown that schema-inconsistency effective on source memory performance only under high expectation conditions (Küppers and Bayen 2014). Participants show guessing bias with the scheme-consistency when their memory traces are weak (Küppers and Bayen 2014). Indeed, in some studies, it was shown that the incompatibility of the facial appearance and the description that depicts the behavior displayed by that face increases the performance of the source memory (Bell et al. 2015). In other words, there is an advantage of source memory regarding the descriptions of behavior that are inconsistent with the expectations aroused by the facial appearance. For example, it was shown that there is an advantage of source memory performance when an unpleasant facial expression matches a pleasant description of behavior, unintelligent facial expression matches the intelligent behavioral description, and a farmer's appearance matches the attorney's behavior description (Bell et al. 2015). However, Küppers and Bayen (2014) stated that the level of expectation is effective for the schema-inconsistency information in order to create an advantage of source memory. Similarly, in another study, the participants are provided to create negative and neutral expectations, and the effect of these expectations on source memory performance was examined (Kroneisen et al. 2015). In this study, the group, who thought that they would see aggressive individuals, showed a better source memory performance when individuals matched with positive behaviors than negative behaviors. It can be inferred from these studies that we have improved source memory performance in case of high expectations and negative-expectation violations. In another study, young adult participants were presented baby-faces and mature-faces in younger and older individuals matched with behavior patterns that reflect either congruent or incongruent target's facial appearance (Cassidy et al. 2012). It was shown that younger participants only have better memory performance when old faces matched with incongruent behavioral description. It can be inferred from this result that young adults may have developed a better source memory performance against incongruence of people outside their group, such as older people. This study suggests that the participants' source memory may also be affected by whether the faces encountered are from their group or not.

It was shown that the groups that the people to be remembered are also useful in the source memory (Greenstein et al. 2016, Hechler et al. 2016). Although similar results are not obtained with the study of Cassidy et al. (2012), it has been shown that there is an advantage in source memory for people who are considered to be ingroup (Greenstein et al. 2016). Similarly, this source memory advantage appears to be more robust when there is an expectation violation at the group level (Hechler et al. 2016). For example, in the study of Hechler et al. (2016), although there was a positive memory bias towards ingroup members, it has been shown to have better source memory performance for non-cooperating internal group members than for cooperative internal group members. However, in the same study, it was shown that there is no source memory advantage for cooperative or uncooperative out-group members. In this study, it was shown that positive expectation violation affects the source memory, but this effect is limited for the ingroup members. Since we are more likely to have relationships with ingroup members in the future, we may be showing better source memory performance to expectation violation. Some studies have shown that self-reference has a positive effect on source memory (Leshikar and Duarte 2012, Genon et al. 2014, Durbin et al. 2017). The findings suggest that people who are ingroup members that are more likely to be evaluated self-related or ingroup members will reveal the advantage of source memory.

Kroneisen (2017) also thought that self-related processes might affect the source memory. In this study, behavioral descriptions were arranged in a way that is related and not related to the participants before the experiment. During the study phase, these behavioral descriptions were matched with faces and presented to the participants (Kroneisen 2017). In the study, it was shown that the source memory accuracy is higher for the faces that match the cheating descriptions that are more related to students. However, the fact that there are no differences in the source memory accuracy between the faces matched with cheating and trustworthy behavior descriptions that are related to students show that the self-related processes play an essential role in the source memory performance. Kroneisen (2017) demonstrated that if the context of the face is essential and relevant for the person, there may be an advantage of a source memory for that face.

In the studies, as mentioned above, source memory was measured categorically. These studies do not answer what is remembered exactly when monitoring the source. However, in a study (Bell et al. 2012a), participants are asked to remember the details of the behavior description that matches the face as much as possible and write those details. In the study, the participants were shown to be entirely wrong in remembering the details of the behavior descriptions that match the faces. This case is the same in all three behavior descriptions (cheating, trustworthiness, and neutral). That is, almost little is remembered about these behavioral descriptions that match with the face. In other words, although the cheating behavior of the face is intense, neither cheating nor trustworthiness nor neutral behavior details are well remembered. Therefore, the researchers showed that when the source memory is separated as partial and specific, in all three conditions, specific source memory advantage does not differ from each other while there is a partial source memory advantage for cheaters (Bell et al., 2012a). The fact that the participants do not remember almost anything about the content of face-matching behavior shows that we encode gist of behavior details better than the details of the behavior content and make a categorical remembering during the recognition. Bell et al. (2012b- Experiment 4) thought that experiencing an incompatibility between the face and behavior description might help us to code and remember the details of the behavior

in more detail. In this study, participants were supported by giving clues to remember the behavioral description in more detail. Emotional mismatch in facial and behavioral descriptions among participants supported by the clue not only increased the performance of general source memory but also increased specific details of the behavior (Bell et al. 2012b- Experiment 4). In other words, it seems that emotional mismatches also helped increase the performance of specific source memory. Besides, the answer to the question of whether it is accompanied by a conscious remembering in the evaluation of social source memory measurement or whether it is based on a feeling of familiarity without a conscious remembering is missing. This question can be answered by combining the remember/know paradigm and the source memory task. The issue of how factors affecting the perception or contextual details in social information will affect the process of recollection based on a conscious remembering or familiarity is lacking, and studies on this subject need to be done.

## **Social source memory in social cooperation game**

Cooperation and conflicts are part of social life. In these kinds of interactions, how we are involved in the process of recalling people is being interested in researchers. Source memory has been shown to be important both to find people we can collaborate with and to stay away from cheaters (Bell et al. 2017b). In the cheater detection module, a specialized system is mentioned to detect cheaters (Cosmides and Tooby 2005). However, in order to distinguish between cheaters and cooperatives, we need to remember not only the cheaters but also the information about the cooperatives.

In order to create a real social interaction, researchers measured source memory performance using a social cooperation game, also called the prisoner's dilemma game. In this game, participants gain profit or loss from social interaction. For example, in the study of Bell et al. (2012b- Experiment1 and Experiment2), participants are given a deposit at the beginning of the game. They are required to invest in a joint business with the partners are seen on the screen in order to increase their money. If the partner is a collaborator, he/she invests at least as much as the participant; if the partner is cheater, he/she invests no money into a joint business. One-third of the total investment is awarded. The total investment and award are added. The total sum eventually is divided into two and added to the account of both parties. For example, it is assumed that a participant is given a starting deposit of 500 points at the start of the game. Participants require to invest either 75 or 150 points. The participant invests 150 points, and if the partner is a collaborator, he/she will invest as much as the participant. In this case, the total investment will be 300 points, and the system will add one-third of the total investment (100 points) to the total sum (400 points) and divide it into two (200 points). In other words, in the last case, the participant and his/her partner gained 200 points of mutual gain for an investment of 150 points. However, if the partner is a cheater, he/she would have not invested. For example, assuming that the participant meets a partner who will never invest in return for the investment of 150 points. Total investment (150 points) will be 200 points with an award that is one-third of total investment (50 points), and half of this total sum will be taken into account of interactants. In other words, the cheating partner will gain 100 points without any investment. The participant will lose by getting 100 points against his 150 points investment. After the game is over, the test phase starts with instructions. Participants are asked to remember whether the face is old

or new. Half of the faces presented on the screen are seen as interactant during games and half of them are new. Following the old answer, participants are asked if they are cheating or trustworthy by considering the investment strategies of their partners made in the game.

In the previous title, it was mentioned that the expectation violation affected the source memory in most of the studies. It has been investigated whether a similar effect is in a state of social cooperation game. It was found that source memory advantage was shown against the information that did not match expectations in the social cooperation game (Bell et al. 2012b). In this study, the faces of the partners that are presented as interactant in the game consist of likable or unlikable (Bell et al. 2012b- Experiment1), and smiling or angry-looking (Bell et al. 2012b-Experiment2) facial photographs. These partners are specified to either cheater or cooperative condition, with the gender of the half being female and the gender of the half being male. Participants who have positive expectations for likable faces (Bell et al. 2012b- Experiment1) and smiling looking faces (Bell et al. 2012b- Experiment2) remember their behavior better when they are cheater (Bell et al. 2012b-Experiment1 and Experiment2). The fact that the participants invest more money into a joint business with smiling and likable partners can be an indication that participants have a positive expectation for these partners (Bell et al. 2012b, Giang et al. 2012). Similarly, this situation is supported by the fact that the participants show more cooperation bias towards smiling partners than the partners with angry facial expressions (Bell et al. 2017b). It can be interpreted that a person who looks smiling or likable supports a cooperative situation more. In other words, the formation of a positive expectation with the clue obtained from the face supports a cooperative situation.

When the expectations are violated, the details about people seem to be more permanent in memory. In other words, when we encounter behaviors that are incompatible with expectations, the source memory performance for these unexpected behavior labels is better. If it is examined in more detail, in a study, it was shown that the source memory performance was positively affected by the faces who created positive expectations such as looking smiling and likable behave differently. It shows that in case of a positive expectation violation, face, and behavioral details result in a better connection compared to the negative expectation violation. In other words, even if we experience the positive behavioral characteristics of those with whom we have negative expectations, there is no source memory advantage to the person who exhibits positive behavior. Similarly, in another study, although the advantage of source memory was not seen for cooperatives who looked untrustworthy, it was shown that the source memory performance was better for trustworthy looking cheaters (Mieth et al. 2016). It appears that there is an advantage of source memory in cases where the positive expectation is violated in a social cooperation game. This source memory advantage is revealed even if the cognitive load is added to tasks (Mieth et al. 2016a- Experiment2 and Experiment3).

Violation of positive expectations seems to be a priority for participants. For example, the effect of trustworthy looking faces on punishment in the social cooperation game was examined by Mieth et al. (2016b). Mieth et al. (2016b) have shown that participants spend more money to punish partners, especially when they violate participants' positive expectations. Participants more likely to cooperate with partners with a likable or smiling face, but if their partners act as a cheater, this creates an opportunity for moral punishment (Mieth et al. 2016b). A similar effect was also shown for the female gender. Participants are biased to say that their female partners are more cooperatives than the males in

the social cooperation game (Mieth et al. 2017). However, if female partners are cheater, the participants have been shown to spend more money to punish those (Mieth et al. 2017). These studies support that positive expectation violation may be a priority information. When the participants encounter a partner who will create a positive expectation in the game, they will suffer more monetary loss because they probably invest more money for joint business. The magnitude of monetary loss probably affects in which situations people are better remembered.

In a recent study, it has been shown that the performance of source memory for cooperative and cheater faces has not changed in the social cooperation game (Schaper et al. 2019). This result seems to be in contradiction with the findings of the experiments with faces matching various behavior descriptions in the previous title. However, the presence of a monetary motivation in social cooperation games creates an incentive for subsequent recognition, which may affect source memory performance. In other words, in case of profit or loss, in order to maximize our profit, there is a need to be remembered the cheaters and cooperatives equally well, as in “tit-for-tat strategy.” As assumed in the cheater detection module (Cosmides and Tooby 2005), it appears that there is no specialized system only for cheaters. As a matter of fact, in the study of Schaper et al. (2019), participants' willingness to cooperate was affected by the behavior of the partners they experienced in the game. Also, it has been shown that there is a relationship between source memory performance and distinguishing between cooperatives and cheaters. In other words, participants with good source memory cooperated with more cooperative partners and fewer cheater partners.

Studies should be evaluated by considering the encouraging nature of the social cooperation game. Also, different effects should not be ignored in the cooperative nature of people in social interaction. For example, factors such as cooperating in a group (Zappa 2012) and the similarity of the person with whom we cooperate (Giang et al. 2012) may affect our behavior and, therefore, how we are in the process of recognition. It can be thought that we are helping individuals like ourselves more, or we are in a more positive expectation. However, a study found that there is no source memory advantage for physically similar faces to participants (Giang et al. 2012). Also, there is no response bias that partners looked like participants, are not seen as cooperatives (Giang et al. 2012). In the study of Giang et al. (2012), preparing faces similar to participants as stimuli is entirely artificial. Physically similar parts of the face may not successfully manipulate the level of similarity of one person with another. For example, displaying a similar attitude to an event or situation with the other person may have more effect than the physical similarity of the face.

In group interactions, cooperatives were shown to be better remembered than cheaters (Zappa 2012). It seems that such factors are important in explaining the basic cognitive mechanisms of social source memory. Apart from these, individual differences are another issue to be mentioned. It is thought that social values, which are frequently used in studies investigating individual differences and form attitudes in social dilemmas, determine the behavior of people (Van Lange and Kuhlman 1994, Van Lange et al. 1997; Balliet et al., 2009). It can be thought that the social value orientations of individuals have an impact on both cooperative behaviors in the social cooperation game and the memory processes related to the partners.

## Discussion

The empirical studies summarized in the review indicate that it may be more inclined to negative information in the process of bringing back the source of social information (Bell and Buchner 2011, Bell et al. 2012b). However, it would be a simple explanation to say that the ability to perform well in bringing back the source of information develops depending on whether it is only negative or not. Bell and Bucher (2012a) mentioned that the advantage of source memory is observed mainly in cases where the information is threatened (Bell et al. 2012c) and may have negative consequences for the observer or the participants. However, even though the information is not harmful or threatening, the advantage of source memory has been shown in other studies (e.g., Bell and Buchner 2010, Bell et al. 2015, Kroneisen 2017). For this reason, it seems that the advantage of source memory does not emerge in only negative or threatening information. Emotional valence and emotional arousal are also seen to be effective and important on source memory when evaluating faces with behavior descriptions (Bell and Buchner, 2011).

Remembering the category that we attribute to that person requires less cognitive sources to be used than remembering specific details of a person (Bell et al. 2012a). This case seems to indicate a strategy that adopts a categorical recognition process whose behavior details are mostly incomplete or to reduce the memory load. It has been shown that source memory does not get involved in a vivid recollection without having complete source information and may reflect a vague memory (Bell et al. 2012a).

As mentioned by Tanyaş and Mısırlısoy (2018), stereotypes and schemas have substantial effects on source memory when the memory trace is weak. It is shown that while monitoring the source in the studies, we are primarily affected by our stereotypes (Cassidy et al. 2012, Kleider et al. 2012, Kuhlmann et al. 2016) and situations where the expectation is violated (Bell et al. 201, Küppers and Bayen 2014, Suzuki and Sugo 2010). In order to see the advantage of source memory in case of expectation violation, it seems that both the level of expectation should be high (Küppers and Bayen 2014) and expectation violation in a negative manner (Bell et al. 2015, Kroneisen et al. 2015). However, in the case of a negative expectation violation, the advantage of source memory has not always been shown in studies. On the contrary, in other studies, it has been demonstrated that positive expectation creates an advantage of source memory, both in experiments with faces with behavior descriptions (Hechler et al. 2016) and in social cooperation games (Bell et al. 2012b, Mieth et al. 2016). Conflicting information in the literature about how the source memory will change in case of an expectation violation reveals the need for further study on this subject.

In cases where memory traces are weak, participants tend to guess while monitoring the source. As studies have shown, stereotypes in incomplete source information seem to have a significant impact on source monitoring (Cassidy et al. 2012, Kleider et al. 2012, Kuhlmann et al. 2016). Therefore, when people cannot remember the source information, they show a bias based on their previous knowledge or impression (e.g., Bell et al. 2015). From this point of view, it is essential to use a model in which memory bias and guessing bias can be distinguished. "Multinomial Model for Source Monitoring (Bayen et al. 1996)" has been used in the vast majority of social source memory studies. This model may have to be preferred, especially in the analysis of source memory studies, because biases should be distinguished and clarified.

## Conclusion

Understanding the basic cognitive mechanism of the source memory will shed light on the subject of the eyewitness. Eyewitness testimony is frequently used when judging people who have doubts about committing a crime. However, eyewitness errors are frequently encountered in these trials (Safer et al. 2016). When a witness is asked to remember details of the crime, his/her memory of crime is unconsciously restructured (Wise et al. 2009). In this restructuring process, it is especially important to prevent false attributions to which factors the source memory is affected by. For this purpose, this review contributes to things to consider when applying to eyewitness testimony. As the studies included in the review show, source memory is affected by expectation, attitude, emotion, and stereotypes. The information and context that are changed in terms of emotional valence and emotional arousal affect the source memory. In cases where memory trace is weak, it becomes difficult to follow the source of information. In such a case, when attributing the source of information, the schemas, beliefs, expectations, and stereotypes are more effective. For this reason, witnesses may fill the gaps in their memory with details of the event they witnessed with their schemas, beliefs, expectations, emotions, and stereotypes. For this reason, it is essential to investigate what kind of biases are more effective in the source memory to prevent misinformation.

## References

- Axelrod R (1984) *The Evolution of Cooperation*. New York, Basic Books.
- Balliet D, Parks C, Joireman J (2009) Social value orientation and cooperation in social dilemmas: A meta-analysis. *Group Process Intergroup Relat*, 12:533–547.
- Barrett HC, Kurzban R (2006) Modularity in cognition: framing the debate. *Psychol Rev*, 113:628–647.
- Bayen UJ, Murnane, K, Erdfelder E (1996) Source discrimination, item detection, and multinomial models of source monitoring. *J Exp Psychol Learn Mem Cogn*, 22:197-215.
- Bell R, Buchner A (2010) Valence modulates source memory for faces. *Mem Cognit*, 38:29–41.
- Bell R, Buchner A (2011) Source memory for faces is determined by their emotional evaluation. *Emotion*, 11:249–261.
- Bell R, Buchner A, Erdfelder E, Giang T, Schain C, Riether N (2012a) How specific is source memory for faces of cheaters? Evidence for categorical emotional tagging. *J Exp Psychol Learn Mem Cogn*, 38:457–472.
- Bell R, Buchner A, Kroneisen M, Giang T (2012b) On the flexibility of social source memory: A test of the emotional incongruity hypothesis. *J Exp Psychol Learn Mem Cogn*, 38:1512–1529.
- Bell R, Giang T, Buchner A (2012c) Partial and specific source memory for faces associated to other- and self-relevant negative contexts. *Cogn Emot*, 26:1036–1055.
- Bell R, Mieth L, Buchner A (2015) Appearance-based first impressions and person memory. *J Exp Psychol Learn Mem Cogn*, 41:456–472.
- Bell R, Mieth L, Buchner A (2017b) Separating conditional and unconditional cooperation in a sequential Prisoner's Dilemma game. *PLoS One*, 12:e0187952.
- Blau PM (1968) Interaction: Social exchange. In *International encyclopedia of the social sciences*, Vol 7 (Ed DL Sills):452-457. New York, Macmillan/Free Press.
- Buchner A, Bell R., Mehl B, Musch J (2009) No enhanced recognition memory, but better source memory for faces of cheaters. *Evol Hum Behav*, 30:212-224.
- Cassidy BS, Zebrowitz LA, Gutchess AH (2012) Appearance-based inferences bias source memory. *Mem Cognit*, 40:1214-1224.

- Chiappe DL, Brown A, Dow B (2004) Cheaters are looked at longer and remember better than cooperators in social exchange situations. *Evol Psychol*, 2:108-120.
- Cook GI, Marsh RL, Hicks JL (2003) Halo and devil effects demonstrate valenced-based influences on source-monitoring decisions. *Conscious Cogn*, 12:257–278.
- Cosmides L, Tooby J (1992) Cognitive adaptations for social exchange. In *The adapted mind* (Eds J Barkow, L Cosmides, J Tooby):163–228. New York, Oxford University Press.
- Cosmides L, Tooby J (2015) Adaptations for reasoning about social exchange. In *The Handbook of Evolutionary Psychology*, 2nd ed. (Ed D Buss):625–668. Hoboken, NJ, Wiley.
- Doerksen S, Shimamura AP (2001) Source memory enhancement for emotional words. *Emotion*, 1:5-11.
- Duarte A, Henson RN, Graham KS (2011) Stimulus content and the neural correlates of source memory. *Brain Res*, 1373:110-123.
- Durbin KA, Mitchell KJ, Johnson MK (2017) Source memory that encoding was self-referential: the influence of stimulus characteristics. *Memory*, 25:1191-1200.
- Erdfelder E, Kroneisen M (2014) Proximate cognitive mechanisms underlying the survival processing effect. In *What is Adaptive About Adaptive Memory?* (Eds BL Schwartz, ML Howe, MP Toggia, H Otgaar):160-200. New York, Oxford University Press.
- Gallo DA (2010) False memories and fantastic beliefs: 15 years of the DRM illusion. *Mem Cognit*, 38:833-848.
- Genon S, Bahri MA, Collette F, Angel L, D'Argembeau A, Clarys D et al. (2014). Cognitive and neuroimaging evidence of impaired interaction between self and memory in Alzheimer's disease. *Cortex*, 51:11–24.
- Giang T, Bell R, Buchner A (2012) Does facial resemblance enhance cooperation? *PLoS One*, 7:e47809.
- Greenstein M, Franklin N, Klug J (2016) In-group versus out-group source memory: Spontaneously inferred features can both facilitate and impair source memory. *Exp Psychol*, 63:150-158.
- Hamilton WD (1964) The genetical evolution of social behaviour II. *J Theor Biol*, 7(1):17–52.
- Hechler S, Neyer FJ, Kessler T (2016) The infamous among us: Enhanced reputational memory for uncooperative ingroup members. *Cognition*, 157:1-13.
- Johnson MK (1997) Source monitoring and memory distortion. *Philos Trans R Soc Lond B Biol Sci.*, 352:1733-1745.
- Johnson MK, Hashtroudi S, Lindsay DS (1993) Source monitoring. *Psychol Bull*, 114:3-28.
- Kensinger EA (2004) Remembering emotional experiences: The contribution of valence and arousal. *Rev Neurosci*, 15:241-252.
- Kensinger EA (2009) How emotion affects older adults' memories for event details. *Memory*, 17:208–219.
- Kleider HM, Cavrak SE, Knuycky LR (2012) Looking like a criminal: Stereotypical black facial features promote face source memory error. *Mem Cognit*, 40:1200-1213.
- Kroneisen M (2017) Is he important to me? Source memory advantage for personally relevant cheaters. *Psychon Bull Rev*, 25:1129-1137.
- Kroneisen M, Woehle L, Rausch LS (2015) Expectancy effects in source memory: How moving to a bad neighborhood can change your memory. *Psychon Bull Rev*, 22:179-189.
- Kuhlmann BG, Bayen UJ, Meuser K, Kornadt AE (2016) The impact of age stereotypes on source monitoring in younger and older adults. *Psychol Aging*, 31:875-889.
- Küppers V, Bayen UJ (2014) Inconsistency effects in source memory and compensatory schema-consistent guessing. *Q J Exp Psychol*, 67:2042-2059.
- Leshikar ED, Duarte A (2012) Medial prefrontal cortex supports source memory accuracy for self-referenced items. *Soc Neurosci*, 7:126–145.
- Mather M, Sutherland MR (2011) Arousal-biased competition in perception and memory. *Perspect Psychol Sci*, 6:114-133.
- Mattarozzi K, Colonnello V, Russo PM, Todorov A (2018) Person information facilitates memory for face identity. *Psychol Res*, 83:181-1824.

- May CP, Rahhal T, Berry EM, Leighton EA (2005) Aging, source memory, and emotion. *Psychol Aging*, 20:571–578.
- Mealey L, Daood C, Krage M (1996) Enhanced memory for faces of cheaters. *Ethol Sociobiol*, 17:119-128.
- Meyer MM, Bell R, Buchner A (2015) Remembering the snake in the grass: Threat enhances recognition but not source memory. *Emotion*, 15:721–730.
- Mieth L, Bell R, Buchner A (2016a) Cognitive load does not affect the behavioral and cognitive foundations of social cooperation. *Front Psychol*, 7:1312.
- Mieth L, Bell R, Buchner A (2016b) Facial likability and smiling enhance cooperation, but have no direct effect on moralistic punishment. *Exp Psychol*, 63:263-277.
- Mieth L, Buchner A, Bell R (2017) Effects of gender on costly punishment: Gender and punishment. *J Behav Decis Mak*, 30:899-912.
- Mitchell KJ, Johnson MK (2000) Source Monitoring: Attributing mental experiences. In *The Oxford Handbook of Memory* (Eds E Tulving, F Craik):179–195. New York, Oxford University Press.
- Mitchell KJ, Johnson MK (2009) Source monitoring 15 years later: What have we learned from fMRI about the neural mechanisms of source memory? *Psychol Bull*, 135:638–677.
- Nairne JS, Pandeirada JNS (2008) Adaptive memory: Remembering with a stone-age brain. *Curr Dir Psychol Sci*, 17:239-243.
- Nairne JS, Thompson SR, Pandeirada JNS (2007) Adaptive memory: Survival processing enhances retention. *J Exp Psychol Learn Mem Cogn*, 33:263–273.
- Nowak MA, Sigmund K (2005) Evolution of indirect reciprocity. *Nature*, 437:1291–1298.
- Panksepp J, Panksepp JB (2000) The seven sins of evolutionary psychology. *Evolution and Cognition*, 6:108-131.
- Peters J, Koch B, Schwarz M, Daum I (2007) Domain-specific impairment of source memory following a right posterior medial temporal lobe lesion. *Hippocampus*, 17:505-509.
- Reisberg D (2010). *Cognition: Exploring the Science of the Mind*, 4th ed. New York, WW Norton.
- Righi S, Gronchi G, Marzi T, Rebai M, Viggiano MP (2015) You are that smiling guy I met at the party! Socially positive signals foster memory for identities and contexts. *Acta Psychol (Amst)*, 159:1–7.
- Safer MA, Murphy RP, Wise RA, Bussey L, Millett C, Holfeld B (2016) Educating jurors about eyewitness testimony in criminal cases with circumstantial and forensic evidence. *Int J Law Psychiatry*. 47:86-92.
- Schacter DL (1999) The seven sins of memory: Insights from psychology and cognitive neuroscience. *Am Psychol*, 54:182-203.
- Schaper ML, Mieth L, Bell R (2019) Adaptive memory: Source memory is positively associated with adaptive social decision making. *Cognition*, 186:7-14.
- Suzuki A, Suga S (2010). Enhanced memory for the wolf in sheep's clothing: Facial trustworthiness modulates face-trait associative memory. *Cognition*, 117:224-229.
- Tanyaş H, Mısırlısoy M (2018) Kaynak belleği: Derleme çalışması. *DTCF Dergisi*, 58:1436-1457.
- Tooby J, Cosmides L (1996) Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. *Proc Br Acad*, 88:119–143.
- Trivers R (1971) The evolution of reciprocal altruism. *Q R Biol*, 46:35–57.
- Van Lange PAM, Kuhlman DM (1994) Social value orientations and impressions of partner's honesty and intelligence: A test of the might versus morality effect. *J Pers Soc Psychol*, 67:126-141.
- Van Lange PAM, Otten W, Joireman JA (1997) Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *J Pers Soc Psychol*, 73:733–746.
- Wise RA, Fishman CS, Safer MA (2009) How to analyze the accuracy of eyewitness testimony in a criminal case. *Conn L Rev*, 42(2):435-513.
- Zappa N (2012) Facial recognition of cheaters and cooperators in group projects. *Sentience*, 6:22–26.

**Authors Contributions:** The author attest that she has made an important scientific contribution to the study and has assisted with the drafting or revising of the manuscript.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** No conflict of interest was declared by the author.

**Financial Disclosure:** The author declared that this study has received no financial support.