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Patient demographic characteristics and facial expressions influence nurses' assessment of mood in the context of pain: A Virtual Human and lens model investigation

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Abstract

Background—Sex, race, and age disparities in pain assessment and treatment have been reported in the literature. However, less is known about how these demographic characteristics influence nurses' assessment of the emotional experiences of patients who are in pain.

Objectives—To investigate the influence of patient demographic characteristics and facial expressions on nurses' assessment of patient mood in the context of pain.

Design—A cross-sectional study employing Virtual Human (VH) technology and lens model methodology.

Settings—The current study was delivered via the internet.

Participants—Participants consisted of 54 registered nurses currently engaged in clinical practice. Nurses were recruited from healthcare settings across the United States.

Methods—Nurses viewed 32 patient vignettes consisting of a video clip of the VH patient and text-based clinical summary information describing a post-surgical context. Patient sex, race, age, and facial expression of pain were systematically manipulated across vignettes. Participants made positive and negative mood assessment ratings on computerized visual analogue scales. Idiographic multiple regression analyses were used to examine the patient characteristics that were significant predictors of nurses' assessment ratings. Nomothetic paired samples t-tests were used to compare ratings within cue for the entire sample.

Results—The results of idiographic and nomothetic analyses indicated that VH sex, race, age, and facial expression cues were significant predictors of the mood assessment ratings of many nurses. The age cue had the largest impact among the demographic variables.

Conclusions—The results of the current study suggest that patient demographic characteristics and facial expressions may influence how nurses assess patient emotional status in the clinical pain context. These findings may lead to greater awareness by individual nurses and nursing

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administrators about the influence of patient demographic characteristics on clinical decision-making. Future research is needed to better understand these relationships, with the ultimate goal of improving patient care.

Keywords

Decision making; Disparities; Lens model; Mood; Virtual Human technology

Introduction

Research indicates that healthcare providers – nurses in particular – are prone to underestimate the severity of patient pain compared to self-report, and that there is variability in pain ratings between and within provider types (Choiniere et al., 1990; Davoudi et al., 2008; Green et al., 2001; Green and Wheeler, 2003; Luger et al., 2003; Sloman et al., 2005). Relatively little has been published concerning the accuracy of nurses' assessment of patient emotional status in general and in the context of pain in particular. Accurate assessment of patient mood in the context of pain is important since pain is both a sensory and emotional experience (Merskey and Bogduk, 1994). Moreover, psychological factors can have powerful influences on the effectiveness of pain treatment (Gatchel and Turk, 1999) and are important targets of intervention in their own right. Therefore, the accurate assessment of mood in persons with pain is a highly important aspect of clinical practice.

Patient demographic characteristics may influence how providers manage pain. Patients who are female (see reviews by Kamath and O'Connor, 2011 and LeResche, 2011), racial/ethnic minority (see reviews by Kamath and O'Connor, 2011 and Mossey, 2011), and elderly (Auret and Schug, 2005; Heins et al., 2006; Horgas and Elliott, 2004; Iyer, 2010) are at increased risk for sub-optimal pain care. These factors may also play a role in the assessment of patient mood; however, this has received little empirical attention to date.

Although the emotional experience of healthy males and females may be differentially perceived by others (Gaelick et al., 1985; Hess et al., 2004), less is known about discrepancies in the assessment of mood in patients with pain. Fishbain and colleagues (1986) found that females with chronic pain were more likely to be diagnosed with Histrionic Personality Disorder. In another study, female patients undergoing cardiac surgery received more sedative agents and less analgesic medications than males (Calderone, 1990). This small literature (i.e., Calderone, 1990; Fishbain et al., 1986) suggests that females with pain may be perceived by providers as having primary psychological concerns, whereas in similar males, pain is prioritized.

Cross-cultural recognition of emotional expressions has also received empirical attention (Ekman and Friesen, 1971; Schimmack, 1996; Shioiri et al., 1999). A meta-analysis indicated that individuals are more accurate in identifying the expressions of persons who share their racial/ethnic background (Elfenbein and Ambady, 2002). We are not aware of any research examining how nurses or other providers assess the emotional experience of persons in pain who are members of different racial/ethnic groups. Given the literature on racial/ethnic disparities in pain assessment and treatment (Kamath and O'Connor, 2011; Mossey, 2011), one might expect differences to emerge in how nurses assess the pain-related emotional experience of these patients.

A smaller literature exists on the perception of emotional states across age groups. Borod and colleagues (2004) found no difference in raters' intensity ratings of positive and negative emotions expressed by individuals of different ages. Moreno and colleagues (1993)

also found the age of the expressor did not influence rater accuracy. In contrast, Malatesta and colleagues (1987) found that the emotional expressions of older subjects were not perceived with clarity. Although this study lacked a younger comparison group, it does suggest that older persons are at risk for misattribution of their emotional displays.

Given the issues above, the current study sought to investigate how nurses assess mood in patients with pain. Specifically, we examined the extent to which patient sex, race, age, and facial expression of pain influenced positive and negative mood assessment ratings. These demographic cues were selected because, as reviewed above, they have received the most empirical attention to date, related to both pain and mood assessment and treatment. Additionally, these cues are easily depicted in video images and lent themselves readily to experimental manipulation. Virtual human (VH) technology and lens model methodology were employed to characterize the mood decision policies of participants (see below). We had two hypotheses: 1) female patients would be viewed as having worse mood (i.e., lower positive mood and higher negative mood) than male patients, and 2) patients expressing a high level of pain would be viewed as having worse mood than patients expressing a low level of pain. Specific hypotheses about patient race and age were not proposed; thus, the analyses involving these variables were considered exploratory.

Methods

This study was approved by the University of Florida Institutional Review Board. The primary purpose of the overall research was to investigate disparities in pain management decisions; results of the pain management analyses have been published elsewhere (Hirsh et al., 2009). The current manuscript is the result of planned secondary analyses that address distinct questions related to the assessment of mood in the context of pain. The current study is not focused on pain management decisions.

Participant Recruitment

Licensed Registered Nurses who were at least 18 years old were recruited for this study. Local recruitment strategies consisted of advertisements in hospitals and presentations at university class lectures and nursing association meetings. National recruitment included postings on nursing email listservs and presentations at nursing conferences.

Lens Model Design

A lens model design was employed, which is an analogue method for modeling decision-making. Lens model methodology has been used in previous investigations of medical decision-making (Stewart, 2009). What follows is a brief summary of the lens model; the reader is referred elsewhere for a detailed description of this approach, including advantages and disadvantages (Cooksey, 1996). In this model, decisions are assumed to be based on individuals' attention to and weighting of available information (cues). Participants are presented a series of profiles containing cues that may be used to form a judgment. The profiles in this study consisted of a patient video and text-based vignette describing the clinical situation. Decisions are made using a quantifiable response mode, such as a visual analogue scale (VAS).

Statistical modeling of decisions occurs at both the individual ('idiographic' analyses) and group ('nomothetic' analyses) level. Idiographic analyses allow one to capture individual variability in the integration and use of cues. Such variability is not readily discernible through nomothetic analyses, since these group-based analyses average out any individual differences.

The profile-to-cue ratio is important in lens model studies. An adequate ratio is needed to estimate stable regression coefficients; however, participant demand increases with the number of profiles. The smallest recommended profile-to-cue ratio is 5:1 (Cooksey, 1996); thus, participants must view 5 profiles for every cue that is investigated. We adopted a profile-to-cue ratio of 8:1 (see below) to ensure adequately powered analyses (Cooksey, 1996).

Study Stimuli

Each profile consisted of a text vignette and 20-second video of a VH patient. Profile presentation was randomized to prevent order effects. Similar vignettes were used for each profile (see Appendix). Each vignette contained identical text-based clinical information about a patient who had undergone an open appendectomy. Patient status, pain complaint, and medication orders were included. The profiles also contained vital signs that varied minimally, but always within normal limits, across profiles.

The VH characters were created with *People Putty* software. Diverse characters were created through systematic manipulation of their sex, race, and age. Facial expressions of pain were based on the Facial Action Coding System (FACS; Ekman et al., 2002). The core features of the facial expression of pain include brow lowering, tightening of the orbital muscles surrounding the eye, nose wrinkling/upper lip raising, and eye closure (Craig et al., 1992, Prkachin, 1992).

The characters contained four cues, each with two levels. The demographic cues were sex (male, female), race (White, Black), and age (young [20-30 years], old [60-70 years]). We chose to examine differences between White and Black races only because: (1) the most consistent findings in the healthcare disparities literature have been between these two racial groups, and (2) including more racial categories necessitates an exponential increase in the number of profiles participants must view (Cooksey, 1996). The fourth cue was facial expression of pain, which was manipulated to represent high and low pain in accord with the FACS (Ekman et al., 2002) and empirically validated facial expression of pain (Craig et al., 1992, Prkachin, 1992). Each possible cue combination was presented twice, resulting in 32 unique profiles (8:1 profile-to-cue ratio). Sample images of the characters are contained in a previous manuscript (Hirsh et al., 2008), and pilot testing indicated that differences in the demographic cues of interest were readily discernable upon viewing.

Participant Ratings

Participants made decisions about the patients' emotional experience; they assessed the amount of positive and negative mood they perceived each patient to be experiencing. Participants used computerized VASs to make their mood assessment ratings, with endpoints at *neutral* and *most positive imaginable* for positive mood, and *neutral* and *most negative imaginable* for negative mood. These VASs were developed specifically for this study and have not been subjected to psychometric examination. However, VASs of this general type are widely used in research and clinical activities and have well-documented strong psychometric properties (Ahern, 1997; Marsh-Richard et al., 2009).

Internet-Based Administration

The current study was delivered over the internet; the majority of participants used a personal computer, and the remainder used a laboratory computer. Informed consent was obtained from each participant. A demographic questionnaire was completed first. For each of the 32 profiles, participants read the clinical information, viewed the video, and recorded their assessment ratings. Participants were not allowed to return to previously completed

profiles. Finally, an educational tutorial about clinical practice with diverse patients was provided. Participants were compensated with continuing education credits or \$15.

Statistical Analyses

SPSS version 18 was used to analyze the data. Descriptive data were compiled on participants' demographic characteristics. The primary analyses included both idiographic and nomothetic statistics. The idiographic approach consisted of hierarchical multiple regressions for each participant. These analyses examined the influence of the four cues (VH sex, race, age, and pain expression) on participants' mood assessment ratings, after controlling for each participant's pain assessment ratings. Pain intensity ratings were included in the first step of the regressions. VH sex, race, age, and pain expression cues were entered simultaneously in step two. This analytic approach was adopted because we were interested in examining the influence of the four cues on mood ratings, over and above the influence of pain intensity ratings on mood ratings. Positive and negative mood assessment ratings were the dependent variables in their respective models.

Idiographic regressions allow one to determine how much weight each participant assigned to a given cue when making mood assessment decisions. This weight is indicated by the standardized regression coefficients (β) and represents the unique contribution of each cue in the participant's clinical decision. The R^2 value indicates the amount of variance in mood ratings accounted for by the cues. A significant result ($p < .05$) indicates that the participant adopted a consistent decision-making approach (i.e., used one or more of the cues in a statistically-reliable manner) for the outcome task. Given the uniqueness of this study and importance of the topic, data are also presented for regression coefficients that approached significance ($p < .10$).

The nomothetic analyses included descriptive statistics to determine: 1) the number of cues that were significant for each mood policy; 2) the amount of variance accounted for by each cue in the decision policies; and 3) the average R^2 for each policy. Next, each participant's average mood assessment ratings were calculated across VH at each level of cue. Paired samples t-tests compared ratings within cue for the entire sample. Cohen's d effect sizes were calculated for significant results. Finally, correlation analyses examined the associations among the aggregated (i.e., collapsed across all cues) pain intensity and mood ratings.

Results

Sample Characteristics

54 nurses participated in this study. Consistent with national (USA) normative data, participants were primarily female (83%) and White (93%), with an average age of 42 years ($SD=11.90$). Participants reported having Associate ($n=22$), Bachelor ($n=17$), and graduate ($n=15$) degrees in nursing. At the time of study participation, approximately 72% were not enrolled in school. Of the 15 nurses who were students, the majority ($n=11$) was pursuing a graduate degree. The average amount of nursing experience was 14 years ($SD=10.52$), and the three most frequently reported practice areas were critical care ($n=22$), primary care ($n=16$), and oncology ($n=14$).

Idiographic Analyses

Positive Mood Assessment—For 37 participants, pain intensity ratings were a significant predictor of positive mood ratings in the first step of the regression. The second step consisting of VH sex, race, age, and pain expression was a significant ($p < .05$) addition to the model for 5 participants, and approached significance ($p < .10$) for 6 participants.

Eighteen participants had at least one demographic cue that influenced ($p < .10$) their positive mood ratings for the VH patients.

Examination of the regression coefficients indicated that 2 participants used the sex cue in a statistically-reliable manner ($p < .05$), and both judged male patients to have greater positive mood than females. Of the 2 nurses who had coefficients that approached significance ($p < .10$), one gave higher positive mood ratings to male patients, and the other used this cue in the opposite direction.

VH race played a greater role in decisions about positive mood; 4 participants had a significant coefficient for race, and 2 had a coefficient that approached significance. Of these 6 participants, 5 provided higher positive mood ratings to Blacks, with the remaining participant giving higher ratings to Whites.

Age was even more influential in participants' assessments of positive mood. This cue was a significant predictor for 8 participants; another 4 had age coefficients that approached significance. Nine of these 12 participants viewed younger patients as having greater positive mood than older patients, whereas 3 used this cue in the opposite direction.

The level of pain expression was a prominent cue for some participants in their positive mood ratings. All 5 nurses with a significant coefficient for this cue, and all 3 with a coefficient that approached significance, judged patients with a low pain expression to have greater positive mood than patients with a high pain expression.

Negative Mood Assessment—Pain intensity ratings were a significant predictor of negative mood assessments among 46 participants. After controlling for pain ratings, the block of VH demographic and pain expression cues was a significant predictor for 7 participants, and approached significance for 4 participants.

Seventeen participants had at least one demographic cue that influenced ($p < .10$) their negative mood assessment ratings.

Female patients were rated as having significantly greater negative mood than male patients by 5 participants. Two participants generated results for this cue that approached significance, with 1 giving higher ratings to females and the other to males.

Two participants used the race cue in a statistically significant manner, and 3 participants had cue coefficients that approached significance. Of these 5 participants, 3 rated White patients as having greater negative mood, whereas 2 assigned higher ratings to Black patients.

Age was a significant predictor for 5 participants; 2 others had coefficients that approached significance. Five of these 7 participants assessed greater negative mood in older patients relative to younger patients. The remaining 2 participants used this cue in the opposite direction.

Finally, pain expression was the most frequently influential cue for negative mood assessments. Eleven and 4 participants produced pain expression coefficients that were significant or approached significance, respectively. With one exception, all of these participants judged patients with a high pain expression to have greater negative mood than those with a low pain expression.

Nomothetic Analyses

Number and Significance of Cues—The total number of demographic and pain expression cues that were significantly weighted at each decision domain is presented in Table 1. On average, a slightly greater number of cues were used for negative ($M=.63$, $SD=.73$) than positive ($M=.56$, $SD=.84$) mood assessments; however, this was not a significant difference ($p=.47$). None of the 4 cues were significant predictors of positive and negative mood assessment ratings for 63% and 50% of participants, respectively. When VH cues were significant predictors of mood ratings, most participants only used 1 cue in a consistent manner, and none used all 4 cues. Most notably, pain expression was the only significant predictor of negative mood ratings for 10 out of the 15 participants who were influenced by this cue.

Descriptive data were also compiled for the individual decision policies across participants. As seen in Table 2, there was variability in overall R^2 values corresponding to the second block of variables (demographic and pain expression cues), both within and between policies. After controlling for pain intensity ratings, a significantly greater amount of variance was accounted for in positive than negative mood assessments [$t(48)=4.20$, $p<.001$, $d=.60$].

The amount of variance accounted for by each cue was also quantified by squaring the individual regression coefficients for each cue within each policy across participant (Table 2). After controlling for pain intensity ratings, VH sex, race, age, and pain expression cues accounted for as much as 15%, 18%, 21%, and 27% of the variance in positive mood policies, respectively, and 15%, 28%, 12%, and 23% of the variance in negative mood policies, respectively.

Within-Cue Differences—Average mood assessment ratings were calculated across VH at each level of cue (Table 3). Within-cue ratings were analyzed with paired samples t -tests. For example, collapsed across all other cues, average positive mood ratings for female patients were compared to average positive mood ratings for male patients. Of interest was the difference in these mean ratings, regardless of whether the ratings occurred on the low (e.g., 15/100) or high (e.g., 85/100) ends of the mood rating scale. The results revealed significant differences in averaged positive mood ratings within age and pain expression cues. Specifically, younger patients were judged to have greater positive mood than older patients [$t(53)=4.83$, $p<.001$, $d=.66$]. Patients demonstrating a low pain expression received higher positive mood ratings than those with a high pain expression [$t(53)=5.64$, $p<.001$, $d=.77$]. The magnitude of both of these differences was medium-to-large (Cohen, 1988). No significant differences in positive mood ratings were evident within sex or race.

Significant within-cue differences also emerged for averaged negative mood ratings. Participants rated female patients as having greater negative mood than males [$t(53)=3.62$, $p=.001$, $d=.49$], and Black patients as having greater negative mood than Whites [$t(53)=-2.17$, $p=.035$, $d=.29$]. They also judged older patients to have greater negative mood than younger [$t(53)=-5.59$, $p<.001$, $d=.76$]. Finally, VH with a high pain expression received higher negative mood ratings than those with low pain expressions [$t(53)=-8.72$, $p<.001$, $d=1.19$]. The magnitude of these within-cue differences varied from relatively small (race) to large (pain expression) (Cohen, 1988).

Associations Among Aggregated Pain Intensity and Mood Ratings—Average ratings for pain intensity, positive mood, and negative mood, collapsed across all cues, were calculated. Correlation analyses examined the associations among these variables. Pain intensity was significantly and strongly related to negative mood ($R=.81$, $p<.001$), but not

positive mood ($R=-.16$, $p=.26$). The association between positive and negative mood ratings was also not significant ($R=-.07$, $p=.619$).

Discussion

The current study employed VH technology and lens model methodology to investigate the extent to which patient demographic and pain expression cues influence nurses' mood assessment policies. Idiographic and nomothetic analyses indicated that VH sex, race, age, and pain expression were significant predictors of mood ratings for many nurses. The findings suggest that nurses' assessment of patient mood may be subject to similar biases that lead to disparities in pain management (Auret and Schug, 2005; Heins et al., 2006; Horgas and Elliott, 2004; Iyer, 2010; Kamath and O'Connor, 2011; LeResche, 2011; Mossey, 2011). This study also provides support for the use of VH technology and lens model methodology in future investigations of nurse decision-making about pain, mood, and other negative sequelae.

Approximately one-third of nurses were influenced by one or more VH demographic cues when assessing patient mood. Although this proportion is substantial in its own right, it is even more striking considering our conservative analytic approach. We controlled for pain intensity assessment ratings prior to examining the influence of VH demographic cues. Moreover, the influence of pain expression cues was examined concurrent to that of demographic cues. That patient sex, race, and age were important factors in many instances, despite these statistical controls, suggests that such demographic influences are robust indeed. Of course, another way of looking at these results is that approximately two-thirds of nurses did not rely on any demographic cues when assessing mood, and the most influential individual cue (age) was, at most, used by approximately one-quarter of nurses. Thus, most nurses did not evince sex-, race-, or age-related biases in this study. Future research could identify factors associated with nurses' use of patient demographic cues, so that any associated intervention efforts are targeted appropriately.

When patient sex was an important factor in mood ratings, males tended to be viewed as having more favorable mood (i.e., less negative, more positive), whereas the opposite (i.e., more negative, less positive) was true for females. These data are consistent with the non-medical literature highlighting the influence of sex in the judgment of another's emotional experience, in particular a study by Hess and colleagues (2004). In that study, given equivalent expressions of happiness and sadness, women were rated as angrier and less happy than men (Hess et al., 2004). Results of the current study are also consistent with clinical evidence that female patients are perceived as less emotionally healthy than similar males (Fishbain et al., 1986; Calderone, 1990). This perception has some basis in reality in that females are more likely than males to experience a number of common mental health conditions, including depression and anxiety (Kessler et al., 2005). These differences in prevalence rates could be internalized by nurses and, thus, make them more likely to perceive female patients as less emotionally healthy.

Given that, to our knowledge, this is the first study to examine such sex differences in the context of a (hypothetical) primary pain condition, replication is needed before drawing strong conclusions. Nevertheless, the Shifting Standards Model (Biernat et al., 1991) provides an interesting interpretive framework. This model posits that subjective judgments of individuals from different social groups fail to elicit the stereotyped expectations of judges, because they invite the use of different evaluative standards. As applied to the current study, males and females are generally expected to display more negatively and positively valenced emotions, respectively (Brody and Hall 2000; Fischer, 1993). Consequently, a given negative emotional expression – an expression of greater pain in this

study – is perceived as more negative when displayed by a female than a male. Conversely, a positive emotion is rated as more positive when expressed by a male than a female. This interpretation is speculative but provides an intriguing basis for future investigations of the pain-mood nexus.

Although there was some directional variability in nurses' use of VH race, when this cue was influential, Black patients were more often perceived as having a more favorable emotional experience than Whites. These findings are difficult to interpret given a lack of relevant literature. Although cross-cultural emotional recognition has been investigated (Ekman and Friesen, 1971; Schimmack, 1996; Shioiri et al., 1999), with results generally indicating greater accuracy among persons of similar racial and/or ethnic background (Elfenbein and Ambady, 2002), this body of research does not speak directly to the current study for two reasons. First, previous studies have emphasized the race/ethnicity of the observer, whereas we focused exclusively on the observed person (VH patient); the sample was insufficiently diverse to examine nurse-by-patient race interaction effects. Second, we investigated mood assessment in a clinical pain context, whereas most previous studies focused on non-medical situations. These points notwithstanding, the current data suggest that patient race influences mood assessment for some practitioners and should be investigated further to better understand this effect.

Of the demographic cues, age had the largest impact on mood assessments, with younger patients generally judged to have more favorable mood than older patients. The literature is mixed regarding differences in emotional assessment across age groups (Borod et al., 2004; Malatesta et al., 1987; Moreno et al., 1993). There are several possible reasons why age influenced nurses' ratings in the current study. Rates of medical comorbidities, including pain, vary across the lifespan (Herr, 2002; Mobily et al., 1994; Van Den Akker et al., 1998), which may affect how nurses assess mood among patients of different ages. Although epidemiological data indicate that individuals age 60 and older have the lowest prevalence rates of mental health conditions (Kessler et al., 2005), they may also be less willing to acknowledge emotional problems, perhaps due to greater perceived stigma (Leaf et al., 1987; Sirey et al., 2001), the effects of which may influence nurses' assessments. It is also possible that nurses perceive older individuals as less able to tolerate similar pain experiences as younger individuals and, thus, as more likely to experience negative emotional sequelae of such experiences. These speculations suggest the need for continued research on the assessment of emotions across the lifespan in general, and in the context of medical conditions – including pain – in particular.

It might be tempting to conclude that because demographic cues were used by relatively few nurses, these results are not clinically important. However, one must consider several features of current nursing practice to properly contextualize these findings. Nurse-to-patient ratios vary across settings, but if the California-mandated 1:5 ratio for medical/surgical units (Buchan, 2005) is used as a conservative estimate of the nationwide average, then a given nurse may interact with hundreds of patients per year. Even a small propensity to be influenced by a patient's sex, race, and/or age when making clinical assessments is highly important in this context. Moreover, experienced nurses often orient new, less experienced colleagues (Hardy and Smith, 2001; Speers et al., 2004). Sex, race, or age biases could be transferred – implicitly and/or explicitly – during such precepting; this could also occur through peer modeling. Given these practice characteristics, any nurse with a propensity to use patient demographic cues when making medical decisions could have widespread influence.

The pain expression cue was the strongest, most consistent predictor of mood assessments. With the exception of 1 participant, when pain expression was influential, patients

displaying high pain were rated as experiencing lower positive mood and greater negative mood than patients displaying low pain. Moreover, among several nurses, pain expression was the only significant predictor of mood ratings. This is not surprising considering the overlap of core facial action units – namely movements of the brow and eyes – of various negative emotional states and pain. From a conceptual standpoint, concomitant negative affect is expected with the experience of pain, so much so that there has been an increasing focus on treating symptom clusters such as pain, negative mood, and fatigue (Miaskowski et al., 2004). Indeed, pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage...” (Merskey and Bogduk, 1994). Accurate mood assessment in patients experiencing pain is also important since psychological factors influence the effectiveness of pain treatments; this is particularly true for patients with chronic pain (Gatchel and Turk, 1999). Therefore, it is in the best interest of nurses – even those focused primarily on pain management – to attend to the psychological experience of patients in addition to their biomedical data.

The current study highlights a principal advantage of using lens model methods to study clinical decision-making. For example, at the nomothetic level, younger patients were judged to have more favorable mood than older patients, and this effect was moderate-to-large. However, idiographic analyses revealed that, instead of being a widespread problem, only 22% and 13% of nurses were influenced by age when assessing positive and negative mood, respectively. Moreover, not all of these nurses used the age cue in the same manner (i.e., some gave more favorable mood ratings to older patients while others did so for younger patients). The conclusions about nursing education that one might draw from these idiographic analyses are likely to be very different than those based solely on nomothetic results.

Several study limitations should be considered. Because this was an analogue study, it may lack representativeness. However, in our preliminary work, feedback from providers suggested that the simulated patients were realistic and believable. Second, we did not assess patient attractiveness, which may influence pain and mood ratings (Hadjistavropoulos et al., 1990). Third, we did not assess the mental health training or experience of participants. Mental health exposure influences clinical practice (Brinn, 2000; Rohde, 1996), and mental health education varies considerably across nursing programs and specialties (McCabe, 2000). Nurses with greater overall clinical experience (mean experience in this study was 14 years), and mental health experience particularly, could have been over-represented in our sample by being more likely to volunteer for research of this type. Fourth, participants may have been aware of the study purpose and thus responded in a socially desirable manner; e.g., purposely provide equivalent ratings across racial categories regardless of participants' natural inclinations. Although many participants did indeed express some awareness of study hypotheses, there were no differences in cue utilization between these participants and those who expressed no awareness of study hypotheses (data not presented). Fifth, human cognitive limitations (Miller, 1956) and increasing cue requirements (Cooksey, 1996) restrict the number of cues that can be investigated. Thus, potentially important cues must be excluded. Finally, although the sample's demographic characteristics were consistent with US national norms, the relative lack of diversity did not permit investigation of how participant characteristics may influence decision-making.

Conclusion

This study used VH technology and lens model methodology to investigate nurses' decision-making. Although the lens model has been used previously to investigate medical decision-making (Stewart, 2009), we are not aware of similar empirical applications of the VH technology used herein. We found that patient demographic and pain expression cues

influenced the mood assessments of some nurses, and that the lens model and VH methodologies were successful in identifying these individuals. Future research is needed to replicate these findings and determine the influence of such cues on the treatment of mood disorders in persons with pain. Future research could also begin to examine the influence of other non-verbal cues, particularly those related to bodily movement and posture. The investigation of potential explanatory variables should also be pursued; for example, one could include measures of nurses' attitudes and beliefs, as well as cues such as patient SES, to determine if these factors account for the observed disparities in clinical decisions. Finally, this methodology could potentially be employed in education settings as a training tool for students of the health sciences.

What is already known about the topic

- Research indicates that patient characteristics such as sex, race, and age may influence how nurses make clinical decisions for patients with pain.
- A large body of literature also indicates that patients with pain frequently experience negative emotional sequelae.
- However, little is known about the patient characteristics that influence nurses' assessment of mood in patients with pain.

What this paper adds

- This study found that patient sex, race, age, and pain expression cues were significant predictors of mood assessment ratings for many nurses.
- These results suggest that nurses' assessment of patient mood may be subject to similar sex-, race-, and age-related biases that lead to disparities in pain management.
- This study also provides support for the use of VH technology and lens model methodology in future investigations of nurse decision-making about pain, mood, and other negative sequelae.

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Appendix

Clinical Vignette

Patient presents with abdominal pain 22 hours post open appendectomy surgery. Patient reports that the pain began immediately following surgery. The pain is localized to the right lower abdomen in the area around the surgical incision. Patient also reports occasional generalized pain throughout the entire abdominal area. The pain limits patient's ability to move around freely. Patient reports no prior surgical treatments and has current prescriptions for anti-inflammatory and analgesic medications.

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Table 1

Number of significant cues at each policy

Decision policy	Mean (SD) Range	Number of significant cues				
		0	1	2	3	4
		N (%)	N (%)	N (%)	N (%)	N (%)
Positive mood	.56 (.84) 0-3	34 (63)	12 (22)	6 (11)	2 (4)	0 (0)
Negative mood	.63 (.73) 0-3	27 (50)	21 (39)	5 (9)	1 (2)	0 (0)

Table 2

Variance in decision policies explained by contextual cues

Overall R ² *		Sex	Race	Age	Expression
Decision policy	Mean (SD) Range	Mean (SD) Range	Mean (SD) Range	Mean (SD) Range	Mean (SD) Range
Positive mood	.12 (.08) .00-.35	.03 (.04) .00-.15	.03 (.04) .00-.18	.04 (.05) .00-.21	.05 (.07) .00-.27
Negative mood	.07 (.07) .01-.35	.02 (.03) .00-.15	.02 (.04) .00-.28	.02 (.03) .00-.12	.04 (.06) .00-.23

Note: Values for each cue represent squared standardized regression coefficients, after controlling for pain intensity ratings.

* Change in R² associated with the second block of variables in regression analyses.

Table 3

Means and standard deviations for ratings within cue

	Sex		Age		Race		Expression	
	Male	Female	Young	Old	Caucasian	African-American	Low	High
Positive mood	14.37 (12.96)	13.44 (11.47)	15.88 (13.12)	11.93 (11.54)	14.16 (12.62)	13.66 (11.93)	18.33 (15.39)	9.47 (10.80)
Negative mood	38.02 (22.00)	41.74 (20.64)	37.45 (21.18)	42.32 (21.28)	38.85 (21.26)	40.92 (21.31)	30.61 (23.22)	49.18 (21.56)

Note: Rating scale is 0–100.