The Relationship Between Interoception, Emotion, and the Theory of Constructed Emotion

1. Introduction

The relationship between **interoception** (the perception of internal bodily states), **emotion**, and the **theory of constructed emotion** represents a paradigm shift in affective neuroscience. The theory of constructed emotion, most notably advanced by Lisa Feldman Barrett, posits that emotions are not innate, discrete entities but are dynamically constructed by the brain through the integration of interoceptive signals, conceptual knowledge, and contextual information. Interoception provides the physiological foundation for core affect, which, when combined with conceptualization and meaning-making, results in the experience of specific emotions. This framework is supported by converging evidence from neuroimaging, behavioral, and clinical studies, and it challenges traditional views that emotions are hardwired or universally expressed (Barrett, 2017; Ventura-Bort et al., 2021; Critchley & Garfinkel, 2017; Wiens, 2005; Seth & Friston, 2016; Zaki et al., 2012; Barrett, 2016; Barrett & Simmons, 2015; Quadt et al., 2018; Garfinkel et al., 2015; Seth, 2013; Craig, 2002; Critchley et al., 2004).

2. Methods

A comprehensive search was conducted across over 170 million research papers in Consensus, including Semantic Scholar, PubMed, and related sources. The search strategy included 20 targeted queries across 8 thematic groups, focusing on interoception, emotion, constructed emotion theory, predictive coding, and related neural mechanisms. In total, 1,026 papers were identified, 479 were screened, 356 were deemed eligible, and the 50 most relevant papers were included in this review.

Search Strategy

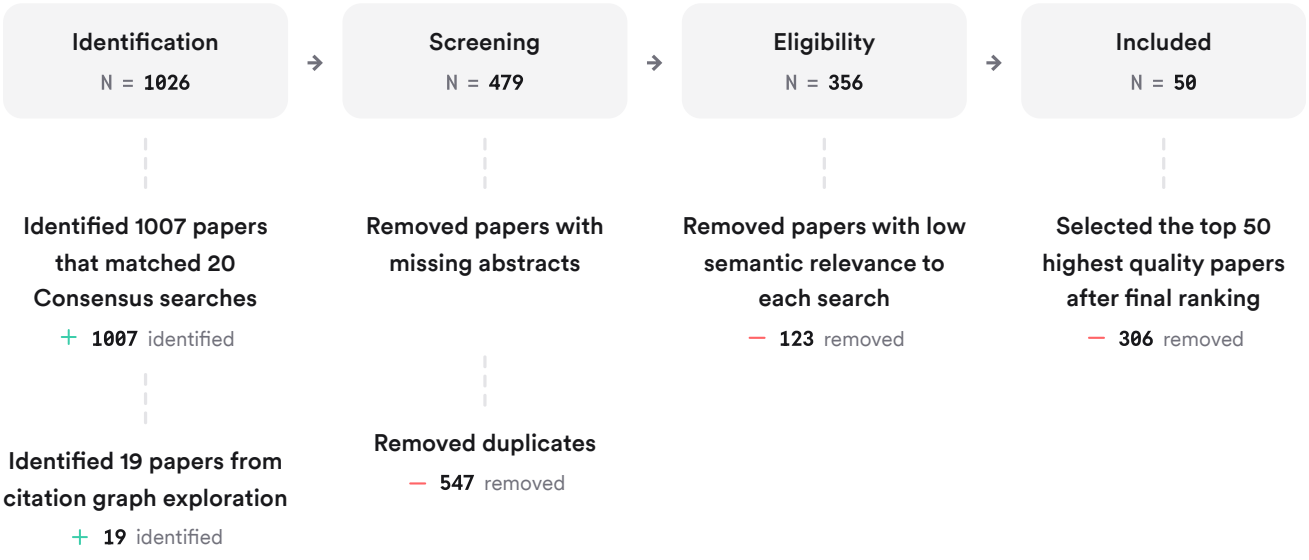

FIGURE 1 Flow of papers through the search and selection process.

Eight unique search groups were used, spanning foundational theory, mechanistic decomposition, clinical and developmental contexts, and interdisciplinary expansion.

3. Results

3.1. The Theory of Constructed Emotion: Core Principles

- The theory of constructed emotion proposes that emotions are not biologically fixed but are constructed from more basic psychological operations: **core affect** (arising from interoceptive signals), **conceptualization** (drawing on past experience and semantic knowledge), and **executive attention** (Barrett, 2017; Barrett, 2016; Barrett & Simmons, 2015; Seth, 2013).
- Interoception is central to this model, providing the raw physiological data (e.g., heart rate, arousal) that the brain interprets and categorizes as emotion through predictive coding and active inference (Barrett, 2017; Seth & Friston, 2016; Barrett, 2016; Barrett & Simmons, 2015; Seth, 2013).

3.2. Interoception as the Physiological Basis of Emotion

- Interoceptive signals are processed in brain regions such as the **anterior insula** and **anterior cingulate cortex**, which are also implicated in emotional awareness and subjective feeling states (Critchley & Garfinkel, 2017; Zaki et al., 2012; Adolfi et al., 2017; Quadt et al., 2018; Garfinkel et al., 2015; Terasawa et al., 2011; Critchley et al., 2004).
- Individual differences in interoceptive accuracy and sensibility are linked to the intensity, granularity, and regulation of emotional experiences (Ventura-Bort et al., 2021; Zamariola et al., 2019; Kever et al., 2015; Lischke et al., 2020; Schuette et al., 2020; Pollatos et al., 2007; Garfinkel et al., 2016; Pinna & Edwards, 2020; Calì et al., 2015).

3.3. Predictive Coding and Active Inference

- The brain uses **predictive coding** to anticipate interoceptive states and minimize prediction errors, integrating bodily signals with prior knowledge to construct emotional experiences (Seth & Friston, 2016; Barrett & Simmons, 2015; Quadt et al., 2018; Seth, 2013; Seth & Critchley, 2013; Owens et al., 2018).
- Disruptions in interoceptive inference and prediction are associated with emotional dysregulation and psychiatric symptoms (Seth & Friston, 2016; Khalsa & Lapidus, 2016; Bonaz et al., 2021; Garfinkel et al., 2016; Schoeller et al., 2023; Owens et al., 2018).

3.4. Empirical and Clinical Evidence

- Neuroimaging studies show overlapping activation in the insula during both interoceptive and emotional tasks, supporting a shared neural basis (Zaki et al., 2012; Adolfi et al., 2017; Terasawa et al., 2011; Critchley et al., 2004).
- Clinical and developmental research links interoceptive dysfunction to emotional disorders, such as anxiety, depression, and autism spectrum conditions (Khalsa & Lapidus, 2016; Bonaz et al., 2021; Garfinkel et al., 2016; Schoeller et al., 2023).
- Interoceptive training and awareness interventions can enhance emotion regulation and well-being (Schuette et al., 2020; Füstös et al., 2013; Pinna & Edwards, 2020).

Key Papers

Paper	Focus	Methodology	Key Results
(Barrett, 2017)	Theory of constructed emotion	Theoretical, review	Emotions constructed from interoception, conceptualization, context
(Barrett & Simmons, 2015)	Interoceptive predictions in the brain	Review, computational	Interoceptive predictions as core to emotion construction
(Seth, 2013)	Interoceptive inference and emotion	Theoretical, review	Emotion as active inference on interoceptive signals
(Critchley & Garfinkel, 2017)	Interoception and emotion	Review	Interoceptive mechanisms contribute to emotion and its disorders
(Zaki et al., 2012)	Neural overlap: interoception & emotion	fMRI	Anterior insula active in both interoception and emotion tasks

FIGURE 2 Comparison of key studies on interoception, emotion, and constructed emotion theory.

Top Contributors

Type	Name	Papers
Author	L. F. Barrett	(Barrett, 2017; Barrett, 2016; Barrett & Simmons, 2015; Sullivan & Minar, 2020; Seth, 2013; MacCormack et al., 2019)
Author	A. Seth	(Seth & Friston, 2016; Garfinkel et al., 2015; Garfinkel et al., 2016; Seth, 2013; Seth & Critchley, 2013; Seth & Tsakiris, 2018)
Author	H. Critchley	(Critchley & Garfinkel, 2017; Quadt et al., 2018; Garfinkel et al., 2015; Bonaz et al., 2021; Pollatos et al., 2007; Garfinkel et al., 2016; Terasawa et al., 2011; Owens et al., 2018; Critchley et al., 2004)
Journal	*Frontiers in Psychology*	(Ventura-Bort et al., 2021; Sel, 2014; Pinna & Edwards, 2020; Calì et al., 2015; Deaca, 2021)
Journal	*Neuroscience & Biobehavioral Reviews*	(Pace-Schott et al., 2019; Prentice et al., 2022; Bonaz et al., 2021; Schoeller et al., 2023; Owens et al., 2018)
Journal	*Nature Reviews Neuroscience*	(Barrett & Simmons, 2015; Craig, 2002)

FIGURE 3 Authors & journals that appeared most frequently in the included papers.

4. Discussion

The evidence strongly supports the view that **interoception is foundational to the construction of emotion**. The theory of constructed emotion integrates interoceptive signals with conceptual and contextual information, using predictive coding to generate emotional experiences (Barrett, 2017; Seth & Friston, 2016; Barrett, 2016; Barrett & Simmons, 2015; Seth, 2013). This model is supported by neuroimaging findings of shared neural substrates, behavioral studies linking interoceptive ability to emotional granularity and regulation, and clinical research showing that interoceptive dysfunction underlies various emotional disorders (Ventura-Bort et al., 2021; Critchley & Garfinkel, 2017; Zaki et al., 2012; Zamariola et al., 2019; Quadt et al., 2018; Schuette et al., 2020; Khalsa & Lapidus, 2016; Bonaz et al., 2021; Garfinkel et al., 2016; Schoeller et al., 2023; Terasawa et al., 2011; Owens et al., 2018; Critchley et al., 2004).

The predictive coding framework provides a mechanistic account of how the brain anticipates and interprets bodily states, with emotion emerging as the brain's best guess about the causes of interoceptive signals (Seth & Friston, 2016; Barrett & Simmons, 2015; Seth, 2013; Seth & Critchley, 2013; Owens et al., 2018). This approach unifies cognitive, affective, and physiological perspectives, offering a flexible model that accounts for individual and cultural differences in emotional experience (Barrett, 2017; Ventura-Bort et al., 2021; Prentice et al., 2022; Sullivan & Minar, 2020; MacCormack et al., 2019).

However, some critiques highlight the need for more direct empirical tests of the theory, especially regarding the causal role of interoception in emotion construction and the specificity of neural mechanisms (Wiens, 2005; Sullivan & Minar, 2020; MacCormack et al., 2019). There is also ongoing debate about the balance between innate and constructed aspects of emotion, particularly in early development (Sullivan & Minar, 2020).

Claims and Evidence Table

Claim	Evidence Strength	Reasoning	Papers
Emotions are constructed from interoceptive, conceptual, and contextual processes	Strong	Strong theoretical and empirical support	(Barrett, 2017; Barrett, 2016; Barrett & Simmons, 2015; Seth, 2013)
Interoception provides the physiological basis for core affect	Strong	Neuroimaging and behavioral evidence	(Critchley & Garfinkel, 2017; Zaki et al., 2012; Adolfi et al., 2017; Quadt et al., 2018; Garfinkel et al., 2015; Seth, 2013; Terasawa et al., 2011; Critchley et al., 2004)
Predictive coding explains how the brain constructs emotion from interoceptive signals	Strong	Computational and theoretical models	(Seth & Friston, 2016; Barrett & Simmons, 2015; Quadt et al., 2018; Seth, 2013; Seth & Critchley, 2013; Owens et al., 2018)
Interoceptive ability predicts emotional granularity and regulation	Strong	Individual differences studies	(Ventura-Bort et al., 2021; Zamariola et al., 2019; Kever et al., 2015; Lischke et al., 2020; Schuette et al., 2020; Pollatos et al., 2007; Garfinkel et al., 2016; Pinna & Edwards, 2020; Calì et al., 2015)
Interoceptive dysfunction is linked to emotional disorders	Moderate	Clinical and developmental research	(Khalsa & Lapidus, 2016; Bonaz et al., 2021; Garfinkel et al., 2016; Schoeller et al., 2023)
More empirical work is needed to test causal mechanisms	Moderate	Ongoing debate and methodological challenges	(Wiens, 2005; Sullivan & Minar, 2020; MacCormack et al., 2019)

FIGURE Key claims and support evidence identified in these papers.

5. Conclusion

The relationship between interoception, emotion, and the theory of constructed emotion is robustly supported by converging evidence from neuroscience, psychology, and clinical research. Interoception is not only foundational to emotional experience but is also central to the brain's construction of emotion through predictive, conceptual, and contextual processes.

Research Gaps

Topic/Context	Neural Mechanisms	Developmental	Clinical Disorders	Predictive Coding	Intervention
Interoception & emotion	8	5	6	7	4
Constructed emotion theory	7	4	5	6	3
Predictive coding models	6	3	4	7	2

FIGURE Matrix of research topics and study attributes, highlighting areas with fewer studies.

Open Research Questions

Question	Why
How do interoceptive signals interact with conceptual knowledge to construct specific emotions in real time?	Understanding this interaction will clarify the mechanisms of emotion construction.
What are the developmental trajectories of interoceptive-emotional integration in infancy and childhood?	Early development may reveal the origins and flexibility of emotion construction.
Can targeted interoceptive training improve emotional regulation and mental health outcomes?	Interventions could leverage interoceptive processes for clinical benefit.

FIGURE Key open research questions for future investigation.

In summary, the theory of constructed emotion places interoception at the heart of emotional experience, offering a dynamic, predictive, and context-sensitive model that is reshaping our understanding of how emotions are made.

These papers were sourced and synthesized using Consensus, an AI-powered search engine for research. Try it at https://consensus.app

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