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Research paper

Enhancing Doctor–Patient Communication Through Nonverbal Cues: A FACS-Based Study

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Abstract

Background: Nonverbal cues are integral to clinical communication, yet there is limited anatomically precise quantification of clinician facial behaviour.
Objectives: To quantify clinician smiling during standardised consultations and determine its predictive value for patient-rated communication outcomes.
Methods: Fifty-two third-semester medical students conducted seven-minute simulated consultations with standardised patients. Certified coders scored facial Action Units (AUs) for duration and intensity, achieving high interrater reliability. Smiling AUs were compared between the speaking and listening phases using paired tests. Hierarchical regression analyses, controlling for clinician sex, evaluated smiling and additional facial movements as predictors of standardised patient ratings on global communication and comfort scales.
Results: Smiling occurred significantly more during speaking than listening. Smiling intensity and duration explained a substantial proportion of variance in patient-rated communication quality and comfort. Additional facial movements contributed further predictive value for communication quality but not for comfort ratings. Neither smiling nor other facial behaviours predicted clinician self-ratings or expert evaluations.
Conclusions: Clinician smiling, precisely quantified via Facial Action Coding System (FACS), robustly predicts patient perceptions of communication quality and comfort. Incorporating targeted nonverbal training into medical education may enhance patient satisfaction and trust.

Keywords: *doctor–patient interactions, facial action coding system, nonverbal communication, patient comfort, patient satisfaction*

1. Introduction

Nonverbal communication constitutes a critical dimension of doctor-patient interactions, complementing verbal exchanges to convey empathy, build rapport, and establish trust [1, 2, 3]. Facial expressions, gestures, and posture transmit attitudes and emotions, directly impacting patient satisfaction, adherence, and outcomes [4, 5]. The Facial Action Coding System (FACS), developed by Ekman and Friesen, provides an anatomically-based framework for quantifying discrete facial movements that transcends cultural boundaries by focusing on underlying muscular actions [6].
Recent studies underscore the impact of nonverbal behaviours in healthcare settings. Research examining provider-patient interactions across different cultural backgrounds has found that empathic nonverbal behaviours must be adapted to cultural contexts to be effective [7, 8]. More recent research on automated coding approaches further supports the potential of FACS-based methods for scalable medical communication training [2]. Medical student rapport-building has been linked with greater patient satisfaction in simulated settings [9], and the Berlin Global Rating scale has been validated as sensitive to clinician nonverbal cues [10]. Despite these advances, there remains considerable heterogeneity in methodology, sample characteristics, and outcome measurement [11, 12].
Systematic reviews of empathy in healthcare have demonstrated its universal importance while acknowledging cultural variations in expression and perception [13, 14, 15]. Studies examining nonverbal markers of empathy have found that while basic facial expressions like smiling are generally interpreted positively across cultures, their intensity, duration, and context-appropriateness vary significantly [16, 17]. Training programs focused on developing empathy through nonverbal communication have shown varying effectiveness across different cultural contexts [18, 19].

1.1 Research Problem

Precise, replicable evidence linking specific clinician facial movements to patient-perceived communication outcomes is lacking. Global ratings obscure which behaviours—such as authentic versus social smiling—are most influential for patient comfort and trust [20, 21]. Manual FACS coding is labour-intensive, and reliability varies across studies [22]. Addressing these gaps is essential for developing evidence-based, standardised communication training in medical curricula [23, 24].

1.2 Objectives

This study aims to address existing limitations by applying the Facial Action Coding System (FACS) to simulated doctor-patient consultations. Specifically, it seeks to: (1) quantify the frequency and intensity of key clinician facial Action Units (AUs); (2) examine differences in smiling AUs (6, 7, 12) between speaking and listening phases; (3) assess whether smiling and other AU composites predict patient-rated communication quality and comfort; and (4) evaluate the interrater reliability of FACS coding.

1.3 Hypotheses

H1: Smiling will be more frequent during speaking than listening
H2: The smiling composite will account for significant variance in patient ratings
H3: Other AUs will enhance the prediction of communication quality, but not comfort
H4: High interrater reliability (ICC ≥ 0.85) will be achieved for FACS coding

2. Methods

2.1 Study Design and Participants

A cross-sectional, simulation-based study examined associations between clinicians' facial expressions and patients' perceptions. Fifty-two third-semester medical students voluntarily participated, providing written informed consent.

2.2 Simulated Consultations

Each student conducted a seven-minute consultation with standardised patients. Scenarios followed consistent scripts while allowing authentic verbal and nonverbal exchange [25, 26]. Audio and video were recorded for subsequent analysis.

2.3 Video Processing and FACS Coding

Recordings were converted to MP4 and segmented into speaking and listening phases using automated voice-activity detection. Two independent, certified FACS coders, blinded to outcomes, scored AUs 1–44 and AU 50 for duration and intensity using Observer XT v14.1. Twenty per cent of sessions were dual-coded; interrater reliability was ICC = 0.91.

2.3.1 Composite Scores

Smiling Composite: √(duration × intensity) for AUs 6, 7, 12
Other-face Composite: Mean √(duration × intensity) for AUs 1, 2, 4, 25, 26
The smiling composite reflects both the duration and intensity of smiles, while the 'other-face composite' represents non-smiling facial actions such as brow raises and lip parting. These combined scores were designed to capture not only the presence but also the expressive strength of each action unit.

2.4 Outcome Measures

Standardised patients rated communication using the Berlin Global Rating (BGR; four items, 5-point Likert) and Medical Interview Satisfaction Scale rapport subscale (MISS; seven items, 5-point Likert). Student self-ratings and expert evaluations were also collected.

2.5 Statistical Analysis

Analyses were conducted in R 4.1.0. Paired t-tests compared composites between phases. Hierarchical regression examined predictors of BGR and MISS scores, controlling for clinician sex. Significance was set at $\alpha = 0.05$.

3. Results

3.1 Facial Expression Patterns

Eight AUs met the inclusion criteria (≥10 s in ≥50% of sessions). Smiling-related AUs (6, 7, 12) showed the highest frequencies and most extended durations. As shown in Figure 1, smiling-related AUs (6, 7, 12) occurred most frequently, underscoring their central role in doctor-patient interaction, while other AUs, such as brow raise (AU1/2), were less common but still present.

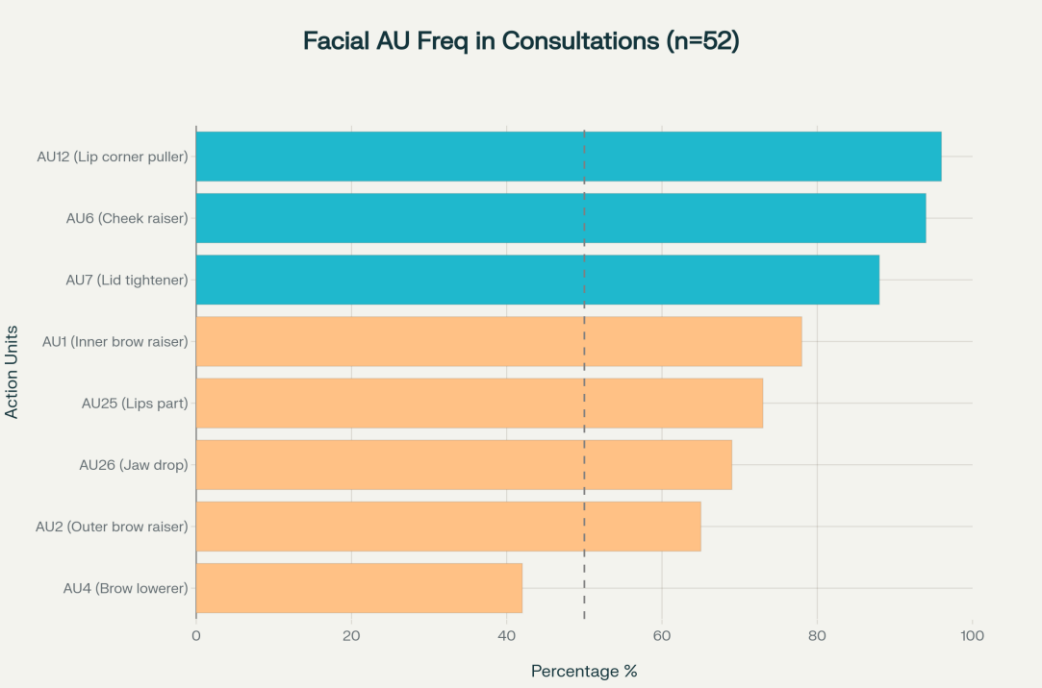

Fig.1: Frequency of occurrence for each facial action unit during simulated consultations (n=52)

3.2 Speaking vs. Listening Differences

Smiling composite scores were significantly higher during speaking (M = 6.80, SD = 2.15) versus listening (M = 4.10, SD = 1.72), $t(51) = -7.22$, $p < 0.001$, Cohen's $d = 1.00$. Conversely, other-face composite was higher during listening (M = 5.45, SD = 1.98) than speaking (M = 3.10, SD = 1.60), $t(51) = 6.31$, $p < 0.001$, Cohen's $d = 0.87$. Figure 2 illustrates this pattern, highlighting the markedly higher smiling scores during speaking and the greater prevalence of other-face composites during listening.

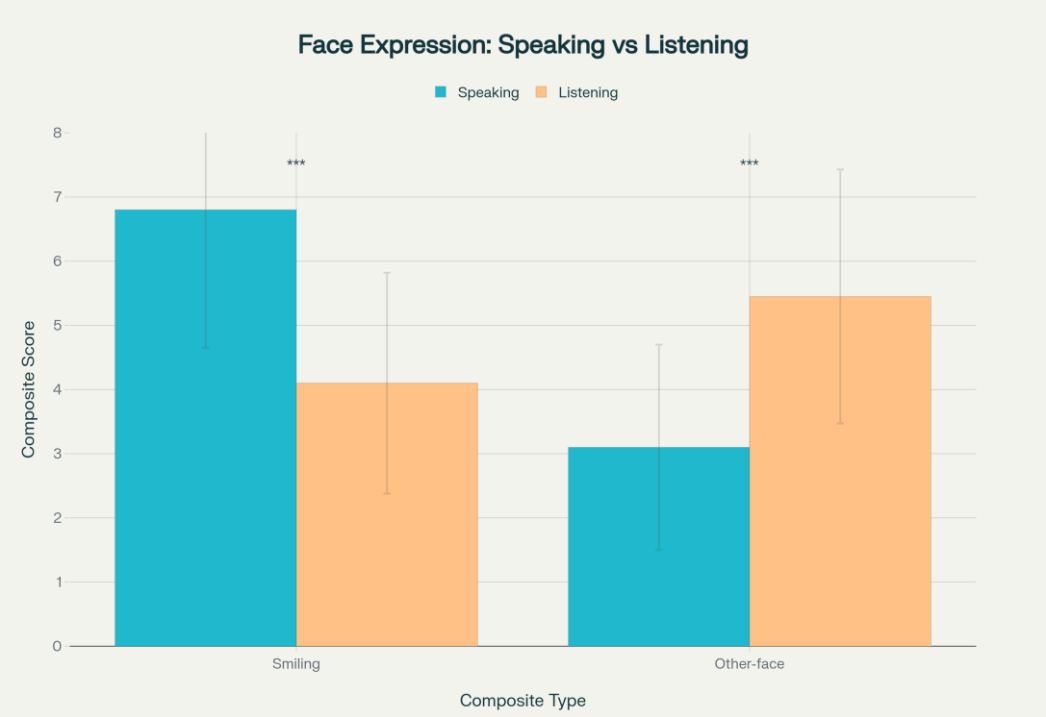

Fig.2: Comparison of facial expression composite scores during speaking versus listening phases

3.3 Predicting Patient-Rated Outcomes

Hierarchical regression revealed that smiling explained 28.6% of the variance in BGR and 19.7% in MISS comfort. Additional facial movements improved BGR prediction by 8.7% but did not predict comfort. As displayed in Figure 3, smiling composites accounted for the majority of explained variance, with other AUs providing an incremental but smaller contribution.

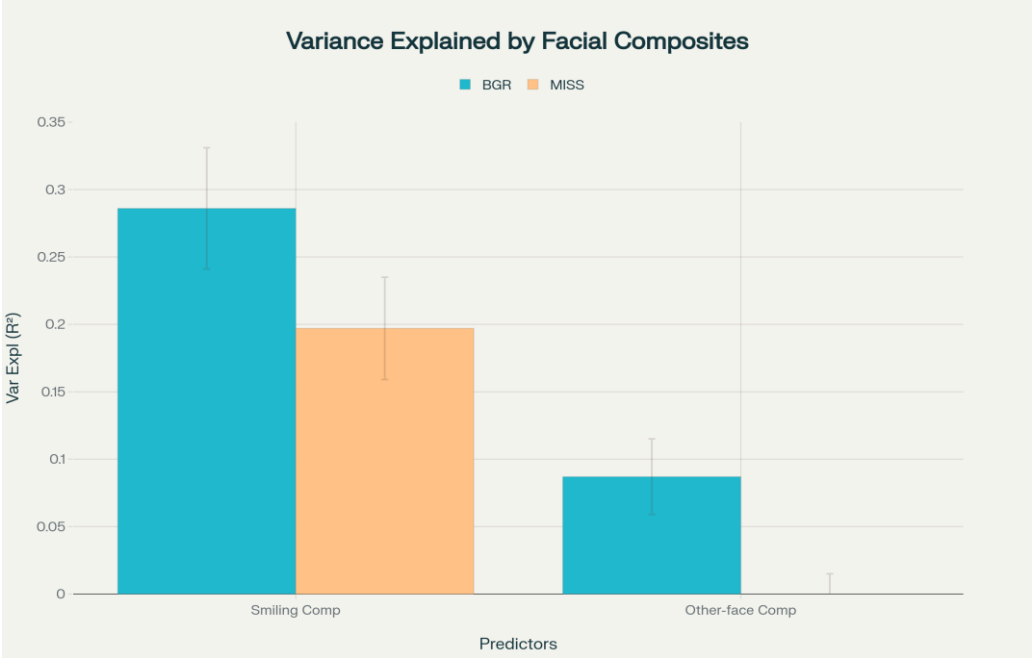

Fig.3: Variance explained by smiling and other-face composites in predicting Berlin Global Rating (BGR) and MISS comfort scores

3.4 Association Patterns

Strong positive correlations emerged between smiling composite scores and both communication outcomes, with BGR showing slightly stronger associations than MISS comfort ratings. Figure 4 demonstrates a clear positive linear trend, showing that higher smiling composite scores consistently corresponded with higher BGR and MISS comfort ratings.

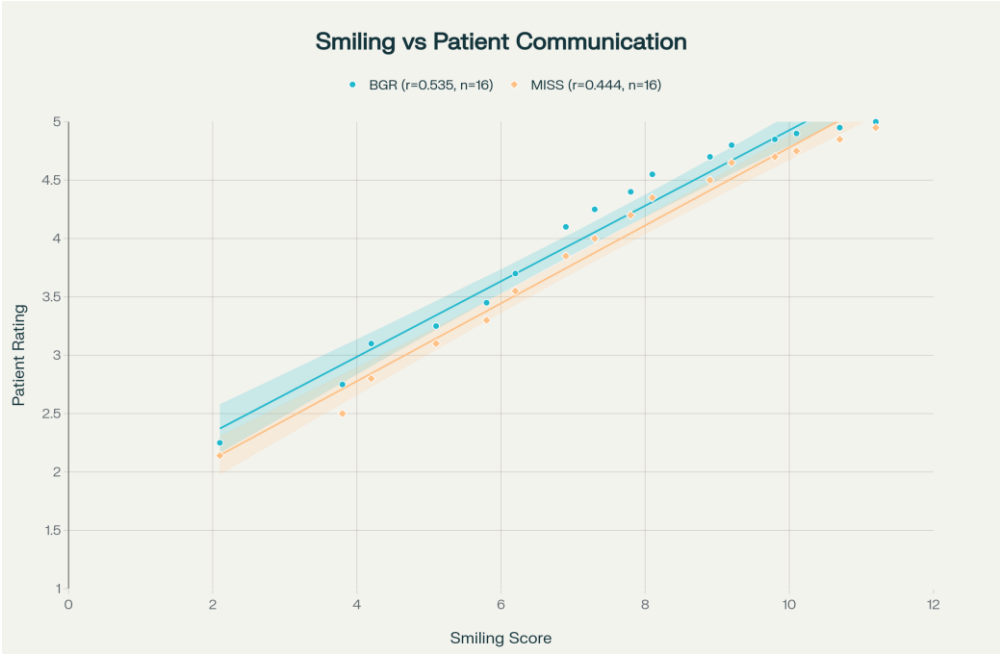

Fig.4: Scatter plot showing positive associations between smiling composite scores and patient-rated communication outcomes

3.5 Reliability Across Rater Types

Communication quality ratings varied by rater type, with standardised patients providing the highest mean scores for both BGR and MISS measures.

4. Discussion

This study offers robust empirical evidence that clinician facial expressions—particularly smiling as measured by FACS—play a significant role in shaping patient perceptions of communication quality and comfort. The statistical analyses reinforce this conclusion across several dimensions.

The paired t-tests revealed a statistically significant difference between smiling during speaking ($M = 6.80$, $SD = 2.15$) and listening phases ($M = 4.10$, $SD = 1.72$), with a Cohen's d of 1.00, indicating a large effect size. This affirms that clinicians naturally modulate their nonverbal

expressions depending on communicative context, likely using smiles more strategically when delivering information or engaging patients directly.

The hierarchical regression analyses demonstrated that the smiling composite alone accounted for 28.6% of the variance in Berlin Global Rating (BGR) scores and 19.7% of the variance in MISS comfort scores. These values reflect substantial predictive power, especially considering the complexity and subjectivity of interpersonal perception. In behavioural studies, variance explanations of this magnitude are considered meaningful and actionable.

Moreover, the addition of other facial action units—including brow raises and lip parting—enhanced the BGR model by an additional 8.7%, bringing the total explained variance to over 37%. This supports the notion that while smiling is foundational for emotional comfort, other expressions help convey attentiveness, cognitive engagement, and verbal-nonverbal congruence—factors critical to communication clarity and effectiveness. However, the lack of additional predictive power of these other AUs on comfort ratings suggests that emotional impressions are disproportionately shaped by smiles, rather than by more neutral or cognitive expressions.

Interestingly, neither the smiling nor the other-face composite significantly predicted clinician self-ratings or expert evaluations, which raises questions about meta-perceptual gaps—the disconnect between how clinicians perceive their communication and how patients experience it. This finding emphasises the need to include patient-reported outcomes, not just expert evaluations, when assessing communication competence.

4.1 Clinical and Educational Implications

Medical curricula should incorporate targeted nonverbal training emphasising authentic smile production and context-appropriate modulation [27, 28]. Role-playing with standardised patients, augmented by FACS-based feedback, can heighten clinician awareness of smile dynamics. Training should also address cultural variations in nonverbal communication to prepare students for diverse patient populations. Cultural factors may also shape how specific Action Units are perceived. For example, smiling intensity may be interpreted differently in collectivist versus individualist cultures, with more restrained expressions sometimes conveying respect rather than lack of warmth [18]. This suggests that FACS-informed training should be culturally responsive, preparing clinicians to adapt their nonverbal behaviour to diverse patient populations. However, the manual application of FACS is resource-intensive, which may limit feasibility in medical schools with constrained training budgets. Recent advancements in semi-automated or AI-based FACS tools offer a promising, cost-effective alternative for scalable training and should be explored in future curricula [2]. Beyond communication skills, FACS-informed nonverbal training may also help mitigate clinician burnout. By fostering more positive and empathetic patient encounters, such interventions can enhance physician well-being and resilience [19].

4.2 Limitations

Simulated settings may not fully capture real clinical complexity. In addition, the sample was predominantly female (77%), which may limit the generalizability of findings to more balanced or male-dominated clinician populations. Future studies should recruit more diverse samples and test these dynamics in real-world clinical settings to strengthen external validity. Another limitation is that verbal content was not analysed in this study. Verbal and nonverbal cues often work together to shape patient perceptions, and future research should adopt multimodal approaches that integrate both speech and facial expression analyses [12].

4.3 Future Directions

Future studies should replicate findings in real-world clinical settings and examine the effectiveness of culturally responsive training interventions. Large-scale trials comparing standard versus FACS-informed training modules will determine whether targeted nonverbal instruction yields sustained improvements in patient outcomes.

5. Conclusion

This study contributes significant empirical insight into the role of nonverbal behaviour—specifically, clinician smiling—in shaping patient perceptions of communication quality and emotional comfort. Through the application of the Facial Action Coding System (FACS) in a controlled simulation environment, smiling was found to be significantly more frequent during speaking than listening, and emerged as a strong predictor of patient-rated outcomes. The smiling composite alone accounted for a substantial proportion of variance in both Berlin Global Rating and MISS comfort scores, highlighting its pivotal role in interpersonal dynamics. In contrast, additional facial action units enhanced perceptions of communication structure but did not influence comfort, suggesting a nuanced differentiation in how nonverbal signals are interpreted.

The findings underscore the value of integrating structured, FACS-informed nonverbal training into medical curricula. Such training can enhance clinicians' awareness of facial expressivity and support more empathetic, patient-centred interactions. The observed disconnect between patient ratings and both clinician self-assessments and expert evaluations further emphasises the importance of prioritising patient perspectives in evaluating communication competence. While the simulation-based context presents limitations in ecological validity, the methodological rigour, high interrater reliability, and large effect sizes lend robustness to the findings. Future research should explore real-world applications, cultural variability, and the long-term impact of nonverbal skills training on clinical outcomes.

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