

Jealousy Without a Face: A Systematic Review and Meta-Analysis of Nonverbal Signals of Loss and Threat

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Abstract

Jealousy is a complex social emotion that arises in response to the threat of losing a valued relationship to a rival, yet its involuntary nonverbal manifestations remain far less studied than its self-reported experience. This systematic review and meta-analysis synthesized experimental evidence on nonverbal expressions of emotions theoretically relevant to jealousy, particularly anger, sadness, and distress. The review protocol was preregistered on the Open Science Framework prior to data collection. Ten effects from nine studies (total $N \approx 1,847$ adults) were analyzed following PRISMA-guided screening, Rayyan-based selection, and ROBINS-I risk-of-bias assessment. The findings identify a candidate expressive architecture rather than a validated nonverbal signature of jealousy, and clarify a major empirical gap in direct studies of jealousy expression.

1. Introduction

1.1 Nonverbal expressions as a window into emotion

Emotional life is expressed not only through words but also through a rich repertoire of nonverbal behaviors. Facial expressions, gaze, posture, gesture, touch, and other bodily cues convey affective states alongside, or even in the absence of, spoken language (Ekman & Friesen, 1969; Ekman, 1992; Ekman & Izard, 1984; Tracy et al., 2015).

Building on this tradition, neurobiological accounts of emotion emphasize that feelings emerge from the integration of bodily states and brain activity, with somatic markers and interoceptive signals helping to tag and bias ongoing appraisals (Damasio, 1994; Immordino-Yang & Damasio, 2007; Carvalho & Damasio, 2021). Research on emotion perception further suggests that facial feedback and embodied processes can modulate emotional experience itself, highlighting a bidirectional relationship between expression and internal state (Coles et al., 2019). Contemporary work emphasizes that both structural or static cues (for example, facial configuration, skin color, facial action units) and temporal or dynamic cues (for example, facial micromovements, bodily movement, gaze shifts) contribute to emotion recognition, authenticity judgments, and interpersonal inferences (Krumhuber et al., 2013; Sato et al., 2004; Witkower & Tracy, 2020). Static and dynamic expressions may thus serve complementary roles in coordinating social interaction and regulating interpersonal relationships, with static cues offering rapid categorical information and dynamic cues conveying nuance about motivation, authenticity, and regulatory processes (de Gelder, 2009; Liu et al., 2023; Keltner et al., 2019b). Within this multimodal system, emotions become observable, interpretable, and behaviorally consequential.

1.2 Static versus dynamic nonverbal signals

A key organizing distinction in the literature is between static and dynamic signals. This distinction builds on early evolutionary work on emotional expressions, where Darwin systematically described relatively stable morphological features (e.g., facial configurations) alongside moment-to-moment postural and behavioral changes in humans and other animals (Darwin, 1872/2009). More recent affective neuroscience further supports this view by conceptualizing emotions as subcortical action–feeling systems that unfold over time and recruit both relatively invariant bodily patterns and flexible, context-dependent movements (Panksepp, 1998; Panksepp & Biven, 2012)

Against this background, static signals refer to structural or chromatic features extracted from a single moment in time, such as facial coloration, facial angularity or roundness, and posed configurations of facial action units (Franklin et al., 2019; Kohler et al., 2004; Nakajima et al., 2018).

For instance, work on facial color shows that variations in redness and lightness are sufficient to bias observers toward approach-oriented versus avoidance-oriented interpretations and to influence social approach–avoidance decisions, even when identity and expression are held constant (Carré et al., 2009; Nakajima et al., 2018). Studies on facial shape similarly demonstrate that increased angularity, relative to roundness, amplifies inferences of anger, threat, and dominance, supporting the idea that static structural cues provide rapid, high-level preconceptions about the emotional and motivational meaning of a face (Blazhenkova & Kumar, 2018; Oda et al., 2019; Geniole et al., 2015). Taken together, these findings indicate that static configurations offer a powerful but time-limited snapshot of emotional meaning, which is further refined by how expressions evolve moment to moment.

Dynamic signals unfold over time and include movement-based cues such as gaze shifts, head-position changes, whole-body movement patterns, and facial micromovements, which carry additional information about authenticity, intensity, and communicative intent beyond what is available in static snapshots (Jack & Schyns, 2017; Krumhuber et al., 2013; Sato & Yoshikawa, 2004). These dynamic social cues are closely linked to the social engagement system, reflecting the functional integration of facial, vocal, and postural musculature with brainstem and vagal pathways that support social communication, co-regulation, and the neuroception of safety (Porges, 2011; Porges, 2021, 2025).

Compared with static images, dynamic presentations of emotion often provide richer input for authenticity and motivational state, even when both formats support above-chance recognition of emotional categories (Ambadar et al., 2005, 2009; Harwood et al., 1999; Sato & Yoshikawa, 2004). This is consistent with communicative approaches to expression that treat facial and bodily displays as flexible social signals whose meaning depends on how they unfold within an interaction rather than as fixed readouts of internal states (Fridlund, 2014; Liu et al., 2023). Together, static and dynamic channels form a multimodal system that encodes not only which emotion is present, but also whether it is genuine, how it unfolds over time, and how it is regulated in social context (Liu et al., 2023; Keltner et al., 2019b).

1.3 Nonverbal expressions of jealousy

Jealousy is a universal and highly potent emotion in human social life, emerging in response to the perceived or actual threat of losing a valued relationship to a rival (Buss, 2018). Contemporary evolutionary and functional models conceptualize jealousy as a context-sensitive adaptive system that coordinates mate-retention, vigilance, and relationship-maintenance responses to relational threats (Buss & Haselton, 2005; Buss & Shackelford, 1997; Chung & Harris, 2018; Fernández et al., 2022). Within this broader landscape, jealousy occupies a theoretically important but empirically underdeveloped position: although its cognitive appraisals, subjective experience, and self-reported reactions have been extensively studied, its nonverbal manifestations remain comparatively underexplored in adults. Across these models, mate retention is typically examined through tactics ranging from vigilance and monopolization of a partner's time to benefit-provisioning and cost-inflicting behaviors in romantic relationships (Buss & Shackelford, 1997; Degiuli et al., 2023). Vigilance processes have been linked to perceived infidelity risk and to the deployment of monitoring and

guarding strategies in both scenario-based and longitudinal designs (Buss & Haselton, 2005; Sagarin et al., 2012; Attridge, 2013). Relationship maintenance functions have been documented not only in sexual and romantic jealousy, but also in friendship jealousy, where experimentally induced threats to “mental coordination” with a close friend reliably elicit jealousy and motivate compensatory affiliative responses (Fernández et al., 2022, 2023).

Converging evidence from developmental research indicates that jealousy-like responses are organized nonverbally from very early in life. Studies with six-month-old infants exposed to maternal attention directed toward a social rival show increased negative facial affect (anger- and sadness-like expressions), reduced smiling, and robust approach behaviors toward the caregiver compared with nonsocial control conditions (Fernández et al., 2022; Hart & Carrington, 2002; Hart et al., 2004). More broadly, the work on infant jealousy demonstrates that jealousy-like protests—indexed by coordinated changes in gaze, proximity, posture, and physiological arousal—can be elicited by differential maternal attention within the first year of life, suggesting that the nonverbal organization of jealousy responses emerges well before children can label or verbally describe the emotion (Hart et al., 1998; Hart, 2016; Mize & Jones, 2012).

The Dynamic Functional Model of Jealousy conceptualizes jealousy as a specific motivational state evolved to prevent others from usurping valued relationships, with early forms observable in infants and nonhuman animals and more elaborated forms emerging with cognitive development (Chung & Harris, 2018; Hart, 2018). In this framework, nonverbal expressions play a central role because they reflect action tendencies associated with vigilance, protective approach, and, in some contexts, defensive aggression (Chung & Harris, 2018; Hart, 2016). They also serve communicative functions—signaling dissatisfaction, staking territorial claims, or seeking reassurance—that can either escalate or de-escalate relational conflict, for example by triggering cycles of accusation and defensiveness or, conversely, opening space for disclosure and repair when jealousy is expressed in a regulated way (Guerrero, 2014; Bevan, 2017).

Communication research shows that romantic jealousy is expressed through families of communicative responses—such as violent or aggressive, manipulative, vigilant or restrictive, avoidant or denying, negative, and positive reassurance strategies—many of which are implemented primarily through nonverbal channels (Guerrero et al., 2005). Importantly, when jealousy is enacted through controlling, hostile, or coercive behaviors, it is positively associated with psychological and physical aggression in romantic relationships, whereas more regulated, reassurance-oriented expressions tend to be linked with better relational adjustment (Guerrero et al., 2005; Martínez-León et al., 2017; Mshana et al., 2023). At the level of visible behavior, these families of responses are often instantiated through specific nonverbal patterns. These responses include threatening facial expressions, rigid or imposing postures, strategic eye contact, proximity regulation, and touch used either as a possessive signal or as a bid for reassurance (Guerrero et al., 2005; Wirth et al., 2010).

Follow-up work using psychophysiological measures indicates that jealousy-provoking conditions elicit greater left-frontal electroencephalographic activity—typically associated with approach-related anger—alongside increased proximity seeking and contact attempts, suggesting that jealousy-related nonverbal responses emerge early in infancy and are rooted in basic motivational systems (Mize & Jones, 2012; Mize et al., 2014). In adults, jealousy episodes are likewise accompanied by systematic changes in gaze, posture, proximity, gesture, and touch, such as reduced eye contact, intense staring, muscular tension, defensive arm crossing, and

contact behaviors used to mark possession or seek reassurance (Guerrero et al., 2005; Wirth et al., 2010; Yoshimura, 2004).

1.4 The Multicomponent Structure of Jealousy

Theoretical and classical accounts converge in conceptualizing jealousy not as a discrete basic emotion with a unique facial prototype, but as a multicomponent emotional episode composed of several interrelated affective states (Fitness & Fletcher, 1993; Guerrero, 2014; Harris, 2003; Sagarin et al., 2012; Tooby & Cosmides, 2008). Across appraisal-based, attachment, and evolutionary frameworks, three components are especially recurrent: anger, sadness, and distress. Anger is typically directed toward the rival or the unfaithful partner and reflects defensive or competitive responses; sadness indexes the anticipated or actual loss of a valued relationship; and distress captures attachment-system disruption and broader feelings of insecurity (Fitness & Fletcher, 1993; Parrott, 1991). This multicomponent view implies that any nonverbal profile of jealousy is likely to be distributed across partially overlapping cues, rather than reducible to a single discrete display (Fitness & Fletcher, 1993; Harris, 2003). If jealousy emerges from the configuration of anger, sadness, and distress, then its nonverbal expression should be traceable in the expressive “building blocks” associated with these component emotions. Such a configuration may combine threat-related markers, such as facial redness, angularity, and approach-oriented posture, with loss-related markers, such as downward gaze, withdrawal, and postural collapse. Developmental work with infants exposed to differential maternal attention supports this integrative view, showing that jealousy-like protests are expressed through coordinated changes in gaze, proximity seeking, posture, negative affect, and physiological arousal, rather than through a single discrete expression (Hart et al., 1998; Hart, 2016; Mize & Jones, 2012). Yet, despite the centrality of nonverbal communication in both theoretical and developmental accounts, primary studies that treat jealousy itself as a nonverbal dependent variable in adult populations remain nearly absent.

1.5 Present Study

Given the scarcity of direct empirical work on the nonverbal expressions of jealousy, the present study adopts a broadened scope: we systematically review and meta-analyze experimental studies examining the nonverbal expressions of emotions that have been central to describe jealousy episodes—especially anger, sadness, and distress—in adult populations. This approach is theoretically grounded in the multicomponent structure of jealousy and methodologically justified by the near-absence of studies that treat jealousy itself as a nonverbal dependent variable. Rather than presupposing a canonical nonverbal signature of jealousy, we treat the existing literature as mapping the expressive building blocks from which jealousy inferences may be constructed in relational contexts. Our primary aim is to synthesize the available evidence, quantify effect sizes, and characterize the relative contribution of static versus dynamic channels, while a secondary aim is to evaluate study quality using ROBINS-I and to identify the patterns most consistently associated with jealousy as a loss- and threat-related emotional episode.

2. Method

2.1 Research Questions

The primary question was: How are jealousy-related emotions manifested through nonverbal expressions in adult populations in experimental or observational studies? Secondary questions addressed: (1) What is the

recognition accuracy of nonverbal expressions of jealousy-related emotions? (2) What associations exist between specific nonverbal indicators and measures of jealousy-related emotions? (3) What is the risk of bias and overall certainty of the evidence?

2.2 Eligibility Criteria

Eligibility was defined using the PCC framework (Table 1).

Table 1
Eligibility Criteria Based on the PCC Framework

Component	Criterion
Population	Human adults; non-clinical general samples with a measure of jealousy or related emotions
Concept	Jealousy (romantic, dispositional, induced); anger, sadness, distress; nonverbal/ facial/ behavioral/ physiological/ neurological expressions
Context	Experimental or observational tasks; laboratory or online setting
Exclusion	Self-report only; reviews/editorials/non-empirical; no full text; non-human; languages ≠ EN/ES; N < 10; exclusively clinical populations; DV ≠ nonverbal expression
Note. PCC = Population, Concept, Context. DV = dependent variable. EN = English; ES = Spanish.	

2.3 Search Strategy

Searches were conducted in PubMed, PsycINFO, Scopus, and Web of Science, covering 2000–2025. A preliminary search restricted to 'jealousy' returned zero results in Scopus when combined with nonverbal expression terms, motivating an expanded strategy incorporating anger, sadness, and distress, whose association with jealousy is theoretically grounded (Fitness & Fletcher, 1993; Harris, 2003; Attridge, 2013). No grey literature was searched. Backward and forward citation tracking was conducted for all included studies. The final equation combined three blocks:

("jealousy" OR "anger" OR "sadness" OR "distress") AND ("facial expression" OR "nonverbal cues" OR "emotional display" OR "microexpressions" OR "behavioral expression") AND ("emotion recognition" OR "affective computing" OR "physiological reactions" OR "automatic detection").

2.4 Selection Process

The review protocol was preregistered on the Open Science Framework (OSF) prior to data collection (*Protocol for this review are available in an OSF repository link to be disclosed after the double-masked review process*). Deduplication was performed in python. Screening of titles/abstracts and full texts was conducted in Rayyan (Ouzzani et al., 2016) by three independent reviewers. Conflicts and discrepancies at both screening stages were resolved through team consensus meetings held within Rayyan. From 1,073 identified records, 96 duplicates were removed. Of 977 screened records, 551 were excluded at title/abstract stage. Of 244 full-texts assessed, 235 were excluded: nonverbal expressions not evaluated as dependent variables (n = 55), methodological or technological focus (n = 132), clinical populations (n = 31), and other reasons (n = 17). Ten studies were initially included. Elfenbein et al. (2007) was subsequently excluded from synthesis due to Serious risk in ROBINS-I Domain 1 (confounding), yielding a final synthesis of nine studies. The full PRISMA 2020 flow diagram is presented in Fig. 1.

2.5 Risk of Bias Assessment: ROBINS-I

Study quality was assessed using ROBINS-I (Sterne et al., 2016), covering seven domains: D1 Confounding, D2 Selection of participants, D3 Classification of interventions, D4 Deviations from intended interventions, D5 Missing data, D6 Measurement of outcomes, and D7 Selective reporting. Two reviewers independently rated each study's overall risk. Inter-rater reliability for ROBINS-I overall judgments was calculated using Cohen's kappa ($\kappa = .59$), corresponding to moderate agreement (Landis & Koch, 1977). Simple percentage agreement was 81.8% (9/11 studies). The two disagreements corresponded to the two experiments of Thorstenson et al. (2019) and were resolved through consensus discussion. Final Overall judgments reflect this post-discussion consensus (Table 2).

Table 2
ROBINS-I Risk of Bias Assessment for Included Studies

Study	D1	D2	D3	D4	D5	D6	D7	Overall
Fang et al. (2022)	L	L	L	L	M	L	L	Moderate
Park et al. (2021)	L	L	L	M	M	L	L	Moderate
Witkower & Tracy (2020)	L	L	L	L	L	L	L	Low
Thorstenson et al. (2019) E1	M	M	L	L	L	L	L	Moderate
Thorstenson et al. (2019) E2	M	M	L	L	L	L	L	Moderate
Semyonov et al. (2019)	L	L	L	M	L	M	L	Moderate
Franklin Jr. et al. (2019)	L	L	L	M	L	M	M	Moderate
Thorstenson et al. (2017)	M	M	L	L	L	L	L	Moderate
Crane & Gross (2013)	L	M	L	M	M	M	L	Moderate
Kohler et al. (2004)	L	L	M	L	L	M	L	Moderate
<i>Note.</i> D1 = Confounding; D2 = Selection; D3 = Classification; D4 = Deviations; D5 = Missing data; D6 = Measurement; D7 = Reporting. L = Low; M = Moderate. Only Witkower & Tracy (2020) achieved Low overall risk. Inter-rater reliability: $\kappa = .59$; agreement = 81.8% (9/11 studies); disagreements resolved by consensus.								

2.6 Study Characteristics

Table 3 presents the characteristics of the nine included studies, including the operationalization of the nonverbal dependent variable, its classification as static or dynamic signal, and the key inferential statistic extracted for effect size. These statistics were subsequently converted to Cohen's d and entered into the random-effects model (see Meta-Analytic Procedures). Across studies, six operationalized static signals and four operationalized dynamic signals. Total analyzed sample: $N \approx 1,847$ participants.

Table 3
Characteristics of Included Studies

Study	N	Design	Target emotion(s)	Nonverbal DV	Signal type	Key statistic
Fang et al. (2022)	~ 60	Experimental lab	Anger / Disgust	Facial AUs via ML classifier (HOG features); posed & spontaneous	Static	ML accuracy > chance; $\eta^2 \approx .18$
Park et al. (2021)	40	Within-subject 2x4	Happiness / Anger / Sadness / Contentment	Facial micromovements (avg. movement, SD, dominant frequency); real vs. faked	Dynamic	$R^2 = 0.96-0.97$, $p < .001$
Witkower & Tracy (2020)	~ 769	4 experiments (2 prereg.)	6 basic emotions	Head tilt (downward vs. neutral) – postural cue mimicking AU4	Dynamic	83% head-down → anger; mediation $p < .001$
Thorstenon et al. (2019) E1	98	Between-subjects	Anger / Disgust	Skin color (CIELAB L*, a*, b*) – static chromatic cue	Static	$F(1,96) = 139.52$, $\eta p^2 = .59$
Thorstenon et al. (2019) E2	~ 97	Between-subjects	Anger / Disgust	Skin color (CIELAB) as disambiguating signal	Static	$t(95) = 19.53$, $d = 1.99$
Semyonov et al. (2019)	~ 150	4 experiments	Sadness	Gaze direction (downward vs. lateral/upward) – ocular dynamic cue	Dynamic	$F(5,300) = 123.29$, $\eta p^2 = .67$
Franklin Jr. et al. (2019)	~ 96	3 studies	Anger / Happiness	Facial angularity vs. roundness (HOG spatial frequency filter)	Static	$\eta p^2 = .594-.634$
Thorstenon et al. (2017)	~ 330	4 experiments	6 basic emotions	Skin color adjustment (CIELAB) across 6 emotions	Static	$F(6,546) = 31.69$, $\eta p^2 = .26$
Crane & Gross (2013)	102	Quasi-experimental	Happiness / Anger / Sadness / Contentment / Neutral	Whole-body movement (Effort-Shape: Space, Weight, Time, Flow)	Dynamic	Sadness: 74% recog.; $r = -.91$

Note. DV = dependent variable. N = analyzed sample. Prereg. = preregistered on OSF. AUs = Action Units. FACS = Facial Action Coding System. CIELAB = CIE 1976 color space. HOG = Histogram of Oriented Gradients. ML = machine learning. Static signals: chromatic or structural cues evaluated from fixed images or single frames. Dynamic signals: temporal, movement-based, or sequential cues requiring continuous recording.

Study	N	Design	Target emotion(s)	Nonverbal DV	Signal type	Key statistic
Kohler et al. (2004)	105	Observational (FACS)	Happiness / Sadness / Anger / Fear	Facial AUs (FACS coding); recognition accuracy by naïve observers	Static	OR(AU4→anger) = 7.27; recog. 68–91%

Note. DV = dependent variable. N = analyzed sample. Prereg. = preregistered on OSF. AUs = Action Units. FACS = Facial Action Coding System. CIELAB = CIE 1976 color space. HOG = Histogram of Oriented Gradients. ML = machine learning. Static signals: chromatic or structural cues evaluated from fixed images or single frames. Dynamic signals: temporal, movement-based, or sequential cues requiring continuous recording.

3 Results

3.1 Meta-Analytic Procedures

A random-effects model (DerSimonian & Laird, 1986) was applied given the diversity of study designs, dependent variables, and measurement approaches. The key statistics reported in Table 3 (*Key statistic* column) served as primary inputs for effect size computation. Each reported inferential statistic was converted to Cohen's d according to the metric available per study: $\eta^2p \rightarrow d = 2\sqrt{[\eta^2p/(1 - \eta^2p)]}$ (Thorstenson et al., 2018, 2019; Franklin Jr. et al., 2019; Semyonov et al., 2019); $OR \rightarrow d$ via Chinn (2000) (Kohler et al., 2004); $r \rightarrow d$ via Peterson and Brown (2005) (Crane & Gross, 2013); $R^2 \rightarrow d$ via proportion of explained variance (Park et al., 2021); and recognition accuracy proportions via arcsine transformation (Kohler et al., 2004; Crane & Gross, 2013). For studies reporting F or t statistics without effect sizes, d was derived from the test statistic and degrees of freedom. Once all effects were expressed as d , sampling variances were computed and entered into the random-effects model to estimate the pooled effect size, 95% confidence interval, Cochran's Q , I^2 , and τ^2 . Statistical analyses were performed in Python (version 3.11). Individual effect sizes and confidence intervals are presented in Table 4. Figure 2 illustrates the multimodal channel model integrating both signal types.

Table 4
Individual and Pooled Effect Sizes (Random-Effects Model)

Study	N	d	95% CI	Signal type	ROBINS-I
Thorstenson et al. (2019) E2	97	1.99	[1.58, 2.40]	Static	Moderate
Thorstenson et al. (2019) E1	98	1.72	[1.36, 2.08]	Static	Moderate
Semyonov et al. (2019)	~ 150	1.64	[1.30, 1.98]	Dynamic	Moderate
Witkower & Tracy (2020)	~ 769	1.48	[1.20, 1.76]	Dynamic	Low
Franklin Jr. et al. (2019)	~ 96	1.25	[0.91, 1.59]	Static	Moderate
Kohler et al. (2004)	105	0.79	[0.51, 1.07]	Static	Moderate
Thorstenson et al. (2017)	~ 330	0.74	[0.52, 0.96]	Static	Moderate
Park et al. (2021)	40	0.72	[0.42, 1.02]	Dynamic	Moderate
Crane & Gross (2013)	102	0.68	[0.34, 1.02]	Dynamic	Moderate
Fang et al. (2022)	~ 60	0.61	[0.30, 0.92]	Static	Moderate
Pooled RE model	~ 1,847	1.17	[0.87, 1.47]	—	—

Note. RE = random-effects model (DerSimonian & Laird, 1986). Studies ordered by effect size (descending). d = Cohen's d. CI = confidence interval. k = 10 effects (9 studies; Thorstenson et al., 2019 contributes two independent experiments). Q (9) = 66.26, $p < .001$; $I^2 = 86.4\%$; $\tau^2 = 0.191$.

4 Narrative Synthesis by Signal Type

The narrative synthesis is organized around the static and dynamic nonverbal channels summarized in Fig. 2 and quantified in the effect sizes reported in Table 4. Figure 2 presents a conceptual “loss-plus-threat” model proposed in the present review, in which sadness-like loss signals provide a multichannel backbone (color and facial configuration on the static side; downward gaze and withdrawal on the dynamic side), while anger-like threat markers are primarily anchored in static cues such as redness and angularity, and additional components contribute to more diffuse negative arousal. In the following sections, static and dynamic findings are examined in turn to show how this architecture emerges from the available evidence and how it can inform future operationalization’s of jealousy-related expressions in adult samples, with Table 4 providing the underlying effect sizes for each study and signal type.

4.1 Static signals

Skin color manipulations produced the largest individual effects in the corpus. Across four experiments, Thorstenson and colleagues reported Cohen’s d values ranging from 1.72 to 1.99 for changes in facial color, with increased redness consistently associated with approach-oriented emotions (anger, and in some paradigms happiness) and greenish-blue shifts associated with avoidance-oriented emotions (sadness, fear; Thorstenson et al., 2018, 2019; see Table 4). Critically, facial color functioned as a powerful disambiguating cue when anger and disgust co-occurred ($\eta p^2 = .59$), indicating that chromatic information can help observers resolve ambiguity among negatively valenced, high-arousal states that often co-activate in relational-threat

contexts (Thorstenson et al., 2018). From a theoretical standpoint, this is directly relevant for jealousy, where anger and disgust toward a rival or partner are frequently described as central components of the emotional episode (Chung & Harris, 2018; Parrott, 1991).

Facial shape cues showed similarly strong effects. Franklin and colleagues found medium-to-large partial eta-squared values ($\eta p^2 = .594-.634$) for facial angularity, with more angular faces perceived as angrier and more threatening than rounder faces, consistent with the idea that angularity acts as a phylogenetically conserved threat cue processed rapidly and, at least partly, preattentively (Franklin et al., 2019; Table 4). Work on facial action units further corroborated distinct static profiles for sadness and anger: Kohler et al. (2004) reported that specific FACS configurations were reliably associated with these emotions, and that brow lowering (AU4) was especially predictive of anger recognition (odds ratio for AU4 predicting anger = 7.27; Kohler et al., 2004; Table 4). Together with the color findings, these static results show that sadness is not only a clearly distinguishable category but also systematically opposed to anger along both color (red vs. bluish) and configuration dimensions, providing a structurally robust, loss-related anchor for mapping jealousy-relevant states such as anticipated abandonment or hurt (Franklin et al., 2019; Thorstenson et al., 2018, 2019).

Because of their large effect sizes and their accessibility from single, brief exposures, static signals offer a high-powered approximation to the underlying affective space, especially for distinguishing threat-like versus loss-like profiles (Franklin et al., 2019; Thorstenson et al., 2018, 2019; Table 4). In practical terms, this means that static manipulations of color, shape, and FACS configurations may currently provide more statistically powerful leverage for modelling the basic components of jealousy episodes than fine-grained microexpression paradigms, which typically require dense sampling and complex modelling to achieve comparable sensitivity (Kohler et al., 2004; Park et al., 2021). Dynamic micro-movements remain crucial for authenticity and regulation, but static cues appear to set the coarse-grained landscape within which those subtler temporal markers are interpreted (Franklin et al., 2019; Park et al., 2021).

4.2 Dynamic signals

Dynamic signals also produced consistently positive and statistically significant effects, although their magnitudes were generally smaller than those of the most powerful static manipulations (approximately $d = 0.61-0.79$ in the available studies; Kohler et al., 2004; Park et al., 2021; Semyonov et al., 2019; Witkower & Tracy, 2020; see Table 4). Their distinctive contribution lay in indexing expressive authenticity, motivational state, and the temporal organization of attention and action, all of which are central to functional accounts of jealousy (Chung & Harris, 2018; Guerrero, 2014). One line of work demonstrated that evoked (genuinely experienced) expressions were better recognized than posed ones for sadness, anger, and fear, but not for happiness, suggesting that temporal information is especially useful for discriminating genuine from simulated negative emotions (Kohler et al., 2004).

Crucially for the present argument, sadness again emerges as the most coherent case across channels. Semyonov et al. (2019) showed that downward gaze is used spontaneously in the majority of sad expressions and plays a central role in the stereotypical representation of sadness; manipulating gaze direction revealed that sadness was the only expression that gained a recognition advantage from downward (versus lateral) gaze (Semyonov et al., 2019). This mirrors the static findings in which sadness occupies a distinctive position

along color and FACS dimensions, implying that sadness is the only negative emotion in this corpus to be supported by a clear, convergent pattern across both static and dynamic cues (Franklin et al., 2019; Kohler et al., 2004; Thorstenson et al., 2018, 2019). The convergence is theoretically important for jealousy, because it suggests that loss-related components (hurt, anticipated abandonment) may be nonverbally expressed through a multichannel sadness-like profile, whereas threat-related components (anger, disgust) are more strongly anchored in static threat cues such as redness and angularity (Chung & Harris, 2018; Franklin et al., 2019; Parrott, 1991; Thorstenson et al., 2018, 2019).

Dynamic markers such as micro-movements and head-position changes add nuance by signaling authenticity and intention—for example, subtle temporal patterns that differentiate genuine from fake anger, or head tilts that mimic AU4 and bias perception toward anger without muscular engagement (Park et al., 2021; Witkower & Tracy, 2020). However, their smaller effect sizes and methodological complexity make them less suitable as a first). Instead, they are best viewed as complementary refinements that can be layered onto a static backbone dominated by strong, easily manipulable cues to threat and loss, with sadness providing the clearest cross-channel template within this architecture (Franklin et al., 2019; Semyonov et al., 2019; Thorstenson et al., 2018, 2019).

4.4 Complementarity of signal types

Static and dynamic signals thus provide qualitatively distinct but complementary information. Static cues convey rapid, structurally stable categorization of emotion from brief or fixed exposures, offering high-magnitude priors about whether a state is threat- versus loss-oriented, with sadness uniquely supported by both color and configuration evidence (Franklin et al., 2019; Kohler et al., 2004; Thorstenson et al., 2018, 2019). Dynamic cues index motivational state, expressive authenticity, and the temporal unfolding of emotion—dimensions such as vigilance, approach, withdrawal, and regulation that are especially salient in jealousy-related episodes (Chung & Harris, 2018; Guerrero et al., 2005; Mize et al., 2014). The fact that sadness appears with coherent signatures in both domains suggests that multichannel convergence may be a useful criterion for identifying which components of jealousy (e.g., loss vs. threat) are most likely to leave reliable nonverbal traces (Franklin et al., 2019; Semyonov et al., 2019).

Importantly, the larger effect sizes observed for static signals in this corpus likely reflect the experimental paradigms employed—highly controlled, single-image manipulations—rather than demonstrating that static signals are inherently more important than dynamic ones (Franklin et al., 2019; Thorstenson et al., 2018, 2019; see Table 4). Nevertheless, for designing jealousy studies with adequate statistical power, static manipulations of color, shape, and FACS configurations offer a practical advantage as a starting point: they provide strong, easily parametrized predictors of threat- versus loss-related appraisals onto which more subtle dynamic and microexpressive measures can then be added (Kohler et al., 2004; Park et al., 2021; Semyonov et al., 2019). A formal moderator analysis comparing effect sizes by signal type would be required to adjudicate their relative contributions, but this lies beyond the scope of the present synthesis given the limited number of effects per category.

Taken together, these findings support a multichannel, loss-plus-threat architecture in which sadness-like loss signals form the most coherent backbone across static and dynamic channels, while anger-like threat markers are primarily anchored in high-magnitude static cues such as redness and angularity (Franklin et al., 2019;

Kohler et al., 2004; Semyonov et al., 2019; Thorstenson et al., 2018, 2019). Building on this pattern, Fig. 2 presents a conceptual model proposed in the present review that integrates these static and dynamic indicators into a single schematic “loss-plus-threat” configuration, intended as a heuristic template for future observational paradigms on the nonverbal expression of jealousy in adult samples.

5 Discussion

The present systematic review and meta-analysis synthesized evidence from nine experimental and observational studies that examined nonverbal expressions of emotions theoretically central to jealousy—particularly anger, sadness, and distress—alongside other basic emotions that appeared in the original paradigms as comparison or contextual conditions (for example, happiness, fear, disgust, and contentment; Crane & Gross, 2013; Kohler et al., 2004; Park et al., 2021; Thorstenson et al., 2018, 2019). The primary aim was to characterize the static and dynamic nonverbal signals associated with these jealousy-related emotions in adult samples, in order to provide an empirical basis for theorizing about the nonverbal expression of jealousy itself. Within this broader emotional set, the large pooled effect size ($d = 1.17$, 95% CI 0.87, 1.47) indicates that nonverbal signals are robust and multimodal, and the overall pattern of results highlights anger, sadness, and distress as core components of jealousy’s expressive architecture (Fitness & Fletcher, 1993; Guerrero, 2014; Harris, 2003; Sagarin et al., 2012). At the same time, the absence of adult studies that directly operationalize jealousy as a nonverbal dependent variable emerges as a central gap, underscoring the need for primary research that uses the static and dynamic candidate signals identified here as a starting point for designing observational paradigms of jealousy in vivo.

5.1 Jealousy as a loss-centered configuration

A central contribution of this review is the identification of a coherent sadness-like pattern that emerges across both static and dynamic channels. Sadness-related cues—such as downward gaze (Semyonov et al., 2019), withdrawal postures (Crane & Gross, 2013), and prototypical FACS configurations (Kohler et al., 2004)—are consistently associated with jealousy-relevant states, whereas anger and disgust, despite their importance in jealousy theories, appear less distinctive at the level of nonverbal patterning because they overlap with other high-arousal, negatively valenced states (Franklin et al., 2019; Thorstenson et al., 2018, 2019). This convergence suggests that jealousy may be best understood, at the level of expressive architecture, as fundamentally organized around relational loss, with threat-related components layered onto this backbone in a context-sensitive manner (Fitness & Fletcher, 1993; Guerrero, 2014; Harris, 2003).

This loss-centered interpretation dovetails with multicomponent models that define jealousy as a configuration of anger, sadness, and distress rather than a discrete basic emotion (Fitness & Fletcher, 1993; Harris, 2003; Guerrero, 2014; Sagarin et al., 2012). Within these models, anger is directed toward rivals or unfaithful partners, sadness indexes anticipated or actual loss of the valued relationship, and distress reflects broader attachment-system disruption (Fitness & Fletcher, 1993; Parrott, 1991). The present synthesis refines this picture by showing that only the loss component—sadness—exhibits a clear multichannel signature spanning static (color, configuration) and dynamic (gaze, posture) cues, whereas anger is more strongly anchored in static threat markers such as facial angularity and redness (Franklin et al., 2019; Thorstenson et al., 2018, 2019).

From this perspective, jealousy episodes may be nonverbally expressed as a composite of a sadness-like profile—characterized by downward gaze, withdrawal, lowered posture, and sadness-type FACS configurations—overlaid with static threat cues such as increased facial redness and angular facial structure that signal approach-oriented, defensive tendencies (Crane & Gross, 2013; Franklin et al., 2019; Thorstenson et al., 2018, 2019). This “loss-plus-threat” configuration is consistent with evolutionary and appraisal-based theories that emphasize both fear of abandonment and defensive responses to rival intrusion (Buss, 2000, 2015; Parrott, 1991; Attridge, 2013), and provides a concrete multichannel template that future studies can use to operationalize and test nonverbal expressions of jealousy in adult populations.

Importantly, this loss-plus-threat configuration is also compatible with developmental work on jealousy-like responses in infancy. Although these studies constructed composite behavioral and physiological indices of jealousy in differential-attention paradigms rather than coding nonverbal expressions with standardized systems, their operationalizations—centered on coordinated changes in gaze, proximity seeking, posture, negative affect, and autonomic arousal—converge with the adult “loss-plus-threat” template identified in the present synthesis, supporting the view that jealousy relies on integrated nonverbal and physiological configurations from early in development (Hart, 2016; Hart et al., 1998, 2004; Mize & Jones, 2012).

5.2 Static and dynamic signals as complementary channels

The present findings also clarify how static and dynamic signals jointly contribute to the social legibility of jealousy-related emotions. Static cues—such as facial color, shape, and key action units—yielded the largest individual effects, providing high-magnitude, rapidly extracted information about whether a state is more threat- versus loss-oriented (Franklin et al., 2019; Kohler et al., 2004; Thorstenson et al., 2018, 2019). Dynamic cues—such as gaze direction, head tilt, facial micromovements, and whole-body movement—produced somewhat smaller effects but carried information about authenticity, motivational state, and temporal unfolding (Crane & Gross, 2013; Park et al., 2021; Semyonov et al., 2019; Witkower & Tracy, 2020).

Instead of treating these channels as interchangeable, the evidence supports a complementary view. Static signals appear to set the coarse-grained affective landscape, enabling observers to locate an expression within broad dimensions such as threat versus loss and high versus low arousal (Franklin et al., 2019; Thorstenson et al., 2018, 2019). Dynamic signals then refine this initial categorization by indexing nuances of intentionality, regulation, and interpersonal orientation—such as whether anger is genuine or posed, whether attentional focus is vigilantly outward or withdrawn, and whether the individual is preparing to approach, avoid, or disengage (Crane & Gross, 2013; Park et al., 2021; Witkower & Tracy, 2020). In jealousy episodes, where rapid inferences about partner commitment and rival intent are crucial, this combination of fast static categorization and dynamic refinement may be especially adaptive (Buss, 2000, 2018; Chung & Harris, 2018; Guerrero, 2014).

Importantly, the larger effect sizes for static manipulations likely reflect highly controlled single-image paradigms rather than an inherent superiority of static information (Franklin et al., 2019; Thorstenson et al., 2018, 2019). Real-world jealousy expressions unfold in dynamic, interactive contexts in which movement, gaze, and timing carry substantial weight (Guerrero et al., 2005; Wirth et al., 2010). The present synthesis therefore argues against prioritizing one channel over the other and instead advocates for multimodal designs that treat static and dynamic markers as coordinated, functionally differentiated components of a broader expressive system (de Gelder, 2009; Liu et al.,

2023; Keltner et al., 2019).

5.3 Implications for paradigms and measurement

These insights have several implications for the design of observational and experimental paradigms on jealousy. First, static cues identified here—facial redness, angularity, and sadness-related FACS configurations—offer powerful, easily parameterized candidates for inclusion in controlled tasks such as vignette-based emotion recognition, facial morphing experiments, and image-based economic games (Franklin et al., 2019; Kohler et al., 2004; Thorstenson et al., 2018, 2019). Such paradigms can systematically manipulate loss- and threat-related dimensions to test how observers infer jealousy, commitment, or mate-retention motives from static expressive profiles (Arnocky et al., 2024; Buss, 2018; Mogilski & Shackelford, 2023).

Second, dynamic cues should be integrated wherever ecological validity is paramount, particularly in studies of romantic dyads. Continuous recording of gaze, head position, posture, and body movement during jealousy-inducing interactions—for example, partner–rival conversations or economic games involving partner choice—would allow researchers to map how jealousy unfolds over time and how static and dynamic markers jointly predict outcomes such as reconciliation, withdrawal, or escalation (Guerrero, 2014; Mize & Jones, 2012; Mize et al., 2014). Automated facial and movement analysis, combined with preregistered hypotheses about specific jealousy-linked patterns, could substantially advance the field beyond hypothetical scenario-based self-reports (Buss et al., 1999; Sabini & Green, 2004; Sagarin et al., 2012).

Third, the multichannel sadness-like profile identified here suggests that indices commonly used in research on sadness—such as downward gaze frequency, posture collapse, and prototypical sadness FACS combinations—may serve as sensitive nonverbal markers of jealousy’s loss-related core (Crane & Gross, 2013; Kohler et al., 2004; Semyonov et al., 2019). At the same time, static threat cues such as redness and angularity may function as proximal indicators of the anger–disgust component, especially in early phases of jealousy episodes when defensive responses are mobilized (Franklin et al., 2019; Parrott, 1991; Thorstenson et al., 2018, 2019). Future paradigms should therefore model jealousy as a temporally extended configuration in which loss and threat components may emerge with different timing and relative weight (Chung & Harris, 2018; Fitness & Fletcher, 1993; Attridge, 2013).

5.4 Limitations and conceptual gaps

Several limitations qualify these conclusions. Most notably, none of the included studies directly measured jealousy as a nonverbal dependent variable; all focused on component emotions such as anger, sadness, and related states (Crane & Gross, 2013; Kohler et al., 2004; Park et al., 2021; Thorstenson et al., 2018, 2019). As a result, the expressive architecture described here is necessarily inferred rather than observed in jealousy episodes per se. This limitation, however, also highlights a clear empirical opportunity: experimental paradigms that induce jealousy and treat nonverbal behavior—rather than self-report—as a primary outcome (Buss et al., 1999; Sabini & Green, 2004; Sagarin et al., 2012). Second, all samples were drawn from WEIRD populations, with no Latin American or other underrepresented regions included. Cultural work on jealousy and emotion suggests that display rules, relational norms, and communication styles may systematically shape how jealousy is expressed and interpreted (Buunk & Hupka, 1987; Edlund et al., 2019; Hupka, 1991). The present findings should therefore be considered as mapping a narrow segment of the cultural landscape, and future

studies are needed to investigate whether the loss-centered expressive architecture identified here holds across diverse cultural contexts. Third, high heterogeneity ($I^2 = 86.4\%$) reflects substantial diversity in stimuli, measurement methods, and analytic choices, limiting strong quantitative claims about precise effect magnitudes (DerSimonian & Laird, 1986). Nonetheless, the consistent direction and size of effects across static and dynamic indices suggest that the core conclusion—namely, that jealousy-related emotions leave robust nonverbal traces—is likely to be robust to methodological variation. Fourth, only one study in the corpus was preregistered, and several influential contributions to the jealousy literature rely on scenario-based designs with limited transparency about analytic flexibility (Buss, 2000, 2018; Sabini & Green, 2004; Sagarin et al., 2012; Witkower & Tracy, 2020). To align with current open-science standards and with practices increasingly visible in work published in *Emotion Review*, future research on jealousy expression should incorporate preregistration, detailed reporting of analytic pipelines, and open sharing of stimuli, code, and data (Liu et al., 2023; Keltner et al., 2019).

5.5 Toward an expressive comprehension of jealousy

Taken together, this review suggests that the nonverbal expression of jealousy is best conceptualized as a patterned configuration of loss- and threat-related components unfolding across static and dynamic channels, and not as a new complex emotion with a unique display. Sadness appears as the most distinctive anchor of this configuration, providing a multichannel template for jealousy's loss core, while anger and disgust are more strongly represented in static threat cues that can be rapidly extracted from faces (Franklin et al., 2019; Kohler et al., 2004; Thorstenson et al., 2018, 2019). A next step for the field is to move from inference to direct observation by designing preregistered, multimodal studies in which jealousy is elicited in ecologically valid contexts and nonverbal behavior is treated as a central, theory-guided outcome (Arnocky et al., 2024; Buss, 2018; Mogilski & Shackelford, 2023).

6 Conclusions

Jealousy-related emotions produce detectable, robust, and multimodal nonverbal expressions ($d = 1.17$, 95% CI [0.87, 1.47]). Static and dynamic signals are not interchangeable: static signals provide high-magnitude structural cues for rapid emotional categorization, while dynamic signals uniquely index expressive authenticity and motivational state. Sadness emerges as the most distinctive nonverbal profile across channels—characterized by downward gaze, withdrawal postures, and specific FACS configurations—supporting the conceptualization of jealousy as fundamentally organized around relational loss. The absence of studies directly measuring jealousy with a nonverbal dependent variable identifies a clear empirical gap. The present synthesis can inform and complement two critical research directions. First, it provides an empirically grounded foundation for primary studies using observational and experimental paradigms in romantic dyads, where static and dynamic markers grounded in established jealousy theory can be pre-registered as *a priori* predictors of jealousy-related appraisals and behaviors (Arnocky et al., 2024; Buss, 2000, 2018; Mogilski & Shackelford, 2023). Second, the emotional building blocks (anger, sadness, distress) identified here can guide future systematic reviews examining how jealousy has been operationalized and measured across the broader literature, helping researchers map which tasks, stimuli, and dependent variables have been used to elicit jealousy episodes and identify nonverbal patterns consistent with this multicomponent configuration.

Declarations

Note

DV = dependent variable. N = analyzed sample. Prereg. = preregistered on OSF. AUs = Action Units. FACS = Facial Action Coding System. CIELAB = CIE 1976 color space. HOG = Histogram of Oriented Gradients. ML = machine learning. Static signals: chromatic or structural cues evaluated from fixed images or single frames. Dynamic signals: temporal, movement-based, or sequential cues requiring continuous recording.

Note

RE = random-effects model (DerSimonian & Laird, 1986). Studies ordered by effect size (descending). d = Cohen's d. CI = confidence interval. k = 10 effects (9 studies; Thorstenson et al., 2019 contributes two independent experiments). $Q(9) = 66.26, p < .001; I^2 = 86.4\%; \tau^2 = 0.191$.

Note

D1 = Confounding; D2 = Selection; D3 = Classification; D4 = Deviations; D5 = Missing data; D6 = Measurement; D7 = Reporting. L = Low; M = Moderate. Only Witkower & Tracy (2020) achieved Low overall risk. Inter-rater reliability: $\kappa = .59$; agreement = 81.8% (9/11 studies); disagreements resolved by consensus.

Note

PCC = Population, Concept, Context. DV = dependent variable. EN = English; ES = Spanish.

Author Contribution

Author contributionsMTB: Conceptualization; methodology; systematic search and screening design; data extraction; data analysis; writing – original draft; project administration.AMF: Funding acquisition; supervision; responsible researcher for the project; conceptualization; screening and study selection as adjudicating judge after Rayyan; critical revision of the manuscript.MD: Conceptualization; supervision of the theoretical framing; guidance on the writing proposal and structure; advice on analytic strategy and methodological steps; critical revision of the manuscript.BZ: Screening of records in Rayyan; support with bibliography management and reference checks; contribution to writing and editing sections of the manuscript.TC: Screening of records in Rayyan; assistance in study selection and organization of screening outputs.

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Data Availability

The data that support the findings of this study (study-level coding, effect-size dataset, and analysis scripts) are openly available in the Open Science Framework at <https://osf.io/u5bta>. These data were derived from published studies identified through systematic search procedures and are curated in the OSF repository for transparency and reproducibility.

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Figures

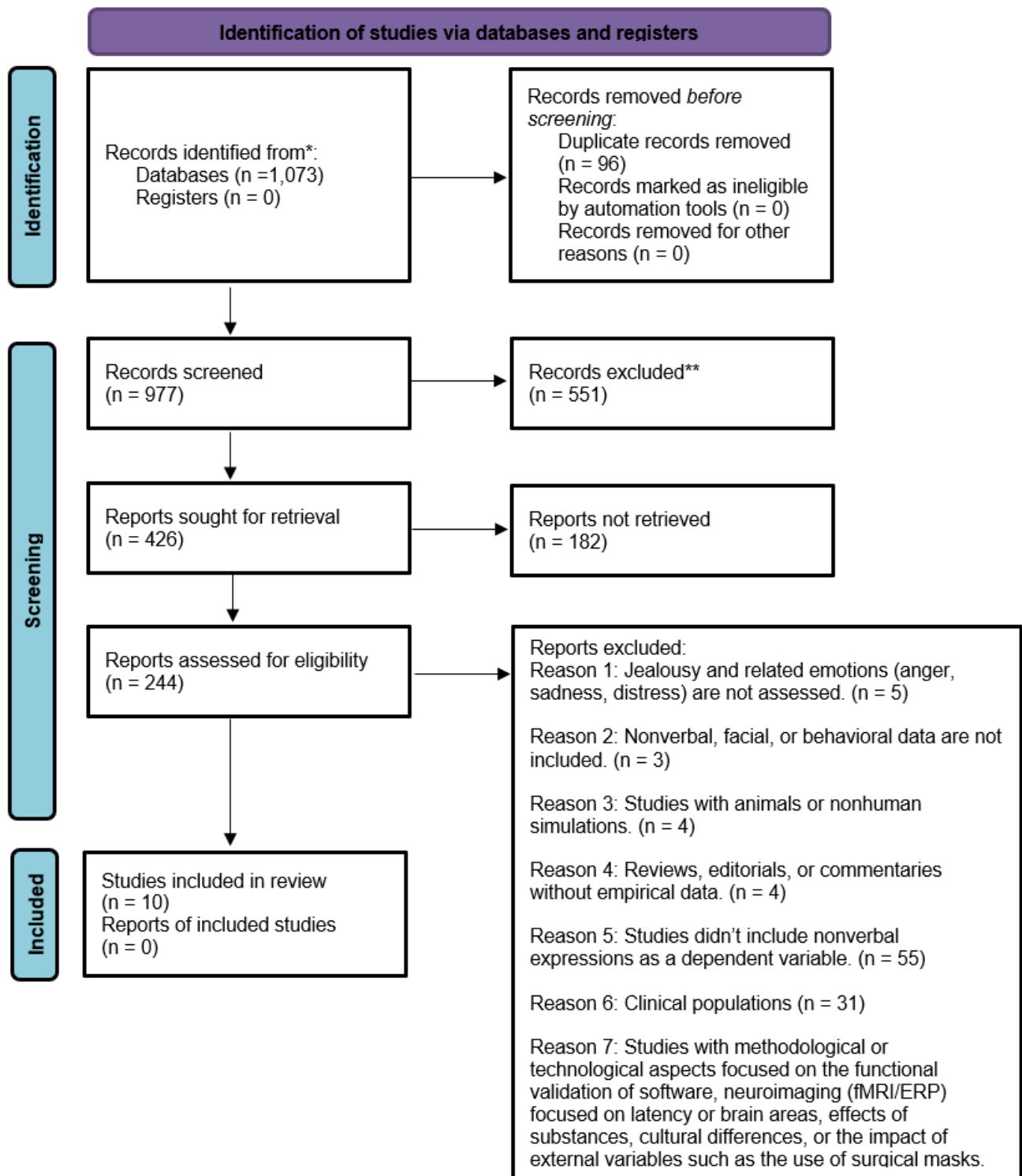


Figure 1

PRISMA 2020 flow diagram for study selection. The diagram summarizes the identification, screening, eligibility assessment, and final inclusion of records in the systematic review, indicating the number of articles retained and excluded at each stage according to PRISMA 2020 guidelines.

Figure 2. Loss-plus-threat model of jealousy-related nonverbal signals

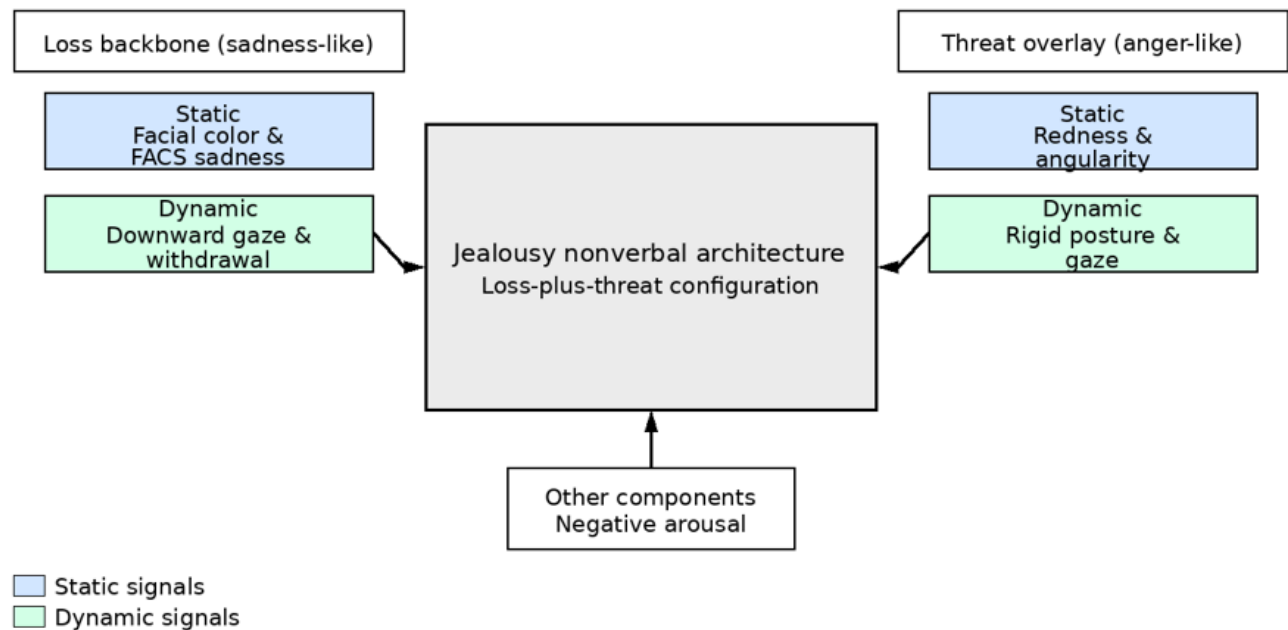


Figure 2

Loss-plus-threat model of jealousy-related nonverbal signals. The diagram summarizes a multichannel architecture in which sadness-like loss signals (static facial color and configurations; dynamic downward gaze and withdrawal) and anger-like threat markers (static facial redness and angularity; dynamic rigid posture and directed gaze), together with other components of nonspecific negative arousal, converge to form an inferred nonverbal configuration of jealousy in adult samples.