

# The Status and Prospects of Research on Interpretation Bias

Wang Jieli<sup>1,a,\*</sup>

<sup>1</sup>Gannan Normal University, Ganzhou, China

<sup>a</sup>1781009765@qq.com

\*Corresponding author

**Abstract:** Interpretation bias stands as one of the three fundamental concepts within cognitive processing bias, representing the final stage in the cognitive processing continuum. When individuals encounter information or situations characterized by ambiguity and unclear meanings, some tend to attribute positive interpretations to them (positive interpretation bias), while others exhibit tendencies towards assigning neutral or negative interpretations (negative interpretation bias). This paper delineates the concept of interpretation bias, its associated research materials, paradigms, and pertinent studies. Future research endeavors should devote greater attention to positive interpretation bias, elucidating its distinctive characteristics and internal mechanisms across diverse demographic groups.

**Keywords:** interpretation bias; positive interpretation bias; negative interpretation bias; research paradigm

## 1. Introduction

Individuals encounter a large amount of information with unknown meaning in daily life, and some interpret it positively while others interpret it negatively, illustrating the presence of different interpretation biases among individuals. According to cognitive theory, interpretation represents a late stage of information processing, involving the determination of meaning for ambiguous information <sup>[1]</sup>. Interpretation bias is one of the three processes of cognitive processing bias (alongside attention bias and memory bias) and plays a key role in cognitive processing <sup>[2]</sup>. The current research on interpretation bias is relatively rich, with diverse research materials and paradigms. Therefore, this paper organizes the research on interpretation bias preliminarily, mainly describing the concept of interpretation bias, research materials, research paradigms, and its current research status, aiming to promote further relevant research on interpretation bias.

## 2. Concept of Interpretation Bias

In 1976, Beck introduced the concept of Interpretation Bias for the first time <sup>[2]</sup>. When individuals encounter ambiguous information (e.g., words, language, sounds, facial expressions, actions, etc.) or situations with vague meanings, some tend to assign positive interpretations to them, while others lean towards assigning neutral or negative interpretations. This inclination to interpret ambiguous information or situations is referred to as interpretation bias <sup>[3]</sup>. From a cognitive psychology perspective, the activation of a particular schema or cluster of schemas directly influences the content of one's interpretation <sup>[4]</sup>. Negative schemas facilitate the development of a cognitive processing bias towards negative information during information processing, leading individuals to interpret ambiguous information or situations in a negative manner (negative interpretation bias) <sup>[5]</sup>. Conversely, they may interpret ambiguous information or situations in a positive manner, reflecting a positive interpretation bias. It is important to note that positive and negative interpretation biases are two distinct dimensions, rather than two extremes of a single dimension <sup>[6]</sup>. The absence of positive interpretation bias and the presence of negative interpretation bias represent two different concepts.

To systematically and thoroughly investigate interpretation bias, scholars have further subdivided it into immediate and delayed interpretation biases based on the duration of time subjects expend on forming judgments concerning ambiguous information <sup>[1]</sup>. Immediate interpretation bias manifests as an individual's tendency to swiftly construe a situation currently unfolding, emphasizing the present

tense. In this phase of information processing, individuals lack additional time for contemplation, thus relying on initial impressions for rapid judgment. Conversely, delayed interpretation bias pertains to an individual's inclination to interpret a situation that has previously transpired, occurring after a period of thorough reflection. This form of bias, framed in the past tense, characterizes the later stages of information processing and represents a retrospective evaluation.

### **3. Research Materials for Interpretation Bias**

Researchers employ a variety of experimental materials to investigate interpretation bias, primarily encompassing verbal and nonverbal materials. The three most commonly utilized materials in current experiments are ambiguous words (homophones/homonyms), ambiguous faces (pictures), and fuzzy contextual statements<sup>[7]</sup>.

#### **3.1 Homophones/Homonyms**

Homophones (also referred to as homonyms) are words pronounced similarly but possessing distinct meanings, such as "die" and "dye," or "pain" and "pane." Despite their identical pronunciation, these words carry disparate semantic connotations. Participants were instructed to transcribe the words they believed to have heard correctly, and if predominantly negative words were recorded, it indicated a negative interpretation bias, and conversely, a positive interpretation bias if predominantly positive words were recorded.

Polysemous words, termed homonyms, (also recognized as lexical priming), such as "fly," exhibit a positive interpretation bias for one meaning and a negative interpretation bias for another. In a lexical priming scenario, a vocabulary word serves as a priming stimulus, followed by a particular meaning of the word presented for the subject's judgment. The subject's reaction time is observed, wherein a quicker response to the negative interpretation signifies a negative interpretation bias in the subject; conversely, a quicker response to the positive interpretation indicates a positive interpretation bias. Nonetheless, utilizing the aforementioned vocabulary materials to examine individuals' interpretation bias carries two drawbacks. Firstly, sourcing homophones or homonyms poses a challenge, and secondly, such vocabulary materials necessitate a high level of cultural and educational background among subjects, demanding a certain level of vocabulary proficiency and language comprehension.

#### **3.2 Ambiguous Faces**

Understanding others' facial emotional expressions is vital for comprehending their intentions, beliefs, and states, serving as a prerequisite for social interaction<sup>[8]</sup>. Fuzzy face pictures are created by amalgamating images depicting multiple emotions, such as 20% anger and 80% happiness. During the experiment, participants were tasked with assessing the type or attribute (positive/negative) of the facial image based on their own interpretation. Faces offer richer stimuli compared to words. Furthermore, participants engage in evaluating facial content, thus effectively mitigating potential biases. Nonetheless, in everyday scenarios, the facial expressions we encounter typically convey multiple emotions, subject to rapid fluctuations. Some facial expressions may also conflict with individuals' true inner thoughts, necessitating judgment aided by additional information (e.g., body language and environmental cues)<sup>[9]</sup>. Alternatively, some scholars contend that facial expressions exhibit variability and complexity, potentially influencing subjects' judgment accuracy. Consequently, processing static expressions may diverge from real-life circumstances, with limited generalizability<sup>[10]</sup>.

#### **3.3 Fuzzy contextual statements**

In addition to vocabulary and images, fuzzy contextual statements can also be employed as experimental materials. Compared to words or pictures, fuzzy contextual statements can portray common life situations, making them more relevant to daily life and easier for participants to comprehend. They allow for the flexible establishment of suitable contexts tailored to specific research themes and subjects. For instance, if your research subjects are students in school, you can utilize the following fuzzy scenario: You have a difficult question you want to ask your classmate, and he says he'll talk to you later. What do you think he means? However, if your research subjects are individuals entering the workforce, you should use the following fuzzy scenario: Shortly after you start working, your boss requests to see you. What do you think the reason for this is?

#### **4. Research Paradigms of Interpretation Bias**

The research paradigms concerning interpretation bias are diverse and multifaceted, varying based on the specific type of interpretation bias; however, many articles fail to make this distinction. Immediate and delayed interpretation biases denote distinct stages in the processing of interpretive information, consequently requiring distinct measurement approaches.

##### ***4.1 Research Paradigm for Immediate Interpretation Bias***

The immediate interpretation bias paradigm focuses on identifying individuals' immediate or transient judgments when encountering information with ambiguous meanings. It is commonly investigated using the Word-Sentence Association Paradigm (WSAP) and Vocabulary Choice Task. Of these, WSAP represents the classical paradigm and has been extensively employed in research.

##### ***4.1.1 Word-Sentence Association Paradigm (WSAP)***

WSAP was developed by Beard and Amir (2009). This paradigm involves presenting a word (referred to as the starter word) to the participant, followed by a sentence of ambiguous meaning (referred to as the fuzzy context sentence). Participants are then instructed to make a keystroke response indicating whether the starter word is related to the fuzzy context sentence or not, while also recording their response time<sup>[6]</sup>. One drawback of this paradigm is its inability to ensure that participants thoroughly read and comprehend both the sentences and the words. There is a possibility that participants may choose their responses based solely on intuition or without adequately attending to the content of the sentences. To address this limitation, Hirsch and Mathews made partial adaptations to the paradigm<sup>[11]</sup>. In their modified version, participants are first presented with fuzzy situational sentences (e.g., "I met my friend on the road, I greeted him and he ignored me"). They are then asked to read the sentence, followed by the appearance of an explanatory word with either a positive connotation (e.g., "didn't see it") or a negative connotation (e.g., "ignored me"). Participants are prompted to quickly judge whether there is a correlation between the word and the sentence. Finally, a yes/no question about the contextual sentence is posed to assess whether participants have accurately understood the sentence. The underlying concept behind this paradigm design is that participants already form an interpretation upon reading the contextual sentence. Therefore, they are expected to respond more swiftly, with shorter reaction times, if the subsequent words presented align with their interpretations. By comparing the differences in reaction times for words with different attributes, researchers can infer which attribute of the word the participant holds an interpretive bias toward.

##### ***4.1.2 Vocabulary Choice Task***

The lexical decision task involves initially presenting participants with an ambiguous situational sentence containing both positive and negative explanatory words. Subsequently, a word is presented, and participants judge whether the word can be utilized in the fuzzy situational sentence (whether it is applicable or not), or whether the word can elucidate the fuzzy situational sentence. The participant's responses to various words are recorded when the word is utilized. If the participant responds more rapidly and with a shorter reaction time to a specific word, they are deemed to exhibit this type of interpretive bias. This paradigm has proven effective in investigating interpretation bias among groups such as those with anxiety (e.g., interview anxiety, social anxiety, pain anxiety) and shy college students<sup>[12]</sup>, yielding consistent findings.

##### ***4.2 Research Paradigm for Delayed Interpretation Bias***

Research paradigms for investigating delayed interpretation bias typically rely on self-report measures alone or in combination with rank ordering or rank evaluation techniques. Commonly utilized methods include the Fuzzy Situation Paradigm and Situation Recognition Task<sup>[13]</sup>.

##### ***4.2.1 Fuzzy Situation Paradigm***

The fuzzy situation paradigm is typically presented in written form, with task requirements tailored to the specific group of subjects. Some studies employ open-ended tasks prompting subjects to articulate their initial interpretations of the presented situation<sup>[14]</sup>. Others task subjects with envisioning potential outcomes or speculating on what might happen based on the scenario<sup>[15]</sup>. Alternatively, subjects may be instructed to assess or rank their interpretations of a fuzzy situation<sup>[16]</sup>. For instance, they may be presented with a simple fuzzy scenario (e.g., "You're on the phone and your friend is waiting for you on the side"), followed by a question (e.g., "He suddenly smiles, why do you think that

is?"). Subjects are then presented with three potential explanations for the situation: one positive (e.g., "Because what you said was funny and amused him/her"), one neutral (e.g., "Because he/she happened to remember a joke"), and one negative (e.g., "Because you looked silly on the phone"). Subjects are asked to assess the likelihood of each explanation<sup>[17]</sup>.

#### **4.2.2 Situation Recognition Task**

The situation recognition task, also referred to as the delayed recollection memory task, entails initially presenting participants with an ambiguous scenario imbued with some meaning (e.g., "All the guests at the wedding chuckled at Mark's speech"), and subsequently requiring them to respond to it during a recognition test based on whether the interpretation of the scenario (e.g., "All the guests at the wedding laughed at Mark's speech" and "All the guests at the wedding enjoyed Mark's speech") aligns with the meaning of the original context<sup>[18]</sup>. Building upon this framework, Miles et al. (2009) introduced a similarity scoring task, wherein participants were presented with ambiguous scenarios and then prompted to answer a comprehension question to ensure comprehension. Following the presentation of all scenarios, participants were presented with test sentences containing both positive and negative interpretations of the preceding scenario and asked to rate the similarity of each sentence to the original scenario<sup>[19]</sup>. An advantage of this paradigm is its ability to circumvent the social approval effect<sup>[20]</sup>. However, the outcomes of this task may reflect an individual's memory bias rather than an interpretation bias.

### **5. Related Research on Interpretation Bias**

The literature review has unveiled that the prevailing academic discourse on interpretation bias primarily encompasses the following dimensions: the characteristics of interpretation bias among various groups and the antecedent/consequent variables associated with interpretation bias.

#### **5.1 Characteristics of Interpretation Bias in Different Groups**

Interpretive bias has undergone extensive examination within the domain of psychopathology. Studies involving both clinical and non-clinical cohorts have elucidated the significant role played by interpretive bias in the initiation and progression of psychiatric disorders such as anxiety and depressive disorders<sup>[21-22]</sup>. In comparison to control subjects, a propensity towards negative interpretive bias tends to prevail within groups afflicted with conditions such as panic disorder<sup>[23]</sup>, generalized anxiety disorder<sup>[24]</sup>, social anxiety<sup>[25]</sup>, and depression<sup>[26]</sup>. Additionally, exploration of interpretive bias extends beyond anxiety and depression cohorts to encompass various other groups, including those experiencing cancer-related fears<sup>[27]</sup>, smokers<sup>[28]</sup>, individuals dependent on alcohol<sup>[29]</sup>, chronic pain sufferers<sup>[30]</sup>, social phobia<sup>[31]</sup>, and individuals with anorexia nervosa<sup>[32]</sup>. Furthermore, characteristics of explanatory bias have been examined within demographic subsets such as females<sup>[33]</sup>, adolescents<sup>[17]</sup>, and children<sup>[34]</sup>.

#### **5.2 Antecedent/Consequent Variables of Interpretation Bias**

Researchers have delved into the factors influencing interpretation bias (i.e., antecedent variables), suggesting that both an individual's emotions and cognitions can exert an influence on interpretation bias. Pertinent investigations have demonstrated that individuals experiencing heightened negative emotions tend to harbor a bias towards negative interpretations, evident in conditions such as burnout and depression<sup>[35]</sup>, as well as social anxiety<sup>[36]</sup>. Conversely, individuals displaying elevated positive emotions tend to exhibit a bias towards positive interpretations, as evidenced in studies examining trait gratitude<sup>[37]</sup>. Moreover, an individual's mental health challenges correlate with an inclination towards negative interpretations, with poorer mental health exacerbating tendencies towards either neutral or negative explanations<sup>[38]</sup>. Furthermore, research has elucidated that trait positivity correlates with diminished negative interpretation bias, and that positivity can directly mitigate an individual's propensity towards negative interpretation bias, either independently or through the attenuation of negative emotions<sup>[39]</sup>.

The scholarly community has also investigated the ramifications of interpretive biases (i.e., consequence variables). Individuals with varying interpretive biases exhibit divergent effects on emotions, cognitions, and behaviors. Firstly, emotional impacts are observed, wherein individuals possessing a positive interpretive bias tend to ameliorate social anxiety symptoms<sup>[40]</sup>, whereas those with a negative interpretive bias may foster increased rumination experiences<sup>[41]</sup> and susceptibility to

depression [42]. Secondly, cognitive aspects are influenced, with a positive interpretation bias fostering ethnopsychological integration [43], while a negative interpretation bias may exacerbate feelings of isolation among adolescents [44]. Lastly, behavioral effects are evident; a positive interpretation bias correlates with heightened prosocial behaviors [45], whereas a negative interpretation bias may precipitate an increase in daily negative life events [46], among other consequences.

## 6. Conclusions

In summary, interpretation bias pertains to the positive or negative inclination of individuals when encountering ambiguous information, and can be categorized into immediate interpretation bias and delayed interpretation bias. Different types of interpretation bias entail distinct research paradigms. Immediate interpretation bias research typically employs paradigms such as Word-Sentence Association Paradigm (WSAP) and Vocabulary Choice Task, while delayed interpretation bias research commonly utilizes the Fuzzy Situation Paradigm and Situation Recognition Task. Ambiguous words (homophones/homonyms), ambiguous faces (pictures), and fuzzy contextual statements serve as the primary experimental materials. Current scholarly discourse on explanatory bias primarily focuses on examining its characteristics across diverse demographics and exploring the antecedents/consequences of such biases.

## 7. Research Prospects of Interpretation Bias

It is evident that interpretation bias has garnered significant attention within the academic community, resulting in numerous discussions and the derivation of valuable conclusions. Nonetheless, there remains a need to expand and deepen research in this domain. Future investigations should prioritize the following aspects: (1) Many previous studies have failed to specify whether they addressed immediate or delayed interpretation bias. The distinction between these two types of interpretation bias is pivotal as it pertains to research variables. Moreover, the research paradigms employed in studying these variants of interpretation bias differ, potentially influencing study outcomes. Hence, future research must attend to this point. (2) Existing research predominantly explores the relationship between individual characteristics (primarily emotional and cognitive traits) and interpretation bias, neglecting the influence of external environmental factors. Consequently, future inquiries should focus on elucidating the impact of environmental factors on interpretation bias. (3) Previous studies have predominantly focused on anxiety, depression, fear, and other psychological disorders, with fewer investigations into the characteristics and mechanisms of interpretation bias in normative populations. Thus, future endeavors should concentrate more on interpretation bias within normative groups. (4) Previous research has primarily investigated the association between negative variables and interpretation bias, emphasizing negative interpretive bias while overlooking positive interpretive bias. Given that positive and negative explanatory biases represent two dimensions of interpretive bias, future research should explore the relationship between positive variables (e.g., pro-social behaviors, attachment feelings) and interpretive bias.

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