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# A systematic review of the behavioral and physiological markers of arousal, cognitive load and emotional processing in nonverbal behavior.

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***Abstract***

*This systematic review investigated the physiological and behavioral indicators of arousal, cognitive load, and emotional processing within the context of nonverbal behavior, aiming to inform the development of a nonverbal behavior–focused therapeutic intervention. 69 empirical studies encompassing 6,399 participants were identified through SCOPUS, Web of Science, and ProQuest for publications from 2014 to 2024. Inclusion criteria targeted healthy adults (≥18 years) and examined nine nonverbal channels: facial expressions, gestures, posture, body orientation, movement, paralanguage, proxemics, haptics, oculesics, appearance, and psychophysiology. A descriptive analysis revealed a rich spectrum of nonverbal behaviors associated with physiological arousal, cognitive load, and emotional responses across these channels. This review underscores the promise of harnessing nuanced nonverbal cues to enhance therapeutic outcomes and deepen understanding of human affective and cognitive processes.*

***Keywords***

*Nonverbal behavior, nonverbal communication, facial expressions, psychophysiology, arousal, cognitive load, emotion.*

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## I. INTRODUCTION

Nonverbal behavior refers to communicative acts that occur independently of an utterance's linguistic content, encompassing a wide range of phenomena that convey both intentional and unintentionally transmitted information (Hall, 2010; Knapp & Hall, 2014). Nonverbal behavior can comment on a communication, regulate communication or be the message itself (Matusumoto & Hwang, 2016). Nonverbal behavior channels are the specific modes or pathways through which nonverbal communication is transmitted and perceived (Hess, 2022). Various authors divide nonverbal behavior into different categories or channels, commonly ranging from six to nine channels (Lopez et al., 2016; Lansley, 2017; Burgoon et al., 2021).

A structured approach to observing and analysing variations in an individual's nonverbal behavior provides a framework for consistently identifying deviations from their normal baseline behavior that may be of interest. In therapeutic settings, the emphasis shifts from the cues themselves to the underlying processes and their contextual significance. By prioritising research on these psychophysiological processes, we can better understand how nonverbal behaviors reflect internal states. This knowledge could potentially be integrated into a therapeutic framework to assist a patient in cultivating greater self-awareness through the development of a clearer roadmap for interpreting bodily responses. Integrating these insights into psychoeducation via an ongoing feedback loop could improve self-regulation and emotional awareness. It is proposed here that these psychophysiological processes can be classified in one of three broad categories, as being an indicator of arousal, cognitive load or emotional processing (ACEs).

The need for effective therapeutic interventions and treatments has never been more pressing, as mental health disorders continue to rise (Cohen et al., 2022; Li, 2023). Yet the literature reports the use of nonverbal behavior in therapeutic contexts is under-utilised (Philippot et al., 2003; Guetterman et al., 2024), despite estimates that 60% of our communication is conveyed nonverbally (Burgoon et al., 2011). It is established that the nonverbal behavior of the therapist greatly influences patient outcomes, being key in developing the therapeutic-alliance - a robust predictor of therapeutic success across multiple meta-analyses (Ardito & Rabellino, 2010; Stubbe, 2018). Nonverbal cues relating to empathy, rapport, and congruence have been identified as crucial contributors to successful therapy (Tickle-Degnen & Rosenthal, 1990; Hatfield, Cacioppo & Rapson, 1993). Practitioners skilled in recognising and interpreting nonverbal cues can detect incongruences between a patient's stated mood and their observable nonverbal behaviors (Foley & Gentile, 2010; Voss & Dass, 2024). These observations can reveal emotional shifts, evaluate comfort with specific topics, and bring unconscious relational patterns into awareness (Gullestad, 2022), enhancing self-reflection and promoting meaningful therapeutic progress.

Several therapeutic frameworks explicitly incorporate nonverbal feedback. Gestalt therapy, for instance, interprets the patient's nonverbal expressions as reflections of their inner state, using techniques such as the repetition and exaggeration of movements to explore their deeper meanings (Joyce & Sills, 2018; Olson, 2017). Body-oriented therapy models (e.g., Somatic Experiencing) use nonverbal behavior to direct attention toward internal sensory experiences (Levine et al., 2018). Mindfulness-based interventions cultivate present-moment awareness that fosters improved body awareness and emotional regulation, often involving nonverbal behaviors and psychophysiological processes (Kabat-Zinn, 1982; Burzler et al., 2019). However, many of these approaches lack formal structure in their use of nonverbal behavior, relying on a practitioner's intuition to identify meaningful cues, in opposition to scientific evidence. Behavioral analysis approaches grounded in empirical research (e.g. Lansley, 2017), are multi-functional and extremely useful, but lack a specific focus on mental health or therapeutic outcomes. It is proposed that an integration of a nonverbal behavior analysis approach specifically tailored to improving mental health outcomes could lead to a novel therapeutic intervention.

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### *A. Rationale*

This systematic review will synthesise research on the physiological and behavioral markers of arousal, cognitive load, and emotional processing within the context of nonverbal behavior (Nonverbal ACEs). Findings may inform the development of a nonverbal feedback-based therapeutic intervention, expand current scientific perspectives, organise current knowledge, and identify key research priorities.

### *B. Primary objective*

To systematically review the existing literature on the physiological and behavioral markers of arousal, cognitive load, and emotional processing within the context of nonverbal behavior.

### *C. Secondary objective*

To produce a qualitative synthesis of these findings, extracting specific, observable markers that could inform a novel, nonverbal-focused therapeutic intervention.

## II. METHOD

This systematic review will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021) to ensure a comprehensive and transparent reporting process.

### *A. Eligibility criteria*

Inclusion criteria: The research methodology is specified below using the PICO framework, which includes population, intervention, comparison, and outcomes (Page et al., 2021).

Population: Healthy adults (≥18 years) in empirical studies examining nonverbal behavior cues.

Interventions: Empirical articles exploring nonverbal behavior and nonverbal communication with specific reference to facial expressions, gestures, posture, body orientation and movement, paralanguage, proxemics, haptics, oculesics, appearance and psychophysiology.

Comparison: Not required for this evidence synthesis.

Outcome: Physiological and/or behavioral indicators of arousal, cognitive load, and emotional processing. Open access studies published in the last 10 years were included (after 2013 and prior to 2025), and the studies were limited to articles and conference papers. Only studies published in English were included.

Exclusion criteria: Research studies involving children, a specific focus on measuring the effects of ageing as an independent variable relative to nonverbal behavior channels, studies examining the role of disease or disease processes, studies involving participants with diagnosed psychopathological conditions (e.g. schizophrenia), and studies involving medication as an independent variable were excluded from the current study. Research focusing on the accuracy or reliability of artificial intelligence, machine learning or robotics were excluded.

This exclusion criteria strategy was selected in order to provide the maximal generalisability of the study's conclusions to the general population, therefore maximising this study's utility.

### *B. Information sources*

Empirical articles were searched via three databases. The SCOPUS database was selected as being one of the largest curated abstract and citation databases, regarded as having global coverage and serving as a widespread bibliometric data source

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(Burnham, 2006). In order to achieve a balanced and comprehensive coverage of data sources, Web of Science and ProQuest Central were also selected. The last database search was on 16th September, 2024.

*C. Search strategy*

The search strategy involved identifying empirical articles examining facial expressions, gestures, posture, body orientation and movement, paralanguage, proxemics, haptics, oculesics, appearance and psychophysiology, within the defined context of nonverbal behavior and nonverbal communication. In order to collect the most comprehensive search results, in addition to the key words described above, various synonyms and subcomponents of each nonverbal behavior channel were included in the study search via Boolean operators (AND/OR) where applicable. For example, in the paralanguage category, vocalics, voice, paralanguage, prosody, pitch, volume, intonation, accent, pauses, speed and rhythm were included. The specific terms included in each search were based on the most frequently used terminology identified during the literature review. Each database automatically recognizes and includes both American and British spellings in search results (e.g., behaviour/behavior).

In order to conduct the most robust search of the literature, the study search composed of 9 individual searches, results were then compiled, categorised into the relevant nonverbal behavior channel, and duplicates removed. An example is provided below:

Facial expressions

Title/abstract/keyword: "facial expression" AND Title/abstract/keyword: ( arousal OR emotion OR "cognitive load" ) AND Title/abstract/keyword: ( "nonverbal behavior" OR "nonverbal communication" )

*D. Selection process*

Following the confirmation and execution of the search strategy according to the previously established eligibility criteria, it was necessary to screen the studies to identify which empirical studies were to be included in the review and qualitative synthesis.

Through the application and execution of the search criteria, the SCOPUS database yielded 1022 studies of interest, Web of Science yielded 181 and ProQuest Central 82 results. This totalled 1285 studies. The screening and selection process consisted of five stages.

1. An initial screening led to the elimination of 130 duplicate records in the search results across databases.
2. Subsequently, the remaining 1155 articles underwent initial screening through a comparison of the title and abstract relative to the study objectives, whereby 89 articles of interest were progressed while 1066 articles were discarded.
3. The remaining 89 articles were further cross-examined with the inclusion and exclusion criteria, where 7 articles were removed as being structured as either opinion or summary articles, leaving 82 articles.
4. 82 articles underwent a final screening process. Following a detailed analysis of the articles, a further 13 articles were removed, primarily consisting of theoretical reviews or critical analyses rather than original research.
5. Therefore, a final 69 articles were selected as successfully meeting the inclusion and exclusion criteria, which progressed to the final analysis and formed the basis of the results of this systematic review.

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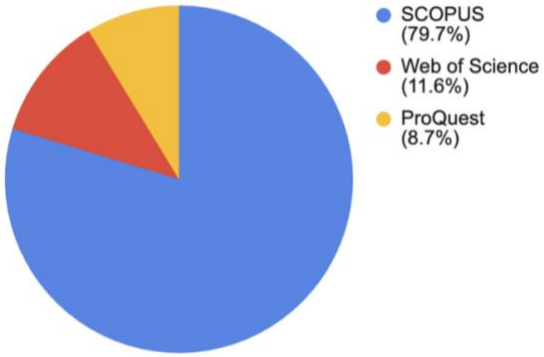
**Figure 1. Distribution of selected articles by database**




*E. Synthesis of results*

The results from the included studies were summarised and presented in narrative format, presenting the key findings by channel. The results were descriptively summarised to highlight key research findings specific to the physiological and behavioral markers of arousal, cognitive load and emotional processing within the context of nonverbal behavior.

*F. Variation of results across studies*

Due to the diversity in study designs, measures and outcomes, results were presented descriptively without attempting to explore statistical variation. This approach was selected to ensure the objective of summarising the key insights from the studies was preserved.

*G. Effect measures*

The results of this systematic review were descriptively integrated and summarised based on the key findings of each study, which were synthesised to reflect trends across studies. Consequently, no formal effect measures, effect size ranges or thresholds, or risk ratios were applied.

*H. Sensitivity analysis and bias*

The synthesis was based on the available data provided exclusively by the authors of each study. No additional sensitivity analysis was conducted to evaluate the robustness of the results in the included studies.

## III. RESULTS

Table 1 presents the distribution of articles by nonverbal behavior channel. Key findings are organized by nonverbal behavior channel and presented in a descriptive narrative format.

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**Table 1. Distribution of articles by nonverbal behavior channel and database source.**

| Nonverbal behaviour channel | Number of articles selected | SCOPUS database | Web of Science | ProQuest |
|---|---|---|---|---|
| Facial expression | 10 | 6 | 3 | 1 |
| Posture | 18 | 16 | 1 | 1 |
| Gestures | 9 | 6 | 1 | 2 |
| Paralanguage | 14 | 13 | 1 | 0 |
| Haptics | 5 | 4 | 0 | 1 |
| Oculesics | 5 | 4 | 1 | 0 |
| Proxemics | 3 | 3 | 0 | 0 |
| Appearance | 1 | 0 | 0 | 1 |
| Psychophysiology | 4 | 3 | 1 | 0 |
| Total | 69 | 55 | 8 | 6 |

### *A. Facial expressions*

Observers can accurately discern valence (positive/negative) and dominance (power) in facial displays, though extremely high arousal can reduce recognition accuracy by making expressions appear more homologous (Engel et al., 2024). Moderate positive expressions are recognised faster than moderate negative ones, reflecting the strong association of smiles with positivity and lowered brows with negativity (Sauter & Fischer, 2018). Some displays, particularly anger, heighten arousal and engagement in perceivers (Boussalis & Coan, 2021), whereas guilt is marked by fewer facial expressions (Stewart et al., 2024).

Facial emotion recognition improves in multimodal contexts (e.g., combined face and voice) compared to face- or voice-only (Israelsson, Sieger & Laukka, 2023). Supporting this, fMRI research shows the posterior superior temporal sulcus (fSTS) integrates facial motion and vocal cues (Deen et al., 2020). Cultural studies reveal greater cross-cultural variation in happy and disgust recognition, whereas surprise appears more universal (Siritanawan et al., 2023). Collectivist versus individualist contexts influence how women express anger or happiness, either facially or via body movements (Muñoz & Farkas, 2017). Additionally, eyebrow and lip movements can become more pronounced with increasing cognitive demand, supporting the link between facial configurations and cognitive load (Saneiro et al., 2014).

### *B. Posture, body orientation and movement*

Body posture offers important cues for emotional processing. Congruent postures facilitate more accurate facial emotion recognition; incongruent ones interfere and reduce it (Civile & Obhi, 2015; Payo Salanos et al., 2018). Even without facial cues, anger, happiness, sadness, and fear can be recognised from posture alone (Parkinson et al., 2017). Negative postures are typically more accurately recognised: sadness often features a downward head tilt, anger may show forceful downward arm thrusts, fear involves crouching, and disgust may include covering the mouth (Parkinson et al., 2017; Werner et al., 2018; Xiao, 2024). Interestingly, restricting one's body posture can reduce recognition accuracy for anger and disgust (Reed et al., 2020). Pride is associated with a slight backward head tilt and it diminishes nonverbal mimicry (Dickens & DeSteno, 2014). Guilt emerges as distinct once again in posture, characterised by minimal head movement (Stewart et al., 2024).

High-arousal states like anger and pain often manifest as tense postures (Walsh et al., 2014). Fearful postures may be perceived as lasting longer (Droit-Volet & Gil, 2016), and they draw more attention toward the hands (Kret et al., 2017).

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Likewise, pain can be reliably signaled by a forward trunk lean, sometimes confused with fear due to postural similarities (Daniali et al., 2014). Expansion correlates with higher activation and can communicate threat or status (Senecal et al., 2016; Vicente et al., 2024). Upright, open postures lower stress responses (decreasing cardiac vagal tone) and enhance perceived power (Laborde et al., 2019). In contrast, a downward head tilt, closed-arm stance, and averted gaze suggest negative affect (Furley & Roth, 2021).

When face and body cues converge, motor, prefrontal, and visual areas activate more strongly in fMRI scans, underscoring the contextual value of posture (Payo Salanos et al., 2018). Notably, fearful postures can prompt amygdala activation—even alongside a happy face—signaling an unconscious threat response. A multimodal model combining facial expression, head motion, and speech rhythm predicted people's emotional impressions with ~72% accuracy (Ito et al., 2024).

### *C. Gestures*

Gesture use can reflect arousal levels and cognitive demands. Anger- or fear-related postures often shift observer focus to the hands (Kret et al., 2017). Higher gestures, consistently observed across categories, may indicate increased arousal (Castillo & Neff, 2019). Fist gestures, in particular, are perceived as especially high in arousal and associated with negative valence. People also tend to gesture more with their dominant hand, with left-handed gestures often perceived as more negative and higher in arousal. Gesture form sometimes mimics previously observed gestures—possibly aiding cognitive processing (Çatak et al., 2018).

Gesture frequency can decrease under heavy cognitive load (Frosina et al., 2018), though certain stressful or time-sensitive tasks may provoke increased gesturing (Saneiro et al., 2014). Anger gestures (e.g., forceful arm movements) are recognised more consistently, suggesting high salience (Visch et al., 2014). During improvisation, individuals gesture more, likely to support mental imagery or lexical retrieval (Lewis et al., 2015). A moderate gesture level appears most credible, while excessive gesturing can distract—yet also increase physiological arousal, as measured by Electrodermal Activity (Rodero Antón et al., 2022; Ismail et al., 2024). Gestures that acknowledge others can enhance perceived empathy (Choi et al., 2024). Interestingly, people can identify personal vs. social intentions (~60% accuracy) from arm movements alone (Quesque et al., 2019).

Winning correlates with more upward right-hand gestures, potentially reflecting left-hemisphere processing of positive emotions. Losing is associated with on-body, reactive left-hand gestures that may help regulate negative states (Neumann et al., 2022).

### *D. Oculesics*

Gaze direction and ocular motion reflect both emotional and cognitive states (Xiao, 2024). Eye gaze showed directional preferences, participants looked more to the right for positive information and more to the left for negative information (Çatak et al., 2018). Direct gaze intensifies the effect of facial expressions on self-esteem, whereas averted gaze reduces it (Lamer et al., 2015). Observing eye regions displaying fear or happiness is sufficient to disrupt the attentional blink, illustrating how the eyes alone can trigger higher vigilance or perceived threat (Li et al., 2022).

Cognitive load may reduce direct eye contact and increase blinking, consistent with internal distraction or stress (Frosina et al., 2018). Avoidant gaze patterns and pupillary changes often signal social rejection, potentially predicting aggression (Quarmley et al., 2023). Brief (3–9 seconds) but intentional eye contact can build rapport and help manage anger in clinical or counseling contexts (Choi et al., 2024). Adjusting gaze dynamics (or adding visual elements) can help de-escalate tension (Engelhard, 2018).

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### *E. Paralanguage*

Vocal attributes can be important markers of arousal and emotion. Listeners discriminate authentic from acted vocalisations at about 65% accuracy, though results vary by emotion (Anikin & Lima, 2018). Emotions like fear and sadness exceed 70% recognition, while joy falls below 40%. Pitch is a major predictor: higher pitches are associated with fear or amusement; lower pitches link to anger or disgust (Anikin & Persson, 2017). In a remote Bhutanese village, 13 emotions delivered via vocal bursts were still identified above chance levels (Cordaro et al., 2016). Overall recognition of nonverbal vocalisations is approximately 50%, with anger the most accurately perceived and joy among the least (Coulombe et al., 2024). Sadness typically features slow, monotone speech, while happiness is reflected by varying pitch and clearer voice (Preti et al., 2016). A breathy voice often signals positivity, notably in ambiguous expressions (Anikin, 2020a).

Negative emotions may be conveyed more effectively in the voice, while touch may be marginally superior for positive emotion (Oya & Tanaka, 2023). A "sad voice" includes a lower pitch, reduced speech rate, and irregular pauses (De Waele et al., 2020). Across genders, anger is best recognised from vocal cues; fear is the hardest (Waaramaa, 2016). Highly salient vocalisations are longer, louder, higher-pitched, and more modulated ("salience code"), focusing audience attention (Anikin, 2020b). Power can shape the processing of emotional prosody: high-power individuals show lower neural sensitivity, whereas low-power individuals dedicate greater attentional resources to differentiate various tonal stimuli (Paulmann & Uskul, 2017). Planning or preparation can also boost vocal fluency and increase displays of nonverbal concern (Ray et al., 2019).

### *F. Proxemics*

Negative affect often leads to an expanded personal space, prompting people to back away or position themselves farther from sources of negativity (Persky et al., 2016). In social exchanges reflecting perceived injustice, individuals may increase frontal body orientation or turn their backs on the perceived offender (McCall & Singer, 2015). Moderate proximity reduces perceived threat and fosters better relational satisfaction (Engelhard, 2018).

### *G. Haptics*

Gentle human touch, especially after oxytocin administration, can amplify positive social evaluations (e.g., rating smiling faces as friendlier) and enhance the pleasure of touch itself (Ellingsen et al., 2024). Collaborative approaches—like touching a partner's artwork—may reduce psychological distance (Hass-Cohen et al., 2015). Empathic and compassionate touch correlate strongly, and early-life deficits in touch relate to social anhedonia or physical anhedonia in adulthood (Suwinyattichaiporn et al., 2021; Zhou et al., 2024).

Frowning faces reduce perceived pleasantness of the same touch, whereas activities like massage foster feelings of calm, warmth, and stronger connection (Naruse & Moss, 2021). EEG-based data suggests a lack of evidence supporting the "Midas Touch" effect in increasing compliance, as documented elsewhere (Spapé et al., 2019).

### *H. Appearance*

Morgan et al. (2017) report perspectives vary on how certain appearances (e.g., wearing a lab coat) influence perceived credibility; some see it as authoritative, others find it distancing. However, nonverbal mirroring, along with smiling, modulating voice tone, maintaining appropriate body posture, using considerate touch, and managing eye contact, can all facilitate rapport and connection.

### *I. Psychophysiology*

Physiological markers such as heart rate (HR) and heart rate variability (HRV) index arousal and cognitive load. Elevated

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HR typically indicates higher arousal during complex tasks (Arble et al., 2019). HR and HRV can also differentiate competitive, cooperative, or solo activities: lower HRV suggests deeper engagement or mental load (Arellano et al., 2017).

Regarding emotion regulation, expressive suppression prolongs the duration of negative nonverbal expressions; reappraisal is inconsistent in reducing their intensity (Koval et al., 2015). Pupil size can also reflect social-cognitive appraisals: larger pupil sizes occur when watching personal intention videos, and this dilation predicts participants' subsequent judgments (Quesque et al., 2019).

## IV. DISCUSSION AND CONCLUSIONS

### *A. Discussion*

The primary objective of this study was to conduct a systematic review of the existing literature pertaining to the physiological and behavioral markers of arousal, cognitive load and emotional processing within the specific context of nonverbal behavior. A secondary objective related to how this information could inform a novel, nonverbal-focused therapeutic intervention. The studies included within this review addressed multiple aspects of these elements from various different perspectives. Collectively, the data offers a rich and nuanced understanding of how Nonverbal ACEs are expressed through nonverbal behavioral cues that could be observed or noticed by the practitioner and/or the subject. When interpreted in context, these subtle cues can raise awareness of nonconscious psychophysiological processes taking place.

There was an abundance of data relating to facial expressions, posture, body orientation and movement, gestures and paralanguage. These four channels in particular each demonstrated channel-specific means of interpreting the subject's inner states. The research exploring paralinguistic features was largely consistent with previous research, increasing the confidence in existing empirical evidence for the importance of pitch in emotional arousal and recognition. Furthermore, recent research relating to gestures adds more depth to the groundbreaking work of Ekman and Friesen (1969), while complementing Matsumoto and Hwang's (2013) research exploring the cultural similarities and differences in gestures. In relation to advancing our knowledge of gesture, fascinating research by Castillo and Neff (2019), as well as Çatak et al. (2018) provide novel insights into the importance of gesture height, handedness and perceived arousal levels. Further support for Goldin-Meadow et al.'s (2001) gesture and cognitive load hypothesis was found.

In contrast, much less research was found relating to appearance, haptics and proxemics, which is consistent with the reduced number of articles in the existing literature base. However, these studies still revealed fascinating findings, such as Ellingsen et al.'s (2024) insights on human touch having a sharpening effect on social interactions.

A very few select studies were included on psychophysiology. Yet even this revealed several physiological markers pertinent to a practitioner, such as using a subject's blink rate as a marker of cognitive load or anxiety (Frosina et al., 2018). This will be discussed more in the limitations of the study.

### *B. Theoretical implications*

The narrative analysis of the data has provided an extensive number of specific, observable, physiological and behavioral markers of arousal, cognitive load and emotional processing. These specific elements could be integrated into a nonverbal-focused therapeutic intervention where the observation, feedback and processing of these cues can facilitate greater introspective and meta-cognitive abilities, therefore enhancing therapeutic outcomes. Moreover, this observation and directed awareness of nonverbal cues, akin to an open-monitoring approach in meditation (Kabat-Zinn, 1982) could bring unconscious behavioral patterns into awareness. These components, when combined with specific verbal interventions, could lead to greater executive functioning and better overall wellbeing.

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### *C. Limitations of the study*

This systematic review made several important decisions that shaped the direction, scope and content of the studies included in the analysis. As a consequence, two primary limitations can be identified.

1. Strict inclusion criteria - due to the large scale of the research across each channel and the inclusion of synonyms, the search strategy specified "nonverbal behavior" or "nonverbal communication" be included in the title, abstract or keywords. As the vast majority of psychophysiological research is not focused specifically on nonverbal behavior, this search criteria excluded a significant number of studies which may have contributed key insights to the current study through more indirect means.

2. Lack of quantitative and statistical analysis - a descriptive narrative was selected to present the information in-line with the key objective of extracting key research findings. As a result, no statistical analysis was conducted, limiting confidence in the specific conclusions of each study.

### *D. Recommendations for future related studies*

This study identified a wide-range of observable Nonverbal ACEs across each of the nonverbal channels that could be of assistance to practitioners in therapeutic and personal development settings. Future research designed to better understand the role and advantages of identifying these markers could help establish the validity of a nonverbal-focused therapeutic intervention. This research could aid the development and formal outline of the therapeutic process that could subsequently be empirically tested in the future.

Further research could be directed to analysing the quality, consistency, and effect sizes of the outcomes extracted from the included data sources. This next step, potentially in the form of a meta-analysis, would enrich our understanding of the relationships and patterns in the data, therefore permitting only the most scientifically robust findings to be progressed to the therapeutic model. Moreover, future research should also investigate individual differences (e.g., personality traits) to refine the interpretation and enhance the validity of nonverbal behaviour channel analyses.

### *E. Conclusions*

Nonverbal behavior, consisting of those elements both with communicative intent and without, play an integral role in many different contexts, with the therapeutic environment being of particular interest in this study. Researchers have reported on the under-utilisation of nonverbal behavior in this setting (Foley and Gentile, 2010), but with no clear reason as to why this occurs. This study set out to examine the existing literature, spanning over the last 10 years, exploring the physiological and behavioral markers of arousal, cognitive load and emotional processing, in such a way that could provide practitioners with an evidence-based approach to understanding nonverbal behavior in a therapeutic context. It is proposed by the current author that this information can inform practitioners as to the observable signs of the patient's internal processing, forming the basis of a novel, nonverbal-focused intervention.

Following the analysis of the data in this study, it can be concluded that there are a plethora of observable, behavioral and physiological markers that indicate some degree of change in the subject's arousal levels, cognitive load or emotional processing. These markers range from overt facial expressions and gestures conveying anger, to subtle variations in blink rate indicative of increased cognitive load. This author proposes the integration of this knowledge into traditional therapy and coaching models could contribute to enhanced outcomes. However, more research is required to evaluate the quality and generalisability of the data, to develop the formal model, and subsequent research examining its effectiveness in therapeutic settings.

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