Published in final edited form as:

Pain. 2008 November 15; 140(1): 231–238. doi:10.1016/j.pain.2008.09.010.

Virtual Human Technology: Capturing Sex, Race, and Age Influences in Individual Pain Decision Policies

Adam T. Hirsh, M.S.,

Center for Pain Research and Behavioral Health, University of Florida, PO Box 100165, Gainesville, FL 32610-0165

Ashraf F. Alqudah, Ph.D.,

Department of Psychology, University of Jordan, Amman, Jordan

Lauren A. Stutts, M.S., and

Center for Pain Research and Behavioral Health, University of Florida, PO Box 100165, Gainesville, FL 32610-0165

Michael E. Robinson, Ph.D.

Center for Pain Research and Behavioral Health, University of Florida, PO Box 100165, Gainesville, FL 32610-0165, Phone: 352.273.6153, Fax: 352.273.6156, Email: merobin@ufl.edu

Abstract

Pain assessment is subject to bias due to characteristics of the individual in pain and of the observing person. Few research studies have examined pain assessment biases in an experimental setting. The present study employs innovative virtual human technology to achieve greater experimental control. A lens model design was used to capture decision-making policies at the idiographic and nomothetic level. Seventy-five undergraduates viewed virtual humans (VH) that varied in sex, race, age, and pain expression. Participants provided computerized ratings with Visual Analogue Scales on the VH's pain intensity, pain unpleasantness, negative mood, coping, and need for medical treatment. Idiographic analyses revealed that individuals used pain expression most frequently as a significant cue. Nomothetic analyses showed that higher pain expression VH and female VH were viewed as having higher pain intensity, higher pain unpleasantness, greater negative mood, worse coping, and a greater need to seek medical treatment than lower pain expression VH and male VH, respectively. Older VH were viewed as having worse coping and a greater need to seek medical treatment than younger VH. This innovative paradigm involving VH technology and a lens model design was shown to be highly effective and could serve as a model for future studies investigating pain-related decision making in healthcare providers.

Keywords

pain assessment; sex differences; race differences; age differences; virtual technology; decision policies

Correspondence to: Michael E. Robinson.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Introduction

Healthcare professionals assess patients' pain based on a combination of medical-related variables and self-report [7]. Their final assessment greatly influences how pain is treated. Therefore, it is critical for healthcare professionals to accurately assess pain. Unfortunately, many biases are known to affect pain assessment. Patient qualities, particularly sex, race, and age, can influence pain assessment.

Regarding sex differences in pain, the overwhelming results of epidemiologic and experimental studies suggest a higher proportion of women than men report pain [18]. A review of the experimental literature indicated there is a sex difference in response to experimentally induced pain, with women having lower pain thresholds and tolerance than men [9]. These differences are often reflected in pain assessment, as women and men tend to rate women as experiencing more pain [23].

Disparities in pain care among racial and ethnic minorities have been reported across a variety of conditions and treatment settings, indicating that African-American and Hispanic patients are more likely to have their pain undertreated compared to Caucasians [11]. Studies examining ethnic differences in analgesic administration have reported conflicting results [8,10,25]. Additionally, ethnic differences have been reported in healthcare providers' ability to accurately interpret patients' pain [24].

Physical pain is a common and significant problem for many older adults. Prevalence rates range from 45% to 80%, depending on the residential status of the sample. Among community-dwelling adults, estimates of the prevalence of pain generally converge around 50% [13,17]. Although common, pain is under-recognized in older adults compared to younger adults [15]. This difference may be due to older adults' tendency to under-report pain relative to younger adults [19]. Furthermore, healthcare providers may be overly cautious in using pharmacologic treatments for pain in older patients [1].

One avenue to explore pain assessment differences is through use of virtual human (VH) technology. *People Putty* is an innovative software program for creating virtual characters with a variety of features. This technology allows one to eliminate the biases that are targeted for study from the development of the actual stimuli. Demographic features such as sex, age, and race can be manipulated to create a diverse array of characters. Moreover, this technology permits manipulation of the facial expressions of characters. This feature of *People Putty* allows for a level of experimental control lacking in retrospective-based research, and permits a level of ecological validity lacking in vignette-based research.

This study employed a lens model design to capture how individuals utilize environmental information to make judgments [2,5]. Empirical applications of this approach typically consist of a series of cue-containing profiles presented to a study participant, about which the participant forms a judgment [12]. Lens model methodology has been used in a variety of investigations of medical decision making [26,27]. It was also effectively used in a recent pain study [14]. The current study uses an analogous type of lens model design, the details of which are described more fully below.

Methods

Participants

Seventy-five undergraduate students at the University of Florida (53 females, 22 males) were recruited through flyers and posters requesting volunteers to participate in this study. Sixty-two of the participants self-reported as Caucasians, and 13 self-reported as African-Americans.

Eligibility for participation required being at least 18 years of age and English speaking. Participation was also contingent upon ability to give consent.

Procedure

A WEB-based delivery model was used for the present study. All participants completed the study on a laboratory computer. Upon giving consent, participants completed a demographic questionnaire. Participants then observed 16 patient profiles, each of which consisted of a vignette and a 20-second looped video clip of a VH representing the patient. Presentation of these profiles was randomized for each participant to prevent order effects. The VH were generated with *People Putty* software, an innovative technology for the creation of virtual characters. This software eliminates from the development of the actual stimuli the very biases the present study is intending to investigate. VH demographic features of sex, race, and age were manipulated to create a diverse array of characters. The facial expressions of pain for the VH were also systematically manipulated and were digitally coded based on the Facial Action Coding System (FACS). The FACS is based on anatomic analysis of facial muscle movements and distinguishes 44 different action units (AUs). The following core action units represent the facial expression of pain in adults: brow lowering (AU4), tightening of the orbital muscles surrounding the eye (AU6&7), nose wrinkling/upper lip raising (AU9&10), and eye closure (AU43) [6,20]. VH pain expressions were achieved through the systematic manipulation of these AUs in accord with the FACS.

Each VH contained four cues: sex (male or female), race (Caucasian or African American), age (young or old), and pain (low pain expression or high pain expression). A total of 16 unique scenarios were created to represent all possible cue combinations. Figures 1 and 2 present sample still frame images captured from the VH videos. Along with each VH, participants were given patient physiological information in a normal range (temperature, blood pressure, pulse rate, respiration rate, and mental status) and a brief vignette (Appendix) about a patient who underwent an appendectomy. For each VH, participants used computerized visual analogue scales (VASs) to rate the VH's level of (1) pain intensity, (2) pain unpleasantness, (3) pain-related negative mood, (4) coping, and (5) medical help recommendations.

Task duration was approximately 1 hour. Following completion of the task, participants were asked to respond, in writing, to a task validity probe, in which they guessed the nature of the study hypotheses. Finally, participants were briefed regarding the variables of interest and the study hypotheses.

Statistical Analyses

Descriptive statistics were conducted to summarize the demographic and background characteristics of the sample. For the idiographic analyses, simultaneous multiple regression equations were generated for each participant to capture their decision making policies. We use the term 'policy' to refer to the consistent approach an individual takes in weighting contextual cues to make a given decision. VH sex, race, age, and pain expression served as independent variables in each model. Pain intensity, pain unpleasantness, negative mood, coping, and medical treatment recommendation ratings were dependent variables in their respective models. The standardized regression coefficients in each equation represent the weight of each cue in the formation of the assessment and treatment judgments. This weight represents the unique contribution and relative importance of each cue in the participant's clinical decision. The coefficient of multiple determination (R^2) represents the amount of variance in assessment and treatment decision policies accounted for by the predictor variables, or the overall function of the cues in each individual's policy. Thus, a significant idiographic regression model indicates that particular individual adopted a consistent decision making policy (i.e., used one or more of the contextual cues in a statistically reliable manner) for the

outcome task. Significant policies were those with equations that met the $p < .05$ level of significance.

Following idiographic analyses for all participants, nomothetic statistics were conducted. For each participant, average assessment and treatment ratings were calculated across VH at each level of cue. Paired samples t -tests were then used to compare ratings within cue for the entire sample.

Results

Idiographic Analyses

Two set of results are reported for each cue (see Table1). Idiographic analyses are described below based on regression models that were significant at $p < .05$. Given the uniqueness of the VH stimuli and the fact that this is the first study to employ this technology for pain-related decision making, Table 1 also reports a more liberal analysis with $p < .10$.

Pain Intensity—Results indicated that 54 out of 75 participants had significant policies for pain intensity assessment. Four of these 54 participants used sex as a significant cue in their policy. Three participants gave higher pain intensity ratings for female VH; the reverse was true for one participant. Race was a prominent cue in the policies of three of these 54 participants, with one more likely to judge higher pain intensity in African-American VH and two more likely to judge higher pain intensity in Caucasian VH. Four participants used age as a prominent cue; one was more likely to judge older VH as experiencing greater pain intensity, whereas the converse was true for three participants. Finally, pain expression was a prominent cue for 54 participants, such that VH displaying high levels of pain expression were judged to be experiencing greater levels of pain by the participants.

Pain Unpleasantness—Results indicated that 52 out of 75 participants had significant policies for pain unpleasantness assessment. Three participants were more inclined to make higher ratings for female VH; the converse was true for two participants. African-American VH were assessed to be experiencing more pain unpleasantness by one participant, whereas three participants judged Caucasian VH to be experiencing more pain. Relative to younger VH, older VH were judged to be experiencing more pain unpleasantness by one participant; the opposite was true for one participant. Finally, 49 participants judged those VH with high expressivity to be experiencing greater pain unpleasantness than those VH with low expressivity.

Negative Mood—Results indicated that 63 out of 75 participants had significant policies for negative mood assessment. Regarding sex, four participants had policies in which this cue was significant. One participant judged female VH to be experiencing greater negative mood compared to males, whereas the converse was true for three participants. Of the six participants who used race as a significant cue, two assigned greater negative mood ratings for African-American VH. The remaining four gave greater ratings for Caucasian VH. Of the four participants with policies in which age was a significant cue, two assessed greater negative mood in younger VH relative to older VH, and the converse was true for two participants. Finally, all 57 participants who used pain expression as a cue assigned greater negative mood ratings to those with high expressivity.

Coping—Results indicated that 48 out of 75 participants had policies for coping assessment that reached statistical significance. Four participants judged female VH to be experiencing worse coping ability compared to male VH. Of the five participants who used race as a significant cue, one assigned worse coping ratings for African-American patients. The

remaining four gave worse coping ratings for Caucasian patients. Of the three participants with policies in which age was a significant cue, one assessed worse coping in younger VH relative to older VH, and the converse was true for two participants. Finally, 48 participants who used pain expression as a significant cue assigned worse mood ratings to those with high expressivity.

Recommendations to Seek Medical Help—Results indicated that 47 out of 75 participants had policies for medical recommendations that reached significance. Two participants recommended female VH seek medical help compared to male VH. Four students recommended that Caucasian VH seek medical help, whereas one recommended that African American VH seek medical help. Two participants recommended that younger VH seek medical help relative to older VH, and the converse was true for three participants. Finally, 46 participants who used pain expression as a significant cue recommended that those with high expressivity seek medical help.

Nomothetic Analyses

Pain Assessment—For pain intensity and unpleasantness ratings, participants assessed female VH to be experiencing greater pain intensity [$t(74) = -2.93, p < .01, dz = .34$] and unpleasantness [$t(74) = -2.70, p < .01, dz = .34$] than male VH. There was not a significant difference between ratings for African American and Caucasian VH or between ratings for young and old VH for pain intensity or pain unpleasantness. Finally, VH with high expressivity were judged to be experiencing greater pain intensity [$t(74) = -14.94, p < .01, dz = 1.73$] and unpleasantness [$t(74) = -15.65, p < .001, dz = 1.80$] than those with low pain expressivity. Results of nomothetic regression analyses for pain intensity and unpleasantness are presented in Table 2.

Mood Assessment—For mood ratings, participants assessed female VH to be experiencing greater pain-related negative mood [$t(74) = -2.67, p < .01, dz = .32$] compared to male VH. There was not a significant difference between ratings for African American and Caucasian VH or between ratings for young and old VH for pain-related negative mood. Finally, VH with high expressivity were judged to be experiencing greater negative mood [$t(74) = -15.88, p < .01, dz = 1.84$] than those with low pain expressivity. Results of nomothetic regression analyses for pain-related negative mood are presented in Table 2.

Coping Assessment—For pain coping ratings, participants assessed female VH to be experiencing worse coping [$t(74) = -2.92, p < .01, dz = .34$] compared to male VH. There was not a significant difference between ratings for African American and Caucasian VH for pain coping. Participants judged older VH to be experiencing worse coping [$t(74) = 2.59, p < .05, dz = .30$] compared to younger VH. Finally, VH with high expressivity were judged to be experiencing worse coping [$t(74) = -13.28, p < .01, dz = 1.53$] than those with low pain expressivity. Results of nomothetic regression analyses for coping assessments are presented in Table 2.

Recommendations to Seek Medical Help—For medical recommendation ratings, participants recommended that female VH seek medical help more than male VH [$t(74) = -3.06, p < .01, dz = .35$]. There was not a significant difference between ratings for African American and Caucasian VH. Participants recommended that older VH seek medical help more than younger VH [$t(74) = 2.32, p < .05, dz = .26$]. Finally, participants recommended that VH with high pain expressivity seek medical help more than VH with low pain expressivity [$t(74) = -13.03, p < .01, dz = 1.50$]. Results of nomothetic regression analyses for medical help recommendations are presented in Table 2.

Discussion

This study is the first to employ computer-generated virtual humans (VH) to test hypotheses about the effects of sex, race, and age on judges' ratings of pain, mood, coping, and treatment directives. This novel technology allowed for the creation of standardized expressions of pain that could be "morphed" onto VH of different sexes, races, and ages. When used in conjunction with the FACS system, this technology permitted the creation of human facsimiles without incorporating the biases of sex, race, or age that were targeted for investigation. For example, creating pictures or motion video with actors or patients would require the use of judges to ascertain the amount of pain present in the stimuli. Those judgments would presumably be subject to the very same empirically-documented sex, race, and age biases under study, thus making it very difficult to determine what biases might be projected onto the images by the research participant viewer. An additional distinction of this study is the use of the lens model approach to capture idiographic decision policies about pain. The majority of research in pain decision making has been nomothetic in nature where only group differences or collated decision policies are assessed.

The validity of the computer-generated pain expression seems to have been supported in this study as demonstrated by the large majority of individuals who were able to use the level of pain displayed by the VH as a significant cue in their decisions about pain. Had the level of pain displayed by the VH been too subtle or non-representative, then the error in judgments about pain would have been too high for either idiographic or nomothetic analyses to be statistically reliable. VH with FACS-standardized "high" expressions of pain were rated by participants as having more pain intensity and unpleasantness, greater negative mood, worse coping, and more likely to be in need of medical attention. The direction of these effects in both idiographic and nomothetic analyses suggest that we were successful in our intention to create VH of significantly different pain levels.

The assessment of the influence of sex, race, and age illustrates the power of the lens model analytic approach. In some cases, nomothetic analyses could miss important influences of these factors, and large variability in decision patterns would be interpreted as error. The lens approach allows for investigation of individual differences in pain-related decision patterns and individual cues. This study demonstrated that many study participants used VH sex, race, and age in making determinations of pain level, coping, mood, and treatment recommendations. It is tempting to refer to these significant predictors as "biases," and in fact we use this term in our discussion below. However, without a standard for comparison it is not currently possible, for instance, to conclude that men or women have higher or lower pain. The direction of the sex difference in pain ratings is somewhat consistent with previous literature [22,23] indicating that women are rated as having higher pain levels than men, and that women often report greater levels of pain than men. Regarding the idiographic analyses for race and age, it appears that the majority of individuals are not consistently biased in one direction. For example, of the 23 significant policies for race, 6 were biased toward African American VH as experiencing more pain and negative sequelae, whereas 17 were biased toward Caucasian VH as experiencing more pain and negative sequelae. Moreover, of the 18 significant age policies, 9 were biased toward younger VH as experiencing more pain and negative sequelae, and 9 were biased toward Caucasian VH as experiencing more pain and negative sequelae. Whether these influences are interpreted as biases remains to be seen as more information about pain processing and cultural expectations is explored.

It is evident from this study that not all cues are used by all individuals, and not all individuals have a reliable decision policy. It may be tempting to view this variability as a weakness of the study. We would argue that since this technology and results might apply to healthcare professionals and/or caregivers of individuals with pain, capturing even a small number of

individual policies or cues could have a large impact on society. The typical nurse, physician, or dentist will see hundreds or thousands of patients during the course of their practices. Further, they may serve as models and/or educators to similar numbers of students/colleagues. A pain decision strategy that erroneously weights patient sex, race, or age in decisions about pain becomes quite significant in this context. The current study employed an undergraduate sample that, admittedly, may not represent practicing healthcare providers. However, it does represent a sample of individuals who experience pain, who observe pain in others, and who serve as consumers of pain-related services. In addition, some of these individuals are almost certain to go on and become healthcare providers.

That it is possible to detect and measure the variability in pain decisions with this technology allows for a number of exciting research and training opportunities. This methodology can be used to study how healthcare providers incorporate sex, race and age in their decisions about pain. A more varied participant population would also allow for the examination of viewer characteristics on pain decision policies. For example, there are a number of interaction effects of viewer characteristics with VH characteristics that will be possible to examine with this technology. Variables such as type of healthcare provider; provider training; and provider sex, race, and age are all examples of viewer characteristics that may influence decisions about pain [3,4,16,21]. Beliefs and stereotypes about different patient diagnostic groups, races, sexes, or ages could also be explored with this technology.

This study serves as a first attempt to demonstrate the utility and validity of the VH technology and also highlights the advantages of lens methodology. There are obvious limitations. As noted previously, the participant population is homogeneously young, relatively well-educated, and may not be representative of the population at large, or specific health-care provider samples. In addition, the number of cues that can be simultaneously investigated with this methodology is limited. There is a geometric expansion of the number of vignettes that have to be viewed as the number of cues increases. At some point this limits the feasibility of the study because of participant burden. We recognize that by necessity this limits the ability to capture a very rich verbal and non-verbal environment and cue set available in most clinical and natural settings. Further, the nature of this study may have been evident to participants and consequently elicited socially-desirable ratings. In fact, many participants did express at least some awareness of study hypotheses. However, there were no differences in the use or weighting of VH cues between those who did express such awareness and those who did not (data not presented). Finally, representativeness is an issue inherent to all analogue studies; the VH stimuli make this particularly salient for the current study. Suboptimal representativeness may be a primary reason why the influence of VH demographic characteristics – particularly race and age – was less robust in this study relative to the clinical literature indicating such influences are often quite prominent. In our pilot work using the same stimuli, over 70% of participants indicated the VH facial expressions were realistic depictions of pain, and over 90% considered the clinical scenario to be reflective of a real post-operative scenario. Although these responses suggest a high degree of representativeness, one must remain cautious when extrapolating from these data.

In summary, the use of VH and lens model methodologies was shown to be sensitive to sex, race, and age influences on the pain-related decision policies of undergraduate men and women. The direction of the findings appear consistent with other literature and show that in general, women are perceived as expressing more pain, more negative mood, coping less well with pain, and are more likely to be in need of medical treatment for their pain. These findings are consistent with pain-related gender role stereotypes about men and women. Similarly, some individuals demonstrated race and age influences in their pain decisions, though these influences were not entirely consistent with previous research [11,15]. This study is seen as

strong evidence for the validity and potential of this technology and methodology in the future examination of pain-related decision making.

Acknowledgements

Support for this research was provided from Grant F31 (NS049675) to A. T. Hirsh from the National Institute of Neurological Disorders and Stroke (NINDS). The authors have no conflicts of interest to declare.

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.

References

1. Aubrun, F. Management of postoperative analgesia in elderly patients; *Reg Anesth Pain Med*. 2005. p. 363-379.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=16032589
2. Beal D, Gillis JS, Stewart T. The lens model: Computational procedures and applications. *Perceptual & Motor Skills* 1978;46:3–28.
3. Chibnall, JT.; Tait, RC.; Merys, SC. Disability management of low back injuries by employer-retained physicians: ratings and costs; *Am J Ind Med*. 2000. p. 529-538.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=11025494
4. Choiniere, M.; Melzack, R.; Girard, N.; Rondeau, J.; Paquin, MJ. Comparisons between patients' and nurses' assessment of pain and medication efficacy in severe burn injuries; *Pain*. 1990. p. 143-152.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=2308761
5. Cooksey, RW. Judgment analysis: Theory, methods, and applications. San Diego, CA: Academic Press; 1996.
6. Craig, KD.; Prkachin, KM.; Grunau, R. The facial expression of pain. In: Turk, D.; Melzack, R., editors. *Handbook of Pain Assessment*. 2. New York: Guilford Press; 2001. p. 257-276.
7. Dworkin, SF.; Sherman, JJ. Relying on objective and subjective measures of chronic pain: Guidelines for use and interpretation. In: Turk, DC.; Melzack, R., editors. *Handbook of Pain Assessment*. 2. New York: Guilford Press; 2001. p. 619-638.
8. Ezenwa, MO.; Ameringer, S.; Ward, SE.; Serlin, RC. Racial and ethnic disparities in pain management in the United States; *J Nurs Scholarsh*. 2006. p. 225-233.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=17044339
9. Fillingim RB, Maixner W. Gender differences in the responses to noxious stimuli. *Pain Forum* 1995;4:209–221.
10. Fuentes, EF.; Kohn, MA.; Neighbor, ML. Lack of association between patient ethnicity or race and fracture analgesia; *Acad Emerg Med*. 2002. p. 910-915.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=12208680
11. Green, CR.; Anderson, KO.; Baker, TA.; Campbell, LC.; Decker, S.; Fillingim, RB.; Kalauokalani, DA.; Lasch, KE.; Myers, C.; Tait, RC.; Todd, KH.; Vallerand, AH. The unequal burden of pain: confronting racial and ethnic disparities in pain; *Pain Med*. 2003. p. 277-294.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=12974827

12. Hammond, KR. How convergence of research paradigms can improve research on diagnostic judgment; *Med Decis Making*. 1996. p. 281-287.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=8818127
13. Herr, K. Chronic pain: challenges and assessment strategies; *J Gerontol Nurs*. 2002. p. 20-27.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=11829221
14. Hirsh, AT. Unpublished doctoral dissertation. University of Florida; 2008. Investigating patient and provider influences on the assessment and treatment of pain: A novel virtual patient technology application.
15. Horgas, AL.; Elliott, AF. Pain assessment and management in persons with dementia; *Nurs Clin North Am*. 2004. p. 593-606.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15331304
16. Marquie, L.; Raufaste, E.; Lauque, D.; Marine, C.; Ecoiffier, M.; Sorum, P. Pain rating by patients and physicians: evidence of systematic pain miscalibration; *Pain*. 2003. p. 289-296.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=12670671
17. Mobily, PR.; Herr, KA.; Nicholson, AC. Validation of cutaneous stimulation interventions for pain management; *Int J Nurs Stud*. 1994. p. 533-544.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=7896516
18. National Center for Health Statistics. Health, United States, 2006 with Chartbook on Trends in the Health of Americans. Hyattsville, MD: 2006.
19. Oberle, K.; Wry, J.; Paul, P.; Grace, M. Environment, anxiety, and postoperative pain; *West J Nurs Res*. 1990. p. 745-753.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=2275192
20. Prkachin, KM. The consistency of facial expressions of pain: a comparison across modalities; *Pain*. 1992. p. 297-306.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=1491857
21. Prkachin, KM.; Solomon, P.; Hwang, T.; Mercer, SR. Does experience influence judgments of pain behaviour? Evidence from relatives of pain patients and therapists; *Pain Res Manag*. 2001. p. 105-112.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=11854772
22. Robinson, ME.; Riley, JL., 3rd; Myers, CD.; Papas, RK.; Wise, EA.; Waxenberg, LB.; Fillingim, RB. Gender role expectations of pain: relationship to sex differences in pain; *J Pain*. 2001. p. 251-257.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14622803
23. Robinson, ME.; Wise, EA. Prior pain experience: influence on the observation of experimental pain in men and women; *J Pain*. 2004. p. 264-269.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15219258
24. Sheiner, EK.; Sheiner, E.; Shoham-Vardi, I.; Mazor, M.; Katz, M. Ethnic differences influence care giver's estimates of pain during labour; *Pain*. 1999. p. 299-305.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=10431717
25. Todd, KH.; Deaton, C.; D'Adamo, AP.; Goe, L. Ethnicity and analgesic practice; *Ann Emerg Med*. 2000. p. 11-16.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=10613935
26. Wigton, RS. Applications of judgement analysis and cognitive feedback to medicine. In: Brehmer, B.; Joyce, CRB., editors. *Human Judgement: The SJT View*. Amsterdam: Elsevier; 1988.

27. Wigton RS. Social Judgement Theory and medical judgement. *Thinking and Reasoning* 1996;2:175–190.

Figure 1.
Still frame of VH with cues representing male sex, Caucasian race, older age, and high pain expression.

Figure 2. Still frame of VH with cues representing female sex, African-American race, younger age, and low pain expression.

Table 1

Idiographic Analyses: Number of participants who had significant policies at the individual cue level for each decision domain at the $p < .05$ and $p < .10$ level

Cue	Pain Intensity	Pain Unpleasantness	Decision Domain ($p < .05$)			Coping	Recommend Medical Help	Total
			Negative Mood					
Gender	Male	2	3	0	0	0	6	
	Female	3	1	4	2	1	13	
Race	African American	1	2	1	1	1	6	
	Caucasian	3	4	4	4	2	17	
Age	Young	1	2	1	2	2	9	
	Old	1	2	2	3	3	9	
Pain	Low Pain	0	0	0	0	0	0	
	High Pain	54	57	57	46	57	254	

Cue	Pain Intensity	Pain Unpleasantness	Decision Domain ($p < .10$)			Coping	Recommend Medical Help	Total
			Negative Mood					
Gender	Male	2	4	1	0	0	10	
	Female	4	2	5	6	1	24	
Race	African American	2	3	6	1	4	17	
	Caucasian	6	5	2	4	2	24	
Age	Young	3	3	1	3	3	14	
	Old	2	4	4	2	2	14	
Pain	Low Pain	0	0	1	0	1	1	
	High Pain	56	61	53	49	53	276	

Table 2
 Nomothetic Analyses: Mean and standard deviation of VAS rating at the individual cue level for each decision domain.

Cue	Pain Intensity	Pain Unpleasantness	Decision Domain		Coping	Recommend Medical Help
			Negative Mood			
Gender	Male	38.66* (14.54)	42.33* (15.17)	37.88* (15.44)	32.47* (13.64)	44.06* (21.16)
	Female	41.14* (13.87)	44.88* (14.54)	40.24* (15.12)	34.76* (13.80)	47.15* (20.95)
Race	African American	39.72 (14.45)	42.90 (15.28)	38.12 (16.03)	32.80 (14.08)	45.29 (20.72)
	Caucasian	39.94 (13.98)	44.31 (14.28)	39.85 (14.97)	34.48 (13.56)	45.80 (21.35)
Age	Young	39.42 (13.66)	43.10 (14.59)	38.39 (15.35)	32.53* (13.35)	44.35* (21.28)
	Old	40.37 (14.91)	44.10 (14.80)	39.58 (15.36)	34.84* (14.30)	46.85* (20.94)
Pain	Low Pain	25.94* (14.80)	28.56* (16.34)	24.82* (15.72)	21.38* (14.38)	31.95* (23.99)
	High Pain	53.86* (16.99)	58.64* (16.73)	53.15* (17.72)	45.99* (16.59)	59.26* (20.91)

* Within-cue difference is significant at $p < .05$