

Emotional contagion within an integrated framework of priming and dual process theory

Dr. Deepa Marina Rasquinha*
Department of Clinical Psychology
Manipal College of Health Professions
Udupi, Karnataka
deepa.rasquinha@manipal.edu

Ms. Shalini Siby**
Department of Clinical Psychology
Manipal College of Health Professions
Udupi, Karnataka
alice.siby12@gmail.com

*Corresponding Author: Dr. Deepa Marina Rasquinha
**First Author: Ms. Shalini Siby

Abstract

Emotional contagion has long deviated from its original conceptualisation as a simple, automatic transfer of emotion and has come to encompass the influences of social cues and environments as well. Investigations have provided evidence for processes of social appraisal that occur after 'catching' a sender's emotion and conscious decision-making to imitate that same emotion to the receiver's social advantage. A very recent line of research has built on two top-down social processing models of emotional mimicry and by extension, emotional contagion, to view emotional contagion in a new light by consolidating modern research in priming with the long-standing theories of dual processing. Their proposal is unique in the way that they propound the working of a compensatory automaticity mechanism that shapes the occurrence of emotional contagion. It is rooted in the flexible correction model from social priming studies, where social affiliation goals can modulate emotional mimicry by directing the facilitation or inhibition of mirror neuron activity in the brain, which in turn is what gives rise to emotional mimicry. The dual processing perspective is attached to support this claim of an automatic correction process by classifying it as an automatic outcome of the interaction between conscious reflective processing and unconscious impulsive processing. This unification of data from the three aforementioned fields of study offers a very optimistic platform for future exploration and enquiry in research themes devoted to analysing the role of social context in the underlying mechanisms of affective linkage or emotional contagion.

Keywords: emotional contagion, emotional mimicry, social appraisal, flexible correction model, dual processing, reflective impulsive model

I.

Introduction

A notion pioneered by Hatfield et al. (1994), emotional contagion was initially portrayed in terms of patterns similar to germ and disease contagion, and its feature of automaticity was explained by way of unintentional emotional mimicry by a receiver and consequent afferent feedback that elicits that same affective state in the receiver. Contradicting research emerged from this paradigm of primitive emotional contagion, which argued that a change in the receiver's emotions need not necessarily be prompted by the automatic simulation of a specific emotional expression but by some auxiliary simultaneous mechanism such as social appraisal, by which the receiver integrates social cues derived from the sender's display into his/her own evaluation of the situation and consequently, how they feel about the same (Bruder, Fischer, & Manstead, 2014; Gump & Kulik, 1997; Parkinson, 2011). As demonstrated by such research, emotional contagion has been observed to be governed by social appraisal at a less automatic level of processing which differs from the primitive emotional contagion model in terms of engagement of conscious control.

The trajectory of the research publication highlighted in this chapter aimed to: exhibit the moderating role of social context in emotional contagion as a mechanism of emotional mimicry; explain the top-down social control of receiver reactions to sender emotional expressions using the correction hypothesis in priming data; analyse whether a similar interpretation may be applied to more controlled processes such as social appraisal-driven-emotional contagion; and explore how the social factors influencing emotional contagion may be construed within a foundation of dual processing.

The literature review of this chosen article by Wróbel & Imbir (2019) summarised the research conclusions for the automaticity of emotional mimicry and afferent feedback by the Hatfield model (1994) of primitive emotional contagion which is associated with the perception-action model of empathy (Preston & de Waal, 2002), where emotional mimicry, one of the bases of empathy, is facilitated by the mirror neuron system of the brain that extends a direct automatic link between perception (i.e., the sender's emotional display) and action (i.e., the receiver's imitation of this display; Catmur, Walsh, & Heyes, 2009). Plenty of data supports the claim that the mirror neuron system (MNS) sparks independent of the receiver's intentions since its ability to match observed and executed actions is contingent on automatically triggered learned associations. A far more calculated and controlled dimension of processing that occurs in emotional contagion activated by social appraisal is supported by studies affirming that in some unusual or uncertain situations, the receiver may deliberately pursue emotional cues from others to gauge the emotional gravity or meaning of these situations (Bruder et al., 2014); but when there is no demand for detailed processing, this social appraisal may be carried out with far less cognitive effort (Bruder et al., 2014; Parkinson, 2011). This is supported by findings that indicate people are often unaware that their evaluations of stimuli and events are influenced by another individual's emotional expressions (Bayliss, Frischen, Fenske, and Tipper, 2007). New proof is now gathering for the highly selective nature of the processes underlying emotional contagion, i.e., the propensity of the receiver to react to a sender's emotional display with a congruent emotional assertion that may be regulated by several contextual elements like similarity or dissimilarity of the sender; familiarity or unfamiliarity; intent of competition or cooperation; or membership in an in-group or out-group (Van der Schalk et al., 2011; Weisbuch & Ambady, 2008; Weyers, Mühlberger, Kund, Hess, & Pauli, 2009; Wróbel & Królewski, 2017). In such an instance, the pleasant, smiling face of a likeable sender may conjure a congruent emotional display while the frowning face of a disliked sender may set off an incongruent emotional reaction (Likowski, Mühlberger, Seibt, Pauli, & Weyers, 2008; Wróbel & Królewski, 2017). The likelihood of congruent emotional reactions climbs in affiliative social contexts whereas the same may be diminished or obstructed in non-affiliative social settings, or result in incongruent emotional reactions—implying that individuals are not motivated to mimic emotions if they do not have the slightest reason to associate with the sender (Fischer & Hess, 2013, 2017). A limitation of the literature referred to and reviewed is that it mostly centres around emotional mimicry more specifically than emotional contagion, but the authors accept emotional contagion as a mechanism of emotional mimicry, and there is also evidence that emotional contagion may be modulated by the same social factors as in emotional mimicry (Epstude & Mussweiler, 2009; Wróbel & Królewski, 2017).

The focus of the featured paper was how the processes of automatic emotional mimicry/contagion operating beyond conscious awareness may be commanded by the receiver's goals or attitudes toward the sender. The authors applied the contextual

model of emotional mimicry (Fischer & Hess, 2017; Hess & Fischer, 2013, 2014) and the social top-down response-modulation (STORM) theory (Wang & Hamilton, 2012) to demonstrate that following the activation of emotional mimicry processes, social cues can influence controlled top-down processes to either permit emotional mimicry/contagion or trigger the social modulation of the same by correcting its automatic action depending on whether the emotional impersonation is desirable for the receiver's social benefit or not. This correction process is affiliated with social priming literature that could conceptualise emotional mimicry/contagion as a special type of priming wherein the receiver's emotional expression is either assimilated with or contrasted away from the sender's. This is in line with the flexible correction model (Chien et al., 2014; Wegener & Petty, 1995, 1997) that claims assimilation and contrast to transpire either by default, uncorrected effects, or when the individual tries to evade the bias of the prime (corrected effects) where the former takes little conscious focus and the latter requires a more controlled approach. Studies have clearly corroborated the existence of a compensatory automaticity mechanism that comes into play in settings where controlled processes are hampered (Glaser & Banaji, 1999; Maddux, Barden, Brewer, & Petty, 2005) which the authors postulate may be supervised by social affiliation goals mentioned in the two social top-down processing models considered here. The dual process theory is connected to this explanatory framework so as to emphasise the role of impulsive and reflective processing in emotional convergence/contagion. On one hand, top-down social processes require reflective processing, and hence, the correction process should be controlled and conscious. However, the authors maintain that conscious control of actions that are not consciously available is questionable and instead proffer automatic correction as the go-to mechanism which may be viewed as a spontaneous outcome of the dynamic interaction between impulsive and reflective mental operations in the context of social interpretations. The reflective-impulsive model (Strack & Deutsch, 2004) accounts for a process called propositional categorisation that exerts an automatic top-down influence on impulsive processing which is responsible for the inadvertent correction that takes place in emotional mimicry/contagion. These variables are linked together to introduce a holistic configuration for emotional contagion and a novel set of future implications for the social environment in the transfer of affective states between individuals.

II. Ease of Use

The model considered in this chapter is rooted in empirical research-backed concepts from various spheres of psychology and, thus, may be proven to be reliable and valid across time, but not necessarily amongst all individuals in the general population. It has multiple implications for future scientific exploration in varying fields, ranging from social cognition to anthropology to artificial intelligence. The structural framework of this model is quite extensive and comprehensive with long links between paradigms, making it slightly inconvenient for a quick and efficient grasp of the surmise while simultaneously providing abundant scope for further extensibility of the model by prospective new research. All the theoretical systems brought in to formulate this holistic model of emotional contagion have been clearly elaborated to demonstrate how they can be successfully interconnected.

III. Methodology

Studies were scouted through the use of electronic research databases, namely Scopus, Pubmed, Sage Journals, and SpringerLink. Inclusion criteria for systematic review listed requirements where the elements of emotional contagion were studied in new frameworks by research conducted after 2018 to gain insight into the latest findings and explorations in the field. Eligibility assessment was commenced by first-level screening of research abstracts to identify articles for review. The study highlighted in this chapter was selected due to its noteworthy and novel contribution of unifying three separate areas of research in emotional contagion, priming, and dual processing.

IV. Result

The spotlighted research article laid out a new coherent foundation for how social-control processes may be involved in emotional mimicry and by extension, emotional contagion, although the outcomes observed for the receiver's emotional expressions (facial action activity) and feelings (self-reported emotions) do not always mirror each other (McIntosh, 2006; Van der Schalk et al., 2011). These differential patterns of results might be explained by the contextual model of emotional mimicry (Fischer & Hess, 2017; Hess & Fischer, 2013, 2014) which states that emotional mimicry is not always triggered by the observed expression itself but by an overall interpretation of that expression in a specific social context which indicates the presence of controlled top-down processes and not just automatic bottom-up mechanisms. These processes are rooted in the activation of affiliation goals (positive or neutral social advantage) and the sender's emotional expression is mimicked only if they are met, otherwise it is not (negative social advantage). The STORM account (Wang & Hamilton, 2012) supports this claim by arguing the presence of a mentalising system in the medial pre-frontal cortex that constantly monitors the mirror neuron system which facilitates emotional mimicry and inhibits it if it is socially inappropriate or non-affiliative. This still accepts the significance of the perception-action link as it is not influenced by social cues per se but more by perceptual input. However, after emotional mimicry mechanisms are triggered, social cues can influence top-down processes to either allow or inhibit emotional mimicry/contagion.

Consistent with these two models, it is proposed that the social modulation of emotional mimicry/contagion may be conceptualised as the correction of an automatic action. "The receiver has an automatic tendency to imitate the sender's emotional display activated by perceptual input, but when the social context suggests that imitation is inappropriate or undesirable (i.e., does not serve the receiver's affiliative goals), he or she attempts to counteract the influence of this display on his or her emotional expression or feelings. In this respect, social modulation of emotional mimicry resembles correction processes observed in priming research" (Wróbel and Imbir, 2019). Additionally, emotional contagion directed by social appraisal is theorised to be moderated by social factors at two different levels, the first allowing social signals to determine an initial evaluation rather than emotional contagion being automatic as in emotional mimicry, and the second notes social signals stimulating corrective processes that may reverse the

direction of the initial automatic reaction (when receiver realizes that the initial predisposition to converge or diverge with the sender's emotion is incongruent with his/her accuracy goals).

Keeping the essentials of priming research in mind, and because psychological proximity is indicative of affiliative intent, the paper links together priming effects and congruent or incongruent affective reactions to the sender's emotional displays as an analogy for the findings that they have mentioned above. The variables that promote self-evaluative assimilation (e.g., similarity, in-group membership, or cooperation) have also been found to foster congruent reactions to the sender's expressions, whereas the variables that promote self-evaluative contrast (e.g., dissimilarity, out-group membership, or competition) have been found to hinder congruent reactions or foster incongruent ones (Weisbuch & Ambady, 2008; Weyers et al., 2009; Wróbel & Królewski, 2017). This suggests that emotional mimicry or contagion might be treated as a distinctive type of priming in which the receiver's expression or feeling is either assimilated with or contrasted away from the sender's emotional expression.

Coming to the correction hypothesis, the flexible correction model (FCM; Chien et al., 2014; Wegener & Petty, 1995, 1997) proposes that assimilation and contrast can occur either by default (uncorrected effects) or when one attempts to avoid the biasing influence of prime (corrected effects) and also assumes default effects to occur automatically and require little conscious attention while corrected effects are rooted in controlled processing and occur when one becomes aware of the potential biasing impact of the prime. When taken in the context of emotional mimicry, one would reason that deliberate correction cannot be involved because the individual is not just unaware that they are imitating the sender's expression but they also consciously cannot realise they are under a biasing influence. However, research on automatic evaluations argues that even under conditions where controlled processing is made impossible (such as subliminal presentations), people may initiate automatic correction without any engagement of conscious control (Glaser & Banaji, 1999; Maddux, Barden, Brewer, & Petty, 2005). This goes to establish that despite being in conditions where a biasing influence cannot be consciously discerned, one may be intrinsically motivated to gauge the target stimulus accurately and hence, actively yet unconsciously amend their preliminary biased judgment, thereby substantiating the mechanism of compensatory automaticity which is defined as "strategic yet non-conscious compensations for unwanted thoughts, feelings, or behaviours" (Glaser & Kihlstrom, 2005, p. 171).

This is where the authors employ the two previously mentioned social top-down models to propose that affiliation goals may modulate emotional mimicry and the emotional contagion involving this mechanism. Once automatically triggered by the integrative evaluation of social cues, these goals can wield a top-down control on the receiver's reactions to the sender's emotional presentation by correcting the mirror neuron activity. From the perspective of the compensatory automaticity process discussed within the FCM framework, "the initial reaction to the sender's emotional display is always assimilative" (because the mere perception of this display, if not inhibited, always leads to congruent reactions); consequently, we think that corrective mechanisms involved in emotional mimicry may result in the transition from assimilation to contrast but not vice versa" (Wróbel & Imbir, 2019).

The dual process perspective is brought into the framework to support the notion that emotional mimicry/contagion may be corrected on either an automatic or a controlled level, particularly highlighting the role of impulsive and reflective processing in the social induction of affect that is, emotional contagion and its mechanisms. Dual process theory essentially lays claim to how thought processes can emerge as a result of two different cognitive mechanisms, one that is implicit and unconscious and another that is explicit and conscious. The first is impulsive processing based on associations built through past experience and organised according to similarity and contiguity, the results of which are subject to conscious awareness, except for the processing part which occurs rapidly, automatically, and pre-consciously. The second is reflective processing which is operated in a controlled manner based on rules constructed in propositional knowledge and hence is slow, requires more attention, and occurs only with a sufficient degree of cognitive capacity and motivation. Most scholars argue that the two modes interact at various points in processing because most situations in the real world environment necessitate the involvement of both kinds of thinking (Imbir, 2016; Kahneman, 2011). Many studies of dual processing have suggested that reflective mechanisms may deploy a top-down influence on impulsive mechanisms to correct impulsively triggered actions (Kahneman, 2003; Petty & Brinol, 2014; Smith & DeCoster, 2000).

Addressing the question of whether automatic correction is plausible from this dual processing outlook, there is a majority claim that rule-based reflective functions require cognizance and for that reason, their top-down control must be correlated with "controlled effort and subjectively conscious decision making" which in turn implies that corrective processes should be of the same nature (Smith & DeCoster, 2000). The notion of controlled correction of emotional mimicry is found in much literature, such as the neurocognitive model of emotional contagion (Prochazkova & Kret, 2017) that declares mimicry may be "consciously inhibited and controlled" (p. 104). The authors believe, in contrast, that the "conscious control of actions that are not consciously accessible is unlikely" (Wróbel & Imbir, 2019) and they build on the priming conclusions discussed to argue that people would instead engage in automatic correction in such situations. Factoring in the findings on the social interpretation of the sender's intent in their emotional expression (Fischer & Hess, 2017, 2013), automatic correction is viewed as an automatic outcome of the interaction between reflective and impulsive processing. This is specifically portrayed in the reflective-impulsive model (RIM; Strack & Deutsch, 2004) which asserts that the 'reflective mode may influence the impulsive mode not just through deliberate decisions (controlled correction) but also through propositional categorisation, which is when a perceived stimulus may be assigned to a semantic category and if some information is activated in the reflective mode, it further activates related contents in the associative network of the impulsive mode, thus influencing automatic actions without one's conscious awareness of it.' This provides clear proof for the automated top-down influence of propositional categorisation outcomes on impulsive processing, and since mirror neuron activity is rooted in associations (Heyes, 2011), authors believe propositional categorisation processes to be accountable for the automatic corrective processes seen in emotional mimicry/contagion. Within the confines of this RIM system, they propound that exposure to the sender's emotional display elicits an automatic tendency to imitate the same by triggering the perception-action link in the associative network compatible with an affiliation goal, but it can be hindered by social data that is incompatible with this goal (e.g., propositional knowledge about the sender's non-affiliative intent, like they are angry with the receiver, or the receiver is immoral or in an out-group), which in turn triggers the reflective mode, leading to activation of corresponding nodes in the associative network (e.g., rivalry, dislike, wickedness) of the impulsive mode by way of propositional categorisation, which impedes the automatic perception-action link. An observation

that can be made here is that the social background only plays its regulatory role in emotional mimicry/contagion when reflective processing is initiated, which is only possible when the receiver has clear social cues (implicit or explicit) and a reasonable degree of cognitive capacity and incentive to recognise the sender's intent.

V.

Conclusion

The merged framework for emotional contagion discussed in this chapter laid out a supporting background for empirical enquiry into the possibility of crossing priming and emotional contagion concepts which has only been previously explored by Epstude & Mussweiler (2009) who attempted to explain concordant and discordant affective reactions in an emotional contagion context using social comparison models. There has been a lack of consensus on the mechanisms underlying emotional contagion which has been addressed by the interconnected system of research that has been outlined in the featured article. The sway of social variables that foster self-evaluative assimilation or contrast in potential circumstances of emotional mimicry advances progress in the field of social cognition by regarding emotional contagion as a remarkably unique variety of priming procedures. Since the dual processing perspective is used by the authors to argue its legitimacy, this can have future ramifications for propaganda broadcasting and infiltration in industries that thrive off the principles of social psychology such as media, marketing, and politics. Allied research on emotional contagion via computer-mediated communication where one is still able to infer emotional cues about from textual and behavioural indicators in a virtual setting can be correlated with the theoretical framework discussed here to encourage further analysis of the scope of artificial intelligence tools such as chat bots and voice assistants in the topic of emotional contagion within human-robot interactions. In educational and child-upbringing settings, parents and teachers may be capable of turning displays of specific emotional expression into pedagogical and developmental social cues so as to convey necessary knowledge and implicit awareness to children and students via emotional contagion mechanisms which is attested to by social neuroscience research that portrays the observing of another individual's affective state to automatically activate a neural representation of the same in the observer along with related autonomic and somatic responses. The scope of this research may also be considered in organisational settings where the deliberate practical application of emotional contagion may serve to enrich the self-management capacities of employees as well as enhance job productivity by selectively utilising positive and negative emotional contagion processes to standardise and inculcate desirable and undesirable workplace behaviours and expression. Additionally, this model may be used to dispute a common evolutionary point of view that generally regards negative or threat-affiliated emotions as transferring more automatically than positive emotions since the aforementioned mechanism of compensatory automaticity underpinned by the propositional categorisation process allows individuals to make an inherent choice of emotional mimicry with respect to the potential social benefit gained from the context, thus broadening the horizons for the study of adaptive survival advantages. The premise of reflective processing influencing the impulsive processing using purposeful decisions in the case of controlled correction and propositional categorisation for automatic correction implies that even automatic correction requires a certain minimal degree of effort which can have controversial implications for the highly popular theme of research on the unconscious mind. Limitations of this structure can be seen in the absence of sufficient attention focused on sender attributes and social data because then, the guiding influence of propositional knowledge on emotional mimicry and contagion can dissipate. More scientific scrutiny of the external validity of this integrative paradigm is required for future study.

References

- Barsade, S. G., Coutifaris, C. G. V., & Pillemer, J. (2018). Emotional contagion in organizational life. *Research in Organizational Behavior*. doi:10.1016/j.riob.2018.11.005
- Bayliss, A. P., Frischen, A., Fenske, M. J., & Tipper, S. P. (2007). Affective evaluations of objects are influenced by observed gaze direction and emotional expression. *Cognition*, 104(3), 644-653.
- Bispo, J., & Paiva, A. (2009). A model for emotional contagion based on the emotional contagion scale. 2009 3rd International Conference on Affective Computing and Intelligent Interaction and Workshops. doi:10.1109/aci.2009.5349396
- Bock, D. E., Wolter, J. S., & Ferrell, O. C. (2020). Artificial intelligence: disrupting what we know about services. *Journal of Services Marketing*, 34 (3), 317-334.
- Bruder, M., Fischer, A., & Manstead, A. S. (2014). Social appraisal as a cause of collective emotions. *Collective emotions*, 141-155.
- Bosse, T., Duell, R., Memon, Z. A., Treur, J., & van der Wal, C. N. (2009). A Multi-agent Model for Emotion Contagion Spirals Integrated within a Supporting Ambient Agent Model. *Lecture Notes in Computer Science*, 48-67. doi:10.1007/978-3-642-11161-7_4
- Catmur, C., Walsh, V., & Heyes, C. (2009). Associative sequence learning: the role of experience in the development of imitation and the mirror system. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1528), 2369-2380.
- Chien, Y. W., Wegener, D. T., Petty, R. E., & Hsiao, C. C. (2014). The flexible correction model: Bias correction guided by naïve theories of bias. *Social and Personality Psychology Compass*, 8(6), 275-286.
- Dezeache, G., Jacob, P., & Grezes, J. (2015). Emotional contagion: its scope and limits. *Trends in Cognitive Sciences*, 19(6), 297-299.
- Epstude, K., & Mussweiler, T. (2009). What you feel is how you compare: How comparisons influence the social induction of affect. *Emotion*, 9(1), 1.
- Ferrara, E., & Yang, Z. (2015). Measuring Emotional Contagion in Social Media. *PLOS ONE*, 10(11), e0142390. doi:10.1371/journal.pone.0142390
- Fischer, A., & Hess, U. (2017). Mimicking emotions. *Current opinion in psychology*, 17, 151-155.
- Glaser, J., & Banaji, M. R. (1999). When fair is foul and foul is fair: reverse priming in automatic evaluation. *Journal of personality and social psychology*, 77(4), 669.

- Glaser, J., & Kihlstrom, J. F. (2005). Compensatory automaticity: Unconscious volition is not an oxymoron. *The new unconscious*, 171-195.
- Goldenberg, A., & Gross, J. J. (2020). Digital Emotion Contagion. *Trends in Cognitive Sciences*, 24(4), 316–328. doi:10.1016/j.tics.2020.01.009
- Gump, B. B., & Kulik, J. A. (1997). Stress, affiliation, and emotional contagion. *Journal of personality and social psychology*, 72(2), 305.
- Hatfield, E., Bensman, L., Thornton, P. D., & Rapson, R. L. (2014). New Perspectives on Emotional Contagion: A Review of Classic and Recent Research on Facial Mimicry and Contagion. *Interpersona: An International Journal on Personal Relationships*, 8(2), 159–179. doi:10.5964/ijpr.v8i2.162
- Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). Emotional contagion. *Studies in emotion and social interaction*. Cambridge University Press.
- Hennig-Thurau, T., Groth, M., Paul, M., & Gremler, D. D. (2006). Are all smiles created equal? How emotional contagion and emotional labor affect service relationships. *Journal of marketing*, 70 (3), 58-73.
- Hess, U., & Fischer, A. (2013). Emotional mimicry as social regulation. *Personality and social psychology review*, 17(2), 142-157.
- Hess, U., & Fischer, A. (2014). Emotional mimicry: Why and when we mimic emotions. *Social and personality psychology compass*, 8(2), 45-57.
- Heyes, C. (2011). Automatic imitation. *Psychological bulletin*, 137(3), 463.
- Imbir, K. K. (2016). From heart to mind and back again. A duality of emotion overview on emotion-cognition interactions. *New Ideas in Psychology*, 43, 39-49.
- Kahneman, D. (2003). A perspective on judgment and choice: mapping bounded rationality. *American psychologist*, 58(9), 697.
- Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.
- Kelly, J. R., Iannone, N. E., & McCarty, M. K. (2016). Emotional contagion of anger is automatic: An evolutionary explanation. *British Journal of Social Psychology*, 55 (1), 182-191.
- Likowski, K. U., Mühlberger, A., Seibt, B., Pauli, P., & Weyers, P. (2008). Modulation of facial mimicry by attitudes. *Journal of experimental social psychology*, 44(4), 1065-1072.
- McIntosh, D. N. (2006). Spontaneous facial mimicry, liking and emotional contagion. *Polish Psychological Bulletin*, 37(1), 31.
- Maddux, W. W., Barden, J., Brewer, M. B., & Petty, R. E. (2005). Saying no to negativity: The effects of context and motivation to control prejudice on automatic evaluative responses. *Journal of Experimental Social Psychology*, 41(1), 19-35.
- Marreiros, G., Ramos, C., & Neves, J. (2005). Emotion and Group Decision Making in Artificial Intelligence. *Cognitive, Emotive and Ethical Aspects of Decision-Making in Humans and in AI*, 4, 41-46.
- Matsui, T., & Yamada, S. (2019). Designing trustworthy product recommendation virtual agents operating positive emotion and having copious amount of knowledge. *Frontiers in psychology*, 10, 675.
- Parkinson, B. (2011). Interpersonal emotion transfer: Contagion and social appraisal. *Social and Personality Psychology Compass*, 5(7), 428-439.
- Petty, R. E., & Brinol, P. (2014). The elaboration likelihood and metacognitive models of attitudes. *Dual-process theories of the social mind*, 172-187.
- Preston, S. D., & De Waal, F. B. (2002). Empathy: Its ultimate and proximate bases. *Behavioral and brain sciences*, 25(1), 1-20.
- Prochazkova, E., & Kret, M. E. (2017). Connecting minds and sharing emotions through mimicry: A neurocognitive model of emotional contagion. *Neuroscience & Biobehavioral Reviews*, 80, 99-114.
- Smith, E. R., & DeCoster, J. (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and social psychology review*, 4(2), 108-131.
- Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and social psychology review*, 8(3), 220-247.
- Van Der Schalk, J., Fischer, A., Doosje, B., Wigboldus, D., Hawk, S., Rotteveel, M., & Hess, U. (2011). Convergent and divergent responses to emotional displays of ingroup and outgroup. *Emotion*, 11(2), 286.
- Vijayalakshmi, V., & Bhattacharyya, S. (2011). Emotional Contagion and its Relevance to Individual Behavior and Organizational Processes: A Position Paper. *Journal of Business and Psychology*, 27(3), 363–374. doi:10.1007/s10869-011-9243-4
- Wang, Y., & Hamilton, A. F. D. C. (2012). Social top-down response modulation (STORM): a model of the control of mimicry in social interaction. *Frontiers in human neuroscience*, 6, 153.
- Weisbuch, M., & Ambady, N. (2008). Affective divergence: automatic responses to others' emotions depend on group membership. *Journal of personality and social psychology*, 95(5), 1063.
- Wegener, D. T., & Petty, R. E. (1995). Flexible correction processes in social judgment: the role of naive theories in corrections for perceived bias. *Journal of personality and social psychology*, 68(1), 36.
- Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naive theories of bias in bias correction. In *Advances in experimental social psychology* (Vol. 29, pp. 141-208). Academic Press.
- Weyers, P., Mühlberger, A., Kund, A., Hess, U., & Pauli, P. (2009). Modulation of facial reactions to avatar emotional faces by nonconscious competition priming. *Psychophysiology*, 46(2), 328-335.

Wróbel, M., & Królewiak, K. (2017). Do we feel the same way if we think the same way? Shared attitudes and the social induction of affect. *Basic and Applied Social Psychology*, 39(1), 19-37.

Wróbel, M., & Imbir, K. K. (2019). Broadening the perspective on emotional contagion and emotional mimicry: The correction hypothesis. *Perspectives on Psychological Science*, 14 (3), 437-451.

Xiong, X., Li, Y., Qiao, S., Han, N., Wu, Y., Peng, J., & Li, B. (2018). An emotional contagion model for heterogeneous social media with multiple behaviors. *Physica A: Statistical Mechanics and Its Applications*, 490, 185–202. doi:10.1016/j.physa.2017.08.025