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Integrating the Who-How-Which Framework with Neurocognitive Evidence to Understand Conformity under Dual-System Theory

Ruofei Hu

Kunzhong High School, Kunshan, China
Angelahu200903@gmail.com

Abstract. This review integrates dual-system theory and evidence from modern cognitive neuroscience. It analyzes the "who-how-which" three-dimensional framework to explore the cognitive mechanisms of conformity, and systematically compares its behavioral differences between real-life and online contexts. The review deconstructs psychological mechanisms of social influence from value assessment, action selection, and learning as three fundamental computational processes. Based on Functional Magnetic Resonance Imaging (fMRI) research, it distinguishes the characteristics of informational social influence and normative social influence at algorithmic, neural, and temporal dynamic levels. It further analyzes the reconstruction of traditional conformity mechanisms in online settings. Normative social influence relies on a specific perception of human interaction. Intuitive output in System 1 is adjusted by external social cues beforehand. Online contexts transform the mechanism driving conformity from passive compromise to one that relies on cognitive shortcuts. The review provides an integrated analytical framework for understanding social influence's operating principles in different social media conditions, offering both theoretical consolidation and practical guidance.

Keywords: Conformity, Dual-system theory, "Who-how-which" three dimensional framework

1. Introduction

The conformity effect is one of the most widespread and widely influential psychological phenomena. From the public's eager adoption of new products to the ebb and flow of political opinion, conformity is present across these diverse social contexts. When facing the group consensus, individuals are more likely to choose the same decision as the group's which facilitates the spread of group think. With the rapid development of information technology and Internet, this phenomenon has taken on a larger effect with its new form. The growing number of page views and the rising popularity of information gradually become a basis for public judgment. "Everyone thinks so, it should be right" this thought gradually becomes a reliable social information without scrutiny. However, following public opinion without adequate rational deliberation often entails considerable risks. Therefore, understanding why and how people change their judgment under the influence of

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the group is not only a fundamental and core topic for discussion in social psychology, but also foundation for helping people make safer decisions.

In the academic research area, psychologists have kept closely monitoring conformity effect since the 20th century. Asch showed the basic characteristic of conformity behavior by traditional Segment judgment Experiment System: Although facing certain and verifiable objective facts, individuals may still give up their true perception under the sway of an incorrect group consensus and choose to align with the majority [1]. In the following decades, researchers began to conduct questionnaire surveys among the general public, starting from the frameworks of normative social influence and informational social influence, and accumulated a substantial body of behavioral-level evidence on the conditions and moderators of conformity. However, traditional questionnaires remain confined to descriptions at the behavioral level and are unable to further explore the underlying processing mechanisms of the conformity effect.

In recent years, progress in neurocognitive science has offered a new angle for understanding the processing mechanisms of conformity. The emergence of the dual-system model provided a foundational framework for investigating the cognitive processing of conformity. Researchers then began to further explore the distinctions between the two systems. At the same time, researchers tried to establish a connection between social influence and cognitive processing. Morris and Kurdi's research approached from the metacognitive level [2]. They found that individual's perception about intuitive judgment is not the result of pure introspection, but it is a mixed processing which heavily depends on external situational cues. This also shows the correlation between conformity effect and system 1 which is driven by external social cues. Pennington and colleagues further reveal the fact of "implicit prejudice" which Implicit Association Test(IAT) measures is the automatic expression of internalization of external social norms [3]. This finding provides a fundamental questioning for "implicit prejudice could directly reflect inner intuition which independent of social influence" this traditional presuppose. Mahmoodi and colleagues combined fMRI technology with computational modeling, distinguishing characteristics between Informational social influence and Normative social influence from algorithm, neural and time dynamics [4].

At the same time, as the development of information-based society, researchers began to focus on a new question: When conformity behavior changes from face-to-face interaction to online space, it remains unclear whether the theoretical conclusions drawn from offline experiments are still applicable. Xu Z and Li K. Y's overview points that anonymity in online environments, deindividuation and information overload make intuitive processing in System 1 significantly intensify [5]. Normative social influence processing shifts from being initially driven by fear of "afraid of being rejected face to face" to approach motive of "pursuing digital identity and virtual rewards" online. From offline conformity research, the conclusion that "normative conformity depends on human social subject specificity" has been drawn from offline studies. However, in online anonymous settings, individuals are unable to directly determine whether there is a real human being behind the screen. Under these circumstances, whether normative conformity can still remain intact, and whether its intensity of effect changes, still require further verification.

Although above research all made significant contributions in their areas, there remain two significant gaps in current study. First, there is no study that systematically connects the cognitive framework of the dual-system model with the neural computational mechanisms of conformity. Current research needs a unified analytical framework to answer the underlying issue: What is a complete cognitive processing chain like for conformity from social information input to behavior output? Second, there has been insufficient systematic comparison of conformity processing between offline and online contexts. Whether theoretical conclusions derived from offline

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experiments are weakened, altered, or still hold in online environments remains an open question, particularly given the lack of analysis from the cognitive processing chain perspective. To address this gap, this review adopts the dual-system model and the three-dimensional framework to systematically examine the cognitive mechanisms of conformity and their behavioral manifestations across offline and online settings. On this basis, the present review proposes a conformity processing chain model that covers the full course from social information input to behavioral output, with the goal of offering an integrated analytical framework for understanding the mechanisms of social influence in different social media environments.

2. Theoretical framework

2.1. Concept of conformity

2.1.1. Two types of social influences

Asch distinguished between two types of social influences: normative social influence and informational social influence [1]. Normative social influence refers to the tendency of individuals to conform to the group to get group acceptation and avoid to be excluded. In this case, individuals may internally disagree with the group's judgment, yet they seek to avoid the social costs that come with deviating from the majority. Therefore, individuals conform to group opinion at the public level.

Informational social influence stems from individual's pursuit of "correctness". When individuals confront ambiguous situations and have insufficient objective information to form independent judgments, they are inclined to adopt the group's perspective as a reliable information source and accept that "the majority's choice is more likely to be correct. "

2.1.2. Asch experiment's duplication and expansion

Franzeno and Mader conducted a replication and extension of Asch's classic experiment on a large scale [6]. In the traditional segment judgment task, the conformity rate for the replication experiment was 33%, successfully replicating Asch's original finding. When monetary incentives were introduced, the conformity rate decreased to 25%, indicating that external motivation can reduce conformity to some extent but cannot completely eliminate social influence. When the tasks shifted to judging social decisions, the conformity rate increased to 38%, suggesting that the conformity effect not only exists in perceptual judgments but is also significant in the domain of opinion expression that lacks objective standards.

2.2. Dual-system model

2.2.1. Concept analyze

The dual-system model distinguishes two modes of information processing. System 1 is quick, automatic, intuitive and consumes less cognitive resource; System 2 is slow, controlled, analytical and requires more cognitive effort. Hochman points out that intuition and analyze processing are not executed by fixed model, but they are cognitive model which adjusted dynamically by situational factor [7]. Morris and Kurdi further shows that individual's perception about intuitive judgment is not the result of pure introspection, but it is a judgment which depends on external situational factor [2].

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2.2.2. Hybrid processing

The two systems do not function in isolation. System 1 generates intuitive signals, whereas System 2 evaluates their credibility and determines their adoptability. Their relationship is permeable: System 1's activation and expression are modulated by external social information that System 2 has processed. In essence, external cues filtered through System 2 shape the likelihood of System 1's output being accepted.

2.3. Who-how-where three-dimensional framework

Lee and Chung proposed the Who-How-Which three-dimensional framework to provide a systematic analytical logic for classifying the factors influencing conformity [8]. The Who dimension focuses on individual differences in cognitive resources. Individuals with high cognitive demand prefer to use System 2 to verify group opinion, whereas interdependent self-construal individuals are more likely to follow System 1 in conformity. The How dimension focuses on the availability of external cues. When conditions are ambiguous, individuals may rely on the majority's view as a basis for judgment. The Which dimension focuses on objective verification standards. Perceptual judgments involve objective standards and can activate System 2, whereas attitudinal judgments lack objective standards, forcing individuals to depend on external social cues to activate System 1.

3. Social influence and conformity

3.1. Dual nature of social influence

Social influence does not operate as a single force; rather, it draws upon both System 1 and System 2, and the character of conformity ultimately emerges from the interaction between cognitive computation and neurobiological underpinnings

3.1.1. Decomposability of social influence

Social influence can be categorized into three fundamental computational processes: value assessment, action selection, and learning.

Value assessment is the process by which individuals attribute subjective value to an object. The value of a given object is not inherent but is subjectively determined by the individual. Social information and others choice will bring "other-attributed utility"--with the effect of others evaluation and behaviors, the object will increase or decrease in individual's value representation. Chen and colleagues' research offers this mechanism direct neural findings: researchers ask the participants to score for their appearance attraction, and researchers allow them to score again after telling them the group average score [9]. The result shows that individuals' scores move towards group average score significantly. This social influence will renew individuals' process towards appearance consistently--although in the subsequent independent scoring processing, individuals still keep higher attraction evaluation for "the face which valued high score before". This shows that social information not just changes subjective value judgment temporarily. Social information is also likely to produce lasting influence for future judgment by renewing neural representation, providing "other-attributed utility" mechanism with a deeper understanding which beyond the level of immediate behaviors.

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Action selection denotes the tendency of individuals to make decisions when facing specific circumstances. Individual's choice is made by their threshold. When object's stimulate level reach the threshold, individual will be more likely to choose after a deep thinking. Social information can adjust individual's threshold, then influencing individual's speed of decision making, standard of care and selected risk preference. In the condition that group think high constancy, individual's decision threshold would increase unconsciously. Therefore, individuals tend to maintain the same choice as the majority and make decisions quickly; When there is polarization of group think, threshold decreases. Individuals would prefer increase the time that they used to make decision and choose prudent schemes.

At the learning level, individuals update their cognition through an adaptive process driven by outcome feedback. When individuals believe that others' information has value, they infer others' intentions to adjust their own choices. Others' suggestions alter the original value of information by modulating rewards and punishments. At the same time, dorsomedial prefrontal cortex at the neural level is activated when receiving the social information which deviate from its information. The activation level of this brain region connects with social information's value representation. When individual accepts information which has value, this brain region will drive cognition to renew. If social information exists moderate differences with personal judgment, the individual would evaluate its strategy, revise existing beliefs to realize more efficient learning adaptation; on the other hand, if difference is too large or information source is unreliable, the individual may ignore this signal and keep its original cognitive structure.

For instance, an individual follows a friend's recommendation to try highly spicy food and finds it uncomfortable. Yet the friend regards the same food as only mildly spicy. This discrepancy may lead the individual to reconsider their standard of spiciness, aiming to bridge the gap between their own experience and the social signal. Through this process, social information informs the individual's cognitive appraisal and reaction, promoting adaptive learning.

Conformity behavior is not solely dominated by either System 1 or System 2; instead, it depends on which processing mode is relatively dominant under specific conditions. When the individual has enough cognitive resource, time and objective judgment standard, System 2 can play its role in analyticity furthest to prevent automatic conformity preference. Instead, when group think is sufficiently prominent, and individual is in the condition which lacks cognitive resource, time or objective judgment standard, System 1's intuitive heuristic will in dominate. The individual will directly listen to the guidance from external social cues, choosing the decision with following the majority.

An individual's age, cognitive ability, and personality characteristics, especially openness, significantly affect susceptibility to social influence. Individual's age will have effect on their analyze preference when facing group think. Increasing ages usually follow with collection of social experiences and controlling levels, and these may change individual's dependent level on group think. As age increases, individual's sensibility towards group pressure would decrease, and they are more likely to prefer to depend on the judgment framework which built by their own experiences instead of external social signals. Cognitive ability directly influence individual's analyze efficiency towards group think. System 2 depends on cognitive resource, such as working memory capability or fluid intelligence to analyze. So when facing group think, individuals with high cognitive resource have more cognitive resource to activate System 2 to analyze; individuals with low cognitive resource are unable to provide enough cognitive resource. Thus, individuals with limited cognitive resources are more susceptible to social influence in their value evaluations, depending on System 1's rapid judgment. Finally, this becomes the high conformity rate. Openness in personality

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characteristic influences individual's level of acceptation towards different views. Individuals with high openness have more open-minded approaches towards novel information, and they would think solely while facing group think instead blind following; Individuals with low openness prefer choose the same as what they are familiar with, they will have increased discomfort when choosing deviate from the group's, and they are more possibly conform the group.

The accessibility of external cues also exerts a direct influence on social influence. The presentation mode of social contexts, such as group scale, consistency or anonymity is the core context viable to decide degree of social influence. When group think is intense, external cues will prevent dorsomedial prefrontal cortex (dmPFC) activities. At this time, System 2 is weakened by conflicting signals related to objective facts. System 1 takes over, depending on external cues to process information quickly and making the decision to follow the majority.

Objective verification standard decides differences between perception judgment and value, showing impacts of different regions in different levels of social openness. When objective verification point exists, such as judgment for segment's physical difference, System 2 are more likely to activate logical analyze to find the group's incorrect. When there is no objective point or valid logical falsification, the individuals are forced to depend on social group think this external social cue to make decision, and their System 1 replaces System 2's work.

3.1.2. Separation of two types of conformity

Mahmoodi and colleagues designed an ingenious Functional Magnetic Resonance Imaging (fMRI) experiment that placed participants in perceptual judgment tasks involving two social roles: "accepting suggestions" and "offering suggestions. " Participants interacted with either human or computer partners [4]. The researchers used the Hierarchical Drift-Diffusion Model (HDDM) to parametrically analyze decision processes and linked it to blood-oxygen-level-dependent (BOLD) signals in the fMRI data. They then compared the two types of conformity across algorithmic and neural levels, and finally summarized their distinctive features across multidimensional indicators (see Table 1).

Table 1. The multi-dimensional separation characteristics of informational conformity and normative conformity

Dimension	Informational Conformity	Normative Conformity
Core Motivation	System 2's rational standard use others' opinions as new information to refine own judgment	Social emotional drive to fit into the group or reciprocate others' compliance
Dependence on Information Source	Insensitive	Highly sensitive Human specific
Neural Basis	Dorsal anterior cingulate cortex (dACC)	dACC +dorsomedial prefrontal cortex (dmPFC) +temporoparietal junction (TPJ)

Mahmoodi and colleagues further elaborated on the differences between the two types of conformity at the algorithmic, neural, and temporal-dynamic levels (see Table 2) [4]. At the algorithmic level, the estimated parameters in the HDDM reveal that the two types of conformity influence decision processing differently. In cases of informational conformity, the drift rate is

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observed to rise—a pattern that suggests others' inputs are incorporated into the evidence accumulation process, thereby reducing decision time. Normative conformity, in contrast, manifests as a shift in starting point, indicating that the brain already holds a bias toward a particular choice before evidence accumulation begins. At the neural level, the dACC exhibits BOLD signal changes that correspond to informational conformity—a pattern suggesting that the cognitive control network is engaged in detecting conflicts between self-generated and socially derived judgments. However, normative conformity is only traced by dACC when interact with human. At this time, the brain will see "whether it fits social group think" as the main conflict signal, instead of only focusing on the correctness of objective facts.

Table 2. Difference characteristics between informational and normative conformity at the algorithmic and neural levels

Dimension	Informational Conformity	Normative Conformity
Algorithmic level	Increase in drift rate others suggestions are treated as additional objective evidence	Shift in starting point A preference bias toward others suggestions before evidence collection start
Neural level	BOLD signal in dACC depends on tracing informational conformity behavior area's general cognitive control network	tracks only when interacting with humans see conflicts with social group think as the main source of conflict

In time dynamic level, the time point that two types of conformity get involved decision also have basic differences, showing two information's adjustments for competition and weighting in time level. Informational conformity is more likely to get involved in early stage of evidence collection, proposing social information and perception information in the early stage of cognitive processing for merge application. To be specific, Individuals automatically use others' suggestions to assist perceptual analysis when it accepting objective stimuli. These are already combined with encoding processing in the stage of evidence collection. Normative conformity is more likely to play its role in reaction boundary phase in the late stage of decision. At this time, individuals already form their fist judgment with objective fact. Meanwhile, external social information gets involved in decision-making process, changing individuals' reaction boundary to increase the possibility that they choose the same answer as the group's.

3.2. Particularity in network conditions

Online contexts transform the conditions that give rise to traditional conformity via anonymity, deindividuation, and information overload [5]. Each of these factors affects a distinct dimension of the conformity mechanism. Anonymity alleviates the normative demands characteristic of direct interpersonal encounters; individuals are freed from the concern of being personally identified, thereby attenuating the exclusion-based motivation that drives normative conformity. Deindividuation, meanwhile, modifies how individuals orient themselves toward their group identity. When self-consciousness is diluted by group immersion, individual's monitor for keeping its self-action and social standard to be uniform declines, but producing stronger dependence on the most vivid group identity and its code of conduct in that condition; Information overload increases individual's dependence on the number of likes, comments and the most opinions these heuristic

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cues. When cognitive resource is continually consumed by large number of information, System 2's analyze processing cannot get involved validly. Individuals have to depend on " the majority's choice=the right" this external social information as judgment evidence. These three network characteristics changes happening condition for traditional conformity from different paths, providing analyze base for following discussion for traditional stress's decline and judgment cues in network conditions.

Cinnirella and Green replicated Asch's experiment in a computer-mediated conformity condition and found that participants' conformity dropped significantly [10]. Individuals' perception of others' social presence is weakened in computer-mediated settings, making them less influenced by others' choices. The difference between real and virtual groups is largely attributable to the critical role that social presence plays in conformity. When interacting face-to-face, others' physical presence activates individuals' perception of group pressure. However, in anonymity condition, this pressure source is eliminated structurally. What's more, deindivididuation theory points out that immersion in the group and anonymity lead to decrease in self-conscious, making individual deindividualize. Then, the individual may more depend on the most vivid group identity and its code of conduct. Because of lacking personal and social identity cues in network anonymity condition, individual's sensibility towards group or social expectation relocates: When group norms become faint, traditional normative pressure is weaken; but when there is vivid group identity signal in the condition, the individual would strength their obey on group norms. Finally, individuals' normative pressure is weaken significantly in anonymity condition due to individuals' fear on being excluded from the group. Nonetheless, this weakening does not mean the disappearance of normative influence. it is a turn point of its target of action and expression method. System 1 which driven by fear " fear on being excluded" is weaken, making System 1 turns from " driven by fear" gradually to "reliance on cognitive shortcuts" this dominate mode.

At the cue judgment level, information overload and ambiguous conditions strip individuals of their original objective basis for judgment, thereby expanding their dependence on group cognition. The Elaboration Likelihood Model (ELM) suggests that when conditions are ambiguous, individuals lose their objective verification standards and are unable to carefully process information via the central route, which leads to conformity. Online environments present a vast amount of fragmented information for individuals to consult, but cognitive resources are limited. When consumers shop online, they cannot physically examine the goods directly, making others' reviews particularly significant. Specifically, consumers tend to rely on heuristic cues such as the number of likes, comments, and majority opinions to judge product quality, rather than engaging in detailed analysis of review content. As these platform-based cues gradually replace in-depth analysis of information and comment quality, judgments about product quality shift from objective evaluation to dependence on social signals—namely, how many people endorse the product. In this process, System 1's intuitive processing is directly activated and amplified, allowing individuals to form judgments quickly based on the simple signal of "the majority agrees, " without needing to read reviews in full. Nevertheless, it should be noted that System 2 does not completely cease to function throughout this process: When individual faces high-risk consume strategy, such as for too expensive good or significant divergences exists in review comments, System 2 may be activated again, and it begins to verify the group's suggestions' quality in some ways. However, in the most low-risk, high information density daily browsing conditions, System 1's heuristic processing plays the dominate role, and System 2's rational monitor is structurally weaken due to continuously consume of cognition resource.

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It is worth noting that offline and online conformity should not be generalized as " offline conformity must stem from the fear of being excluded, whereas online conformity stems from intuitive processing" this binary difference. Offline condition also is likely to have informational conformity. For example, when individual has no specialized knowledge towards a complex question, although in face-to-face condition, it is possible that it would follow the majority's choice base on the rational consideration instead of just being fear on be excluded. Meanwhile, online condition may produce real normative pressure. Although anonymity decreases the sense of being excluded and pressure from face-on-face conversation, in communities with high identification, individuals are still possible to follow the major thought due to being fear of being excluded when their points different from the majority or hoping get community consensus. This normative driven do not disappear completely with the change of media form. In fact, differences between and offline and online conformity are more suitable to be explained from social presence, objective verify standard, information load and group identity's significance these factors: In offline condition, social presence is strong, and normative pressure is more direct; in online condition, objective verify standard is easier to be fuzzificicated, with higher information load. Therefore, its trigger frequency of informational conformity is higher. Hence, conformity's dominate mechanism has difference in weighting rate between these two conditions: Normative driven is relative prominent in offline condition; but Informational driven and System 1's intuitive processing is relative prominent in online condition.

4. Conformity's influence on cognition process

4.1. External social group think

Group consensus serves as a powerful external social cue that influences individuals' cognitive regulation of self-perception and contributes to the formation of implicit attitudes.

4.1.1. Perceptual dependence on external cues rather than pure introspection

Morris and Kurdi's research indicates that individuals' perceptual changes rely on intuitive judgment rather than on introspection alone. It is a higher-order cognitive processing depending on external cues [2]. To be specific, it can be analyzed from perception, cognition evaluation and execution these three levels.

Individuals would first collect useful external cues in social situation from perception level. In conformity condition, "everyone chooses this" becomes a strong statistics external cue, being perceived and inputing by individuals. This cue then be characterized as high valid group think" Everyone thinks so, it must be right". When individual accepts this group think as cue to understand social situation or seek for cognition certainty more quickly, they are more likely to activate System 1 to code automatically.

Next, after individual collecting external cues, metacognition monitor begins to activate System 2 to analyze, having rational evaluation for group think's reliability. However, under conformity's strong effect, System 1 already views characteristic of group think as reliable information the stage of brain metacognition with relative high subjective reliability. The probability of System 2 being recruited for subsequent revision and processing decreases, resulting in insufficient activation of its rational monitoring capabilities.

Finally, in execution level, individual would integrate its original judgment, reliablility of group think and the result of metacognition monitor, finally analyzing them with different information

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sources and forming explicit reaction. Due to group think is already given relative high subjective reliability in the stage of metacognition monitor . This biased weights makes final judgment already has been verified in a certain extent for the direction external social cues providing before explicit reaction shows. In conformity condition, when group think is strong enough, individual will finish adopt external cues in the stage of cognition monitor, producing a certain tendency. This leads to the result that System 2's verified mechanism cannot be activated fully. Instead, it follows an efficient, automatic method without thinking to conform the group think external cues formed. System 1 dominates analyze and encode for perception, monitor and execution.

4.1.2. Societal shaping of implicit intuition

Implicit intuition is already influenced by external social norms at the stage of attitude formation. Directly using System 1 for judgment becomes a part of social consensus, Pennington and others researchers' research finds that racial IAT scores have positive correlation to positive affective empathy in explicit presentation ; But it has no significant correlation to another implicit score they researched (such as implicit imitation tendency, perspective taking and emotion recognition). This choice correlation mode shows that the " implicit bias" racial IAT measures is not purely individual's implicit intuition, but it reflects individual's internalization which it learns from explicit norms in social situations. This finding provides fundamental questioning for "Implicit measure could directly reflect implicit intuitive which sole from social influence" this traditional assumption [3]. To be specific, it can be analyzed from formation of explicit attitude to automatically activation these two parts.

Internalization of social norms lays the foundation for System 1's association content. IAT measures the automatic association between individuals towards racial types and its characteristics. Pennington and others researchers' study points out that this automatic activation reaction is not "pure intuition" in individual's mind, it instead reflects internalization for explicit value norms the individual learns from social condition [3]. In a nutshell, this automatic association content is already collected in the early stage of formation by external social cues, being permeable by explicit value. These explicit social information gradually precipitates into System 1's knowledge background with the accumulation of time. Finally, it becomes the automatic association basic of System 1. For example, when "the white" and "good", "the black" and "black" reflection uses shorter time in classification tasks, showing individual's automatic bias towards like the white but avoid the black. To be specific, through interacting repeatedly, individual faces information which links to special nature repeatedly; situational reinforcement, magnify for some racial nature correlation in special condition; and lasting activation for both social categories and evaluation natures, like the minority always connects to some negative narration. These three methods' activation make external social information gradually becomes the association knowledge which System 1 depending on.

Further more, the information provided from System 1 depends on the attitude representation which shaped by social consensus. When IAT shows stimuli, the individual would start to associate automatically. For instance, the association for racial difference: the white is good, the black is bad. This automatic activation is a classical behavior in System 1: quick, unconscious, do not consume cognition resource. However, Pennington and others researchers' study provides a fundamental questioning "IAT measures pure implicit perception" this presuppose. The study shows that racial IAT has positive correlation with explicit positive emotive empathy. The higher the individual's preference on the white showed in IAT, the more positive emotive empathy it would prefer in the certain explicit measure. Therefore, the "implicit association" IAT captured, its content closely connects to the external social attitude which the individual has consciously, instead of coming from

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some implicit processing system which are general, be in common use domains. Social norms first shapes individual's attitude in explicit level, and then this attitude permeates into automatic association processing in System 1.

As a result, although individuals believe that they express their implicit intuition in IAT, but their intuitive content is already permeated and verified by external social norms in the formation stage. What IAT reflects is more likely the automatic expression that activated repeatedly by external social norms and finally formed.

4.2. Limitations of conformity influence and cognitive adjustment

4.2.1. The limits of rationality

Franzen and Mader examined the effects of monetary incentives and task conditions on social behavior through a large-scale replication and extension of Asch's original experiment [6]. This experiment verifies System 2's rational processing's limit effect on external motivation by controlling the exist of objective standard and the level of social resource adjustment.

The influence of conformity cannot be completely eliminated by incentives, and the intervention of external motivation is limited. Monetary incentive in fact is a kind of external motivation signal. It prompts individuals use more cognition resource to activate System 2's rational analyze by increasing individuals' perception towards the importance of task. In cognition processing level, this external motivation expresses as increasing examination of focus level and preventing intention towards automatic following preference. However, From Franzeno and Madar's study, it shows that this incentive could only decline instead of eliminate the influence of conformity. The data shows that baseline group's average conformity rate is about 33% in traditional Asch segment adjustment task [1]; when monetary incentive is introduced, although conformity rate declines, but it still maintain in the level about 25%. This means that, though in the condition that individuals have strong motivation to seek for correct answer, there is still one quarter of participants would follow the group's incorrect judgment. Social influence's permeating power not only effects on System 1's intuition producing process, but also weakening System 2's validity in intervening by adjusting cognition resource to a certain degree. Though individuals acquire more resource to activate rational analyze, it is possible that group pressure still has effect on their perception explaining, their judgment confidence and the answer of their final unclassified report.

This limit intervene effect could also be understood with the perspective of Who level in three-dimension framework: Cognitive resources vary significantly across individuals, which directly influences the effectiveness of external motivational interventions. More specifically, cognitive abilities—including working memory capacity and fluid intelligence—directly affect individuals' efficiency in analyzing information when facing group pressure and monitoring cognitive conflict. Individuals with high cognition resource could compare group think and subjective fact more effective, recognizing its inconsistency and verifying it rationally with System 2 adjustment fully in the incentive condition; Instead, individuals with low cognition resource, though they acquire monetary incentives, their limit cognition capacity is unable to support enough conflict monitor. Thus, they are more easily guided by external social cues. Openness in the personal nature influences individual's accept level for different views. Individuals with high openness have more open attitude towards novel or heterogeneous information. They prefer thinking solely when facing group think instead of following blindly, making incentive plays a significant role in activating System 2; Individuals with low openness tend to conform to familiar views, avoiding the choice which deviating from the group's choice and leading to stronger mental uncomfort. Although there is

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the driven from incentive, intervening effect of System 2 is still possible to be counteracted. Moreover, the accumulation of social experience and self control level which come from increasing age also may change individual's dependence level towards group think. With increasing ages, individuals accumulate more complicate judgment experience. At the same time, their self-control ability increases, making their sensibility to group pressure declines. They would prefer the judgment framework that they accumulated instead of immediate external social signals, making monetary incentive has a more vivid effect on the elder. In other words, although external motivate signal is the same, different individual's efficiency and influence from activating System 2 to intervene have systematically difference.

Meanwhile, objective verification standards play a key role in regulating the competition between the two systems. For perception judgment which exists quantizable objective standard, System 2's logical analyze being activated validly. Using judging the length of segment as an example, this judgment has a well-defined physical standards due to standard segment is fixed, measurable, not depend on subjective explanation. Individuals could verify whether their judgment is correct by comparison and using logical analyze repeatedly. Thus, rational examination has entry point to operate. On the other hand, when facing attitudinal judgment which lacks external verify standard, System 2's valid intervene faces structural constraints. For instance, political view judgment, this kind of task lacks the sole answer which can be verified immediately. In fact, it is a semantic representation with relative high fuzziness. Individual's cognition system is unable to activate logical analyze like dealing with segment length. In this condition, System 2's analytical processing lacks logical instruction to control. Individuals may be more likely to depend on external social cues to fill up their cognition blank, activating System 1's intuitive heuristic to judge. This deduction gets support in the experimental data: In social view judgment tasks, conformity rate increases to about 38%, significantly higher than 33% in segment judgment task. This shows that, when there is not enough objective verify standard in the task domain, Which level in the three-dimension framework, individuals' dependence on group thinks further deeper.

4.2.2. The specificity of conformity in System 1

Mahmoodi and colleagues used fMRI to examine the core cognitive processes underlying normative conformity. They found that normative conformity is relatively specific to suggestions attributed to human agents; it does not elicit the same neural responses to non-social computational sources. This holds even when the content is exactly the same--when the source is marked as a computer, the distinctive neural signature fails to appear [4]. Xu and LI further points out that, online anonymity situation significantly weaken this social perception: individuals are unable to judge whether it is "human kind" or virtual symbol behind the screen, leading normative conformity's trigger chain is blocked at the source [5]. Integrating these two researches' finding, the core processing mechanism of normative conformity can be analyzed from type coding of interaction subject, the formation of recognition-emotion, resolution of cognitive conflict and speciality of online anonymity these four levels.

When an individual receives judgment suggestion, it will first classify the source of information in the subconscious level: whether the source is a human conspecific. This classified belonging processing is automatic, controlled by System 1, providing important premise for whether it could prime cognition-emotion association in normative conformity in the following. When information source is encoded as "human", System 1 opens the path for following social emotion activation; When information source is encoded as "computer" or "virtual symbols", normative conformity's processing is blocked. It is worthy that source of information is not the only factor to decide whether

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normative conformity will happen or not. Its following processing also depends on the adjustment of source reliability, group affiliation, social status and interact objects and so on multiple factors. Meanwhile, when information source is recognized as computer or virtual symbols, though normative conformity path is blocked, its suggestion still may influence individual's informative judgment from arithmetic authority, specialization expectation and information value these path--individual may consider that "computers can calculate more precisely" and accept its suggestion. Nonetheless, this is in the domain of informational conformity, instead of normative conformity processing. In a nutshell, the core function of classify belonging is to open or close the emotional path of normative conformity, instead of deciding individual's whole body response towards all suggestion sources.

Once the interaction partner is encoded as human, the individual's concern about social exclusion is triggered, forming unconscious cognition-emotion reaction. While the brain detects the individual is not constant to the group, it produces the warning signal" I will be excluded, lose my belonging". The basic nerve performance of this emotion condition is the combination functions of Dorsomedial Prefrontal Cortex(dmPFC) and Temporoparietal Junction(TPJ): dmPFC connects with mentalization processing, as conjecturing others intention; TPJ participants in distinguish between ones and others view. These two make a quick evaluation for the social consequence an individual may produce if it deviates from the group, prompting individual prefer the "safe" following choice while making a decision. The core driver of normative conformity in this process is people's avoidance of potential social loss--brain encodes "deviating from the group" as a threaten signal from society pain, but it encodes "following the group" as the path to get the sense of belonging. System 1 outputs conform behaviors automatically in the guiding of this emotional driven.

After encoding the other as a human conspecific and activating social emotions, the individual moves into the stage of resolving cognitive conflict. When individual's original judgment is different from the group think, the brain detects this inconstant signal, Dorsal Anterior Cingulate Cortex(dACC)is activated during this processing. At the same time, dACC further accepts warning signal "deviating from the group may bring social risks" which inputs from dmPFC-TPJ network. When social signals have high significance, the activity of dACC is possible to reflect individual's increase sensibility towards "the difference between individual judgment and group think", and it further pushes judgment adjusts toward group domination. During this process, the brain gives the signal " inconstant to social consensus" action priority; To eliminate this uncomfort which is brought from social conflict quickly, dACC gives the signal preferring the group to decision-making system, prompting individual follows the group's judgment to resolute conflict. This process does not involve a conscious deliberation about whether to conform; instead, it is an automatic decision made at the System 1 level to follow the group and thereby alleviate social unease.

Online anonymity creates a structural barrier that prevents the full development of normative conformity. When individual interacts behind the screen with virtual identity, information source loses its human nature for physical presence: Individual could only evaluate the front with a user name, a profile picture or a chapter of text. In this condition, the classification of the source of information in the subconscious level may judge the front as "nonhuman" virtual symbol, instead of "human" in biological meaning. This classification means: the possibility that individual produces "be fear on being excluded" towards virtual symbols declines, and the motivation for seeking for the real belonging also declines. Normative conformity is weaken from the source.

Bocian and colleagues' study provides empirical support for this inference at the behavioral level [11]. The researchers asked participants to evaluate others' moral traits in a VR setting, where group pressure was said to be exerted by agents controlled either by humans or by AI. The results showed

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that moral conformity occurred in both conditions, with an average conformity rate of approximately 25%. However, there was no significant difference in conformity rates between the human-controlled and AI-controlled conditions. This discovery indicates that in a virtual environment, when the "human attributes" of the interactive objects are blurred due to the medium form, the perception of "human social subject specificity" that normative conformity relies on is weaken, and individuals' conformity behavior may shift more towards reliance on informational cues (such as algorithmic authority, professional expectations of virtual agents). In other words, when an individual is unable to clearly identify the interaction objects behind the screen or headset as real human social subjects, the triggering conditions for normative worrying is weaken. Conformity behavior is more likely to be driven by informational paths rather than normative ones -- this forms an important contextual supplement to Mahmoodi and colleagues' finding that "normative conformity only responds to human sources" : In the physical world, the boundaries between human and non-human kinds are clearly distinguishable [4]; However, in the online and virtual environments, this boundary is blurred by the form of media, and the triggering conditions for normative conformity also change accordingly.

5. Conclusion

This review adopts the cognitive-processing perspective of dual-system theory and integrates the "who-how-which" three-dimensional analytical framework to systematically examine the cognitive and neural mechanisms of the conformity effect, as well as its differential manifestations in offline and online contexts. By integrating and analyzing Asch's classic experiments and following extended research, this review attempts to answer a core question: How does the cognitive processing chain by which an individual changes their own judgment under group pressure operate, and what kind of reconstruction has this chain undergone in different media environments?

The conformity effect results from competition between System 1 and System 2 under specific situational conditions, rather than a one-way substitution of one system for the other. When group consensus is prominent, time pressure is significant, or the basis for judgment is insufficient, System 1 is more likely to take the dominant position. When an individual has sufficient cognitive resources and is capable of testing the opinions of the group, System 2 may suppress automatic conformity. This dynamic balance reveals that conformity is not a simple product of rational "failure", but rather an adaptive response of the cognitive system under specific social information conditions.

Informational conformity and normative conformity are essentially separated at three levels: algorithmic, neural and temporal dynamics. Mahmoodi and colleagues' research indicates that informational conformity is manifested as an increase in drift rate [4]. That is, the suggestions of others are processed by individuals as evidence information, thereby accelerating the accumulation of evidence. This process is relatively independently tracked by dACC and plays a role in the early stage of decision-making, while normative conformity is mainly manifested as a shift from the starting point. Social motivation presets prior preferences at the starting point of decision-making, depends on the functional coupling of the dACC and dmPFC-TPJ social brain networks, and changes the reaction boundary in the later stage of decision-making. This separation provides a solid neural computational foundation for understanding "why individual cognition leans towards group choice when group consensus is strong".

The intuitive processing of System 1 is not produced through introspection alone, but rather relies deeply on external social cues at both the attitude formation and metacognitive assessment levels. Morris and Kurdi revealed that intuitive awareness relies on external cues rather than introspection [2]; Pennington and colleagues further demonstrated that the "implicit bias" measured by IAT is

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essentially an automated expression permeated by explicit social norms [3]. Franzeno and Mader, from the perspective of rational limitations, confirmed that even in the face of monetary incentives and objective standards, social influence is still difficult to be completely overcome by System 2 [6]. These findings collectively point to a core mechanism: the output of System 1 is itself a product of social context shaping, rather than merely a cognitive bias that System 2 failed to correct.

Through the reconstruction of the "how" dimension, referring to the contextual presentation of social information, the network context has systematically transformed the conditions and mechanisms underlying traditional conformity. Anonymity weakens the perception of "human social subject specificity" that normative conformity relies on. Individuals may find it difficult to clearly identify the interaction objects behind the screen as real human social subjects, thereby reducing the participation degree of the dmPFC-TPJ social cognitive network and weakening the early input of social cues in the processing chain of normative conformity. Depersonalization has altered the distinctiveness of group identity, transforming the way individuals respond to social norms from "punishment avoidance" to "reward approach". Information overload weakens the analytical resources available to System 2 and amplifies individuals' reliance on heuristic cues such as the number of likes and reviews. From offline to online, the driving mechanism of conformity is shifting from "passive social compromise" to "active reliance on cognitive shortcuts".

The significance of this review lies in its systematic integration of dual-system theory, the three-dimensional framework, and contemporary cognitive neuroscience evidence, and proposing a conformity processing chain analysis model from social information input to behavioral output. This model breaks through the limitation of traditional research that discusses informative conformity and normative conformity separately, reveals the interaction and weight distribution mechanism of the two at different stages of cognitive processing, and provides a new theoretical analysis tool for social impact research. Meanwhile, this review provides a cognitive-level explanatory framework for understanding phenomena such as the formation of public opinion and group polarization in the digital age. When "heat" itself becomes an alternative indicator of "credibility", and when virtual symbols behind the screen replace face-to-face interpersonal interaction, understanding the cognitive mechanism of conformity has gradually become an indispensable part of social life.

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