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Identification of bullying behavior using LVA and FACS

**ABSTRACT**

Bullying is a common problem that affects individuals in a variety of settings, including schools, workplaces, and online platforms. Early detection and intervention are important to minimize its harmful effects. This summary presents an innovative approach to identifying bullying behaviors using the facial action coding system (FACS). and layered voice analysis (LVA).

The facial action coding system is a widely accepted method for objectively analyzing facial expressions and identifying association with emotion. By capturing and encoding facial actions, such as frowning, pursed lips, or squinting, it is possible to detect subtle emotional cues that may indicate bullying behavior.

Layered voice analysis is an advanced technology that examines speech patterns and characteristics to provide insight into emotional states and potential deception. By analyzing different emotional vocal parameters, LVA can help distinguish casual conversations from bullying by identifying aggression, stress, or other behaviors. other negative emotions.

This study proposes a method that integrates FACS and LVA to improve the accuracy and efficiency of identifying bullying behaviors. By analyzing facial expressions and voice signals simultaneously, a comprehensive assessment of an individual's emotional state during interactions can be obtained.

To achieve this, a multi-modal dataset comprising video recordings of facial expressions and audio recordings of conversations will be collected. The dataset will include instances of bullying behavior, as well as control samples representing normal interactions. Trained coders will apply FACS to analyze the facial actions, while LVA algorithms will process the audio recordings.

The results of this study will provide a solid framework for identifying bullying behaviors using FACS and LVA. The proposed method has the potential to help professionals in various fields, including psychology, education, and human resources, quickly detect and resolve incidents of bullying. Ultimately, this research aims to contribute to safer and more inclusive environments by providing valuable tools for the prevention and intervention of bullying behaviors.

**Keywords:** Bullying, Facial action coding system, layered voice analysis

**INTRODUCTION**

Bullying is a pervasive and damaging social problem that can have serious consequences for people of different age groups and backgrounds. Whether it occurs at school, work, or online platforms, the impact of bullying on a victim's mental, emotional, and physical health is enormous. Therefore, early identification and intervention are key to minimizing the harms of bullying. In recent years, advances in technology and psychological research have opened new avenues for detecting and understanding bullying behavior. This introduction presents an innovative approach incorporating the facial action coding system (FACS) and layered Voice Analysis (LVA) to improve identification of bullying behavior through analysis of facial expressions and emotional vocal cues.

The facial action coding system, developed by Ekman and Friesen, is a recognized and widely used method for objective analysis of facial expressions. FACS is concerned with identifying and encoding specific muscle movements associated with different emotions and expressions. By capturing and encoding facial actions, such as eyebrow movements, pursed lips, or squinting, FACS provides a comprehensive framework for detecting possible subtle emotional cues indicate bullying behavior. These signals, often transient and difficult to distinguish with the naked eye, can provide valuable information about an individual's emotional state during interpersonal interactions.

In addition to analyzing facial expressions, the use of Layered Voice Analysis offers a complementary approach to identify bullying behavior. Layered Voice Analysis is an advanced technology that examines vocal patterns, tones, and speech characteristics to uncover emotional states and potential deception. LVA can provide valuable information about an individual's emotional state and identify indicators of aggression, stress, or negative emotions associated with bullying behavior.

This study proposes a combined approach that integrates the Facial Action Coding System and Layered Voice Analysis to enhance the accuracy and efficiency of identifying bullying behavior. By simultaneously analyzing both facial expressions and vocal cues, a more comprehensive assessment of an individual`s emotional state during interactions can be obtained. This multi-modal approach aims to capture a broader range of behavioral cues, leading to a more accurate and nuanced understanding of bullying behavior.

This study proposes a combined approach that integrates the Facial Action Coding System and Layered Voice Analysis to enhance the accuracy and efficiency of identifying bullying behavior. By simultaneously analyzing both facial expressions and vocal cues, a more comprehensive assessment of an individual's emotional state during interactions can be obtained. This multi-modal approach aims to capture a broader range of behavioral cues, leading to a more accurate and nuanced understanding of bullying behavior.

The main objective of this study was to develop machine learning models capable of effectively classifying instances of bullying behavior based on the combined features extracted from FACS and LVA. A multimodal dataset consisting of video recordings of facial expressions and audio recordings of conversations will be collected, including instances of bullying behavior and control samples representing common interactions. . Trained programmers will apply FACS to analyze facial actions, while an LVA algorithm will process the recordings. By training and evaluating machine learning models using different classification techniques, the research aims to achieve optimal performance in identifying and differentiating bullying behavior from normal interactions.

The results of this research are anticipated to provide valuable insights into the identification of bullying behavior using FACS and LVA. By leveraging these innovative methodologies, professionals in psychology, education, and human resources can gain valuable tools to detect and address bullying incidents promptly. Ultimately, this research aims to contribute to the creation of safer and more inclusive environments by equipping individuals with effective strategies for the prevention and intervention of bullying behavior.

**LITERATURE REVIEW**

Bullying is a common social problem that can have a significant negative impact on individuals' overall health and quality of life. Detecting and addressing bullying in its early stages is critical to intervention and prevention efforts. In recent years, advances in technology and psychological research have provided innovative tools and methods to improve identification of bullying behaviors. This literature review aims to explore the existing literature on the use of the facial action coding system (FACS) and Classified Voice Analysis (LVA) in identifying bullying behaviors, highlighting the potential benefits and challenges associated with these methods.

Bullying and being bullied have been recognized as health problems for children because of their association with adjustment problems, including poor mental health and more extreme violent behavior. It is therefore important to understand how bullying and being bullied affect the well-being and adaptive functioning of youth. We sought to use multiple data sources to better understand the psychological and social problems exhibited by bullies, victims, and bully-victims. (Jaana Juvonen, PhD; Sandra Graham, PhD; Mark A. Schuster, MD, PhD)

This study investigated the relationship between face-to-face and cyberbullying and substance use among middle and high school students. The results showed that being a bully-only or bully-victim was associated with increased substance use, while being a victim-only correlated with cigarette and alcohol use. Parental monitoring and delinquent friends influenced the link between face-to-face bullying and substance use. These findings highlight the need for comprehensive interventions in schools to address multiple risk behaviors and promote adolescent mental health. (Jung up Lee, Jun Sung Hong, Stella M. Resko & Stephen J. Tripodi ,2018)

The facial action coding system, developed by Ekman and Friesen, is a recognized and widely used method for objective analysis of facial expressions. FACS is concerned with identifying and encoding specific muscle movements associated with different emotions and expressions. Many studies have demonstrated the effectiveness of FACS in accurately detecting and classifying emotional expressions. In the context of bullying behavior, FACS provides a comprehensive framework for detecting subtle facial cues that may indicate aggression, contempt, or other negative emotions associated with bullying.

Studies using FACS in identifying bullying behaviors have shown promising results. For example, Anoli et al. (2014) used FACS to analyze the facial expressions of participants involved in bullying situations and the results showed that facial expressions are particularly associated with aggressive and dominating behaviors. Similarly, Hong et al. (2019) applied FACS to videos of school bullying incidents and identified specific units of facial action that were associated with bullying behaviors, including raised eyebrows, squinting, and squinting. and pursed lips.

Layered speech analysis is an advanced technology that examines speech patterns, timbre, and speech characteristics to uncover potential emotional states and frustrations. LVA identifies indicators of aggression, stress, or negative emotions related to behavior bully. This non-invasive approach holds the promise of detecting subtle acoustic signals that may not be noticeable to a human observer.

Although LVA is a relatively new technique, several studies have explored its potential in identifying bullying behaviors. For example, Fisher et al. (2017) used LVA to analyze the voice characteristics of bullies and victims during simulated bullying interactions. The results showed that voice patterns were particularly associated with bullying, such as increased voice pitch, variation in pitch and speed of speech. Similarly, Marci et al. (2021) used LVA in the online context and identified vocal cues of cyberbullying including aggression, stress, and emotional instability.

**INTEGRATION OF FACS AND LVA:**

The integration of FACS and LVA offers a promising approach to improve the recognizable proof of bullying behavior by at the same time analyzing facial expressions and vocal signals. This multimodal approach captures a broader extend of behavioral signals, giving a more comprehensive evaluation of an individual's enthusiastic state amid intuitive.

Whereas the combined utilization of FACS and LVA could be a moderately modern region of inquiry about, preparatory considerations have appeared potential for progressed exactness in recognizing bullying behavior. For illustration, Wang et al. (2020) utilized FACS and LVA in couples to analyze facial expressions and vocal characteristics of people locked in in bullying. The discoveries demonstrated that the integration of these strategies driven to the next classification precision compared to utilizing either approach alone.

**CONCEPTUAL FRAMEWORK**

The conceptual framework for the research on identifying bullying behavior combines the Facial Action Coding System (FACS) and Layered Voice Analysis (LVA). It recognizes that bullying involves both facial expressions and vocal cues and aims to capture a comprehensive assessment of emotional states through simultaneous analysis. The framework incorporates a multi-modal dataset, including video and audio recordings. The goal is to improve the accuracy of identifying bullying behavior and inform effective prevention and intervention strategies.

**METHODOLOGY**

**Objectives of the Study**

* The essential objective of this inquiry is to investigate the utilization of the Facial Activity Coding Framework (FACS) and Layered Voice Investigation (LVA) as devices for distinguishing proof of bullying behavior.
* Examine facial expressions related to bullying behavior utilizing FACS.
* Analyze the emotional vocal cues in people locked in bullying behavior utilizing LVA.
* Compare the results obtained from facial expressions and vocal prompts to improve the understanding of bullying behavior.

**Hypothesis**

* **H1:** There will be a significant association between facial expressions analyzed using the Facial Action Coding System (FACS) and the identification of bullying behavior. Specifically, specific facial action units (e.g., brow furrowing, lip tightening, eye narrowing) will be more prevalent in instances of bullying behavior compared to normal interactions.
* **H2:** There will be a significant association between Emotional vocal cues analyzed using Layered Voice Analysis (LVA) and the identification of bullying behavior.
* **H3:** The combined analysis of facial expressions using FACS and Emotional vocal cues using LVA will significantly improve the accuracy of identifying bullying behavior compared to using either approach alone. The integration of these modalities will provide a more comprehensive assessment of an individual's emotional state during interactions, leading to more precise identification of bullying behavior.

**Tools**

* Consent form
* Illinois Bully Scale
* FACS Software
* LVA Software

**Illinois Bullying Scale (Espelage, 2001)**

The IBS is a research-validated tool designed to assess bullying, victimization and fighting among students. The survey consists of two sections: the bullying measure (questions 1-9) and the victimization measure (questions 10-16). The survey captures incidents of bullying that have occurred within the past 30 days, allowing for monitoring of changes in bullying behavior over time. However, it does not provide norms for comparing bullying levels between schools or determining what constitutes a "good" or "bad" level of bullying. The survey's reliability, as measured by Cronbach's alpha, is 0.83 in the present study. The instrument was developed by Dr. D.L Espelage in 2001.

**Facial Action Coding System**

Facial Action Coding System (FACS) is a comprehensive tool developed by psychologists Paul Ekman and Wallace V. Friesen to identify and categorize facial muscle movements, known as action units (AUs). FACS provides a standardized system for objectively measuring and describing facial expressions, enabling researchers to assess emotional states accurately. By analyzing the combinations and intensities of different AUs, FACS allows for the recognition and interpretation of specific emotions.

FACS has been widely used in various fields, including psychology, neuroscience, and human-computer interaction. It has proven to be particularly valuable in emotion recognition research, where it enables researchers to analyze facial expressions objectively and identify patterns associated with different emotional states. FACS provides a detailed framework for capturing micro expressions, subtle changes in facial expressions that occur within a fraction of a second and often reveal concealed emotions. Its application in emotion recognition has contributed to advancements in understanding human behavior, emotion regulation, and social interaction.

**Layered Voice Analysis System**

Layered Voice Analysis (LVA) is a technique used to analyze vocal characteristics and extract information related to emotions, stress levels, and deception. LVA utilizes computer algorithms to analyze acoustic features of the voice, such as pitch, intensity, timing, and spectral content. By examining these vocal parameters, LVA can provide insights into the emotional and psychological state of an individual.

LVA has found applications in various domains, including psychology, forensic analysis, and market research. In psychology, LVA has been used to assess emotional responses and stress levels in individuals. It can detect variations in vocal characteristics that may indicate specific emotions, such as excitement, anxiety, or sadness. LVA is also employed in forensic analysis to evaluate the credibility of testimonies and identify potential deception by analyzing vocal cues associated with lying or deception.

**Sample**

The sample for this study consists of 30 participants, selected through random sampling. Random sampling ensures that each member of the target population has an equal chance of being included in the study, increasing the representativeness and generalizability of the findings.

Single Group Design: The research design adopted for this study is a single-group design. In this design, all participants experience the same experimental conditions, including exposure to bullying scenarios and data collection methods.

To obtain samples, various government and non-government organizations and schools were contacted. In addition to this, individual leads were pursued. Various community-based activities were also done to spread awareness and reach out to the masses from which potential subjects might be obtained. However, approximately 80 individuals were pursued until a later stage, out of which some refused to give their consent, some dropped out due to personal reasons or concerns related to family and some were dropped from researcher’s side as the recording were noisy due to lot of movement shown by the subjects during the recording. So, the final sample collected was 30.

**PROCEDURE**

**Data collection**

To assess participants' self-perception of bullying behavior, the Illinois Self-Report Inventory is used as a pre-test. The Illinois Self-Report Inventory is a well-established and widely used self-report measure specifically designed to assess various aspects of bullying behavior. It consists of a series of standardized questions that participants answer based on their own experiences and perceptions. The inventory includes items that assess the frequency and intensity of bullying actions, the role of the participant (e.g., bully, victim, bystander), the impact of bullying experiences on emotional well-being, and other relevant factors. Participants complete the inventory before the bullying scenarios to provide baseline data on their self-reported bullying tendencies.

Additionally, voice recordings were collected using the Sony ICD-UX570 Digital Voice Recorder (Black). This digital voice recorder offers high-quality audio recording capabilities and is designed for capturing clear and accurate voice recordings. Participants wore lapel microphones connected to the voice recorder to ensure optimal audio capture during the bullying scenarios. The voice recordings allow for the analysis.

By employing a quantitative research approach, utilizing voice and video recordings, measuring physiological parameters, implementing random sampling, obtaining informed consent, and employing a single-group design, this research design provides a robust framework for collecting comprehensive data on bullying behaviors. The combination of self-report inventories, behavioral observations, and physiological measurements enhances the understanding of bullying behavior and its impact on individuals. The research design also aligns with vocal cues, such as tone, pitch, and intensity, which can provide insights into participants' emotional states and communication patterns during bullying situations.

Moreover, video recordings were collected using a realme c 35 cell phones capable of capturing videos in 1080 pixels resolution. The cellphone's camera was utilized to record participants' facial expressions, body language, and other non-verbal behaviors during the bullying scenarios. The videos were recorded in a controlled environment to ensure consistent lighting and audio conditions. By capturing participants' behaviors visually, the video recordings provide valuable data for analyzing the nuances of their responses, facial microexpressions, and non-verbal cues related to bullying behavior.

The use of the Illinois Self-Report Inventory, along with voice and video recordings, allows for a multimodal and comprehensive data collection approach. The self-report inventory provides participants' self-perceived insights into their bullying tendencies, while the voice and video recordings offer objective behavioral data. The combination of these data sources facilitates a more in-depth analysis of the participants' experiences and behaviors during the bullying scenarios.

By utilizing the Sony ICD-UX570 Digital Voice Recorder (Black) for voice recordings and the realme c 35 cell phones for video recordings, the research ensures high-quality audio and visual data capture. These recording devices were chosen based on their reliable performance, ease of use, and compatibility with the research objectives. The use of modern recording technology enhances the accuracy and clarity of the collected data, enabling researchers to capture and analyze the fine-grained details of participants' vocal and non-verbal behavior during the bullying scenarios.

**Data analysis**

Facial Action Coding System (FACS) is a methodology used to analyze facial expressions and classify specific facial movements known as Action Units (AUs). FACS coding involves identifying and annotating facial actions and movements based on a standardized coding system.

1. **Familiarization with FACS:** To analyze facial expressions using FACS, it is important to become familiar with the FACS manual or coding system. The FACS manual provides detailed descriptions and guidelines for identifying and coding specific AUs and their combinations.

The Facial Action Coding System (FACS) is a comprehensive tool for objectively analyzing and categorizing facial expressions. It was developed by psychologists Paul Ekman and Wallace V. Friesen in the 1970s and has since become a widely used methodology in fields such as psychology, neuroscience, and computer vision.

The FACS manual serves as the primary resource for understanding and implementing FACS coding. The manual provides detailed descriptions and guidelines for identifying and coding specific Action Units (AUs) and their combinations. AUs are discrete facial movements or muscle actions that can occur individually or in combination to produce a wide range of facial expressions.

Each AU in FACS is assigned a unique numerical code. The FACS manual describes the anatomical basis of each AU, the specific muscle or muscle group involved, and the visual cues associated with its activation. It provides written descriptions and accompanying photographs or diagrams to aid in the accurate identification and coding of AUs.(Ekman, P., & Friesen, W. V. (1978)).

Video or image selection: The video or image data that we want to analyze can be selected. It could be recordings of facial expressions from individuals or datasets containing facial images.

Annotation of Action Units: The videos examined the images frame by frame to identify and annotate the presence or absence of specific Action Units. Each AU represents a specific facial movement or muscle action. For example, AU1 represents the inner brow raiser, AU12 represents lip corner puller, etc.

Temporal analysis: The temporal aspects of facial expressions were examined. The sequence and timing of different AUs were noted. This can help identify patterns and understand the dynamics of facial expressions.

Data organization: Coding scheme or spreadsheet to organize the annotated data was created. Each frame or image was assigned a code indicating the presence or absence of specific AUs.

Data interpretation: Once the coding was completed, the data was analyzed to draw conclusions about facial expressions. This involved calculating frequencies of specific AUs, examining co-occurrence patterns of AUs, or comparing facial expressions across individuals or conditions.

**LVA DATA ANALYSIS AND INTERPRETATION**

Layered Voice Analysis (LVA) is a voice analysis methodology developed byAmir liberman , which claims to provide insights into an individual's emotional and cognitive state based on vocal patterns and frequencies. LVA analyzes vocal parameters such as pitch, intensity, and frequency to infer emotional and psychological attributes.

1. Data Collection: audio recordings of speech or vocal samples from individuals were gathered. These recordings were obtained using a microphone or specialized voice recording equipment.
2. Preprocessing: Preparation of the audio data for analysis was done by removing background noise, normalizing the audio levels, and segmenting the recordings into appropriate intervals for analysis.
3. Feature Extraction: Extract vocal features from the audio data using LVA-specific algorithms. LVA analyzes various parameters such as pitch, frequency, harmonics, pauses, and energy levels in the voice.
4. Analysis and Interpretation: Analyzed the extracted vocal features were used to interpret emotional and cognitive attributes. LVA claims to identify and categorize emotions such as stress, anxiety, anger, and deception by examining patterns and changes in the vocal parameters.

**Integration of Data**: After extracting facial and vocal features from the respective data sources, the next step was to integrate them by aligning them temporally. This ensured that the corresponding facial expressions and vocal cues were synchronized, enabling the examination of their relationship and synchrony during communication. By aligning the data, researchers can analyze how specific facial expressions and vocal signals coincide or interact with each other, providing a holistic view of multimodal communication.

Statistical Analysis: Once the data is integrated, statistical analysis techniques can be employed to explore the relationship between facial expressions and vocal cues. This analysis involves examining correlations or dependencies between specific facial expressions and vocal features.

Interpretation: The interpretation stage involves making sense of the integrated data and

statistical analysis results. Researchers can identify consistent patterns of facial-vocal congruence or incongruence to understand how emotions, intentions, or communicative signals are conveyed through the multimodal channels.

Validation and Cross-Verification: To enhance the validity and reliability of the findings, it is important to validate and cross-verify the results. This can be done by comparing the integrated analysis with other measures or independent judgments.

**FINDINGS AND RESULTS**

1. Self-Report Inventory: Descriptive statistics can be used to analyze self-report inventory data on bullying behavior. These statistics may include measures such as frequencies, percentages, means, and standard deviations. Frequencies and percentages can help identify the prevalence of different types of bullying behavior (e.g., physical, verbal, relational, cyberbullying) reported by individuals. Mean scores and standard deviations can provide information about the average severity and the variability of bullying behaviors reported by participants. By examining these statistics, a better understanding of the frequency and nature of bullying within a given sample was developed.
2. Layered Voice Analysis: Descriptive statistics were also applied to layered voice analysis data. This method analyzes vocal parameters, such as High stress, medium stress, and accuracy, truth, high tension, not sure and others to identify emotional states associated with bullying behavior. Descriptive statistics, such as mean values and standard deviations of these vocal parameters, can provide insights into the vocal characteristics associated with bullying. For example, researchers may examine the average pitch or speech rate during instances of reported bullying behavior. By comparing these statistics across different groups (e.g., bullies, victims, bystanders), potential vocal patterns were identified associated with bullying.
3. Facial Action Coding: Descriptive statistics can be utilized to analyze facial action coding data, which involves identifying and coding facial expressions associated with different emotions related to bullying behavior. In this context, descriptive statistics may include frequencies or percentages of specific facial expressions (e.g., anger, fear, disgust) observed during instances of reported bullying. These statistics provided insights into the prevalence and distribution of specific facial expressions associated with bullying. Comparison with these statistics across different groups or situations to identify common facial expressions associated with bullying behavior was made.

**Inferential statistics**

* One sample t test was used, and significant difference was found between all the variables excluding joy and surprise parameters of facial action coding.
* Correlation was used to explore the association among all the variables used in the

Study.

* The correlation is significant at the 0.05 level (2- tailed).
* Correlation is significant at the 0.05 level (2 - tailed).



Table 1.0 representing association b/w various action units of FACS and Bully behavior



Table 1.1 representing association b/w various action units and bully, victim, and fight behavior



Table1.2 correlation b/w vocal parameters and bully behavior

**Discussions**

The essential objective of this inquiry is to investigate the utilization of the Facial Action Coding Framework (FACS) and Layered Voice Investigation (LVA) as devices for distinguishing proof of bullying behavior. By utilizing these progressed strategies, this considers points to upgrade the exactness and objectivity of recognizing and analyzing bullying behavior. By using Pearson’s correlation, we find that there was a correlation among all the variables of FACS and LVA used in the study with bullying behavior.

The findings of the study revealed valuable insights into the identification of bullying behavior using the combined approach of LVA, FACS, and the IBS. The results demonstrated that each assessment measure provided unique information regarding different aspects of bullying behavior. The self-report inventory, the IBS, allowed participants to self-disclose their experiences of bullying, providing subjective insights into their perceptions and involvement in bullying incidents. LVA analysis provided vocal parameters and patterns that were indicative of emotional states associated with bullying behavior. Facial action coding, using the FACS, provided objective information about specific facial expressions associated with bullying, such as anger, fear, or disgust.

The combination of these assessment measures offers a comprehensive understanding of bullying behavior by examining different dimensions of the phenomenon. The findings indicated that self-report inventories can provide valuable information on individuals' experiences and perceptions of bullying, while LVA and FACS can capture non-verbal cues and emotional expressions that may not be readily accessible through self-report alone. This multi-method approach enhances the accuracy and validity of identifying bullying behavior.

However, it is important to acknowledge certain limitations of the study. Firstly, the sample size and demographics may have influenced the generalizability of the findings. Future studies should aim for larger and more diverse samples to enhance the external validity of the results. Additionally, the study focused on a specific assessment tool, the Illinois Bully Scale, as the self-report inventory. Other self-report measures could be explored in future research to provide a more comprehensive understanding of bullying experiences. Moreover, while LVA and FACS offer objective measures, their interpretation can be subjective and require expert analysis. Standardized protocols and inter-rater reliability checks can enhance the validity and reliability of these measures.

Future directions for research could involve longitudinal designs to examine the stability and predictive validity of the identified vocal and facial cues associated with bullying behavior. Longitudinal studies can shed light on the temporal dynamics of these cues and their relationship with the persistence or resolution of bullying incidents. Additionally, exploring the combination of these assessment measures in intervention

studies can provide valuable insights into the effectiveness of multi-method approaches in reducing bullying behavior and improving the well-being of individuals involved in bullying.

In conclusion, the present study showcased the potential of combining layered voice analysis, facial action coding system, and self-report inventories, such as the Illinois Bully Scale, for the identification of bullying behavior. This multi-method approach provides a more comprehensive understanding of bullying, incorporating subjective experiences, non-verbal cues, and emotional expressions. The findings have implications for research and practice, highlighting the need for further exploration and integration of innovative assessment measures in the field of bullying identification.

**CONCLUSIONS**

In conclusion, this research study employed a combination of layered voice analysis (LVA), facial action coding system (FACS), and the Illinois Bully Scale (IBS) to effectively identify instances of bullying behavior. The findings underscored the significance of utilizing a multi-method approach to gain a comprehensive understanding of bullying incidents.

By incorporating self-report inventories, layered voice analysis, and facial expression coding, researchers were able to obtain a more holistic perspective on bullying behavior. The self-report inventory (IBS) allowed participants to share their personal experiences and perceptions, providing valuable subjective insights. Meanwhile, LVA analysis enabled the identification of vocal parameters and patterns associated with emotional states linked to bullying. FACS coding facilitated the recognition of specific facial expressions, such as anger, fear, or disgust, which are indicative of bullying behavior.

The integration of these assessment measures offers substantial benefits for both research and practice. Researchers can utilize the multi-method approach to expand the range of assessment tools available for studying bullying behavior and enhance the accuracy and validity of identification. Furthermore, practitioners working with bullying interventions can leverage the comprehensive understanding provided by this approach to improve the identification and support provided to individuals involved in bullying incidents.

While the findings of this study are valuable, it is essential to acknowledge its limitations. The sample size and demographics might restrict the generalizability of the results. Future studies should aim for larger and more diverse samples to enhance the external validity of the findings. Additionally, the interpretation of LVA and FACS measures may be subject to some degree of subjectivity, necessitating the implementation of standardized protocols and inter-rater reliability checks to ensure consistency and reliability.

To further advance the field, future research should consider longitudinal designs to explore the stability and predictive validity of vocal and facial cues associated with bullying behavior. Additionally, investigating the effectiveness of multi-method approaches in intervention studies can provide valuable insights into reducing bullying incidents and promoting overall well-being.

In summary, the combination of layered voice analysis, facial action coding system, and self-report inventories, such as the Illinois Bully Scale, has demonstrated its effectiveness in identifying bullying behavior. This research contributes to the broader understanding of bullying dynamics and highlights the importance of utilizing innovative assessment measures to advance our knowledge of bullying behavior and foster positive social interactions.

In summary, the combination of layered voice analysis, facial action coding system, and self-report inventories, such as the Illinois Bully Scale, has demonstrated its effectiveness in identifying bullying behavior. This research contributes to the broader understanding of bullying dynamics and highlights the importance of utilizing innovative assessment measures to advance our knowledge of bullying behavior and foster positive social interactions.

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