

The Imperative for Social Competency Prediction

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Abstract. Some military personnel returning from deployment show social competency deficits: They act impulsively and make risky decisions, misinterpret interaction cues, experience difficulties with personal relationships, and adopt high-risk behaviors. These adverse social skills directly influence, among other important variables, psychological health and quality of life. Social skills deficits are not just a military concern; for instance, at-risk adolescents and reintegrating prisoners must also learn to demonstrate social competence. Meanwhile, today's screening is limited in its ability to assess current—and predict future—social competency; typical neurocognitive assessment is not designed to assess social competence in realistic situations. The author proposes a tool to improve screening by identifying social competency deficits through assessment of behavior in simulated social situations. This is important not only to more accurately assess adverse behaviors, but also to predict future behaviors and their causes, to focus intervention to address social competency deficits before adverse behaviors are ever exhibited.

Keywords. Social competency, interaction skills, situated assessment.

1 Introduction

Social skills are those abilities that underlie individuals' management of their behavior in a variety of challenging or demanding social situations. Social skills *deficits* manifest as poor behaviors in such situations. For example, in a confrontational situation, some individuals may perceive linguistic, gestural, and expressive cues of the dialog partner as indicating hostile intent. Misinterpretation of these cues—the words used during the situation, the gestures used and facial expressions shown by the dialog partner—could lead to an escalation in the potential for violence or an adverse outcome as a result of the confrontation. Other situations where social skills are essential are those involving risky choices, those involving impulsive versus deliberate decisions, those involving familial or personal relationships, and those involving negotiation or the expressing of one's preferences in conflict with peer opinions or influences.

These situations and others are prevalent for U.S. military personnel returning from deployment, and an increasing number of personnel are behaving poorly. Social skills deficits demonstrated by these personnel are manifested in numerous ways, including:

- *Psychological health.* Some 40% of personnel returning from Iraq and Afghanistan experience high rates of psychological problems such as posttraumatic stress disorder and depression [1]. These mental health conditions are associated with substance abuse disorders and with behavioral problems such as poor anger management and aggression [2]. They may get progressively worse postdeployment [3].
- *Substance use.* Anywhere from 12-15% to nearly one-third of returnees screen positive for or experience alcohol misuse [4,5]. It is estimated that, between 2004 and 2006, 25% of young veterans suffered from substance abuse disorders in the preceding year [6]. Certain substance abuse trends for deploying [7] and post-deployed [8] personnel are concerning.
- *Aggression and violence.* Intimate partner violence is a significant concern for spouses of personnel returning from combat [9], as anger problems mediate between stress disorders and intimate partner violence among veteran couples [10]. Other indicators of aggression include risky driving and hypervigilance [11,12]. Additionally, there is a distressing trend of suicide by veterans [13].

The problem is not just one of postdeployed military personnel, however. Social skills deficits are demonstrated as well by formerly incarcerated persons [14], at-risk youth [15], certain individuals along the autism spectrum [16], the mentally ill [17], even pediatric cancer survivors [18]. The intent of this paper is to demonstrate how prediction of social competency is possible through behavior modeling using simulated situations and why such prediction would benefit intervention.

1.1 Improving Screening

In particular the vision is a tool to improve health screening by identifying social skills deficits and helping to focus interventions that address those deficits. It is proposed here to “situate” the assessment using virtual vignettes that the author pioneered with inner-city, at-risk adolescents [15]. The idea is to present social situations adapted for the given population (returning personnel, autistic children) to have individuals *demonstrate* their social skills *rather than describe* their attitudes and beliefs as is typical with conventional assessments. The aim would be for user behaviors exhibited while engaged in the set of virtual vignettes to compare favorably against current best practice conventional clinical measures of social skills. Operationalizing improved screening for this situated assessment would involve, relative to existing screening, identifying more individuals with social skills deficits, identifying more specific skills deficits through detailed behavior models that could be used to focus subsequent clinical intervention, and predicting, with greater accuracy, actual social behaviors during an interval between a baseline and a follow-up assessment.

2 Social Skills Assessment

Typical best practice assessment of social skills involves placing individuals into hypothetical (but considered real life) social situations. Examples include asking individuals what they would do in these situations and measuring responses using obser-

vation and validated rubrics, presenting non-interactive videotapes to gauge individuals' reactions, and presenting questionnaires that may involve inaccurate reporting but are still considered best available [19]. Other approaches are usually more focused on specific social constructs such as quality of life and family functioning, but even with these constructs there are not systematic assessment approaches [20].

The author has conducted research that represents a different approach to improving assessment of social skills. These studies evaluate decision making and social skills using situated assessment—implemented using a gaming engine and established artificial intelligence models [17,21]—based on types of decision making and social skills that have been associated with violent behavior and drug use and that are targeted by violence and drug abuse prevention programs. These skills include emotional control, information seeking, expressing preferences, negotiation and willingness to compromise, and using non-provocative language. The skills are assessed by simulating in a virtual environment real social encounters that may have adverse consequences.

In these studies, behavior is assessed using two approaches. First, individuals' engagement is observed while they interact within the virtual environment. Specifically considered are their body language, tone of voice, emotional control, and reaction time, for each vignette, mapping each against a predefined scale. Users have been found to be engaged during the vignettes, quickly suspending any disbelief that they may have in speaking with a virtual character once the character responds appropriately to the first few dialog exchanges [15]. These observations provide one source of data for assessing appropriate social behaviors.

Second, which path to outcome that is taken is evaluated. That is, each vignette may have any of several outcomes—usually one or more good outcomes demonstrating avoidance of risky behavior and one or more poor outcomes demonstrating risky behavior—and any of several paths leading to a given outcome. Different paths (i.e., dialog exchanges, manipulation of objects, and other components of the social interaction) represent more or less appropriate social skills. For example, a vignette may involve a virtual character trying to entice an individual into a confrontation. One good outcome is to defuse the situation using dialog. A poor outcome is to vehemently disagree with the character by raising one's voice toward the character. On the path toward any outcome there are worse and better exchanges, such as those that cause a decrease or an increase in how anxious or angry the character behaves [21] or those that demonstrate desired skills such as seeking additional information or expressing one's preferences. These exchanges are behaviorally based—that is, demonstrated by the individual—hence provide data for assessing appropriate social behaviors.

2.1 The Need for Predictive Ability

There is reason to believe that engagement with virtual vignettes could predict real-world, socially adverse behaviors *before* an individual has had the opportunity to demonstrate any adverse behaviors. To test this conjecture would require monitoring user performance with vignettes at a baseline, then following up after some time (e.g., three months). Individuals' actual behaviors in the interim (captured through a ques-

tionnaire) would be mapped against baseline behaviors in an attempt to determine predictive patterns of social skills deficits. Thus, supposing that a given individual was arrested for battery in the three months following a baseline, correlations could be sought in that individual's baseline vignette performance that make theoretical sense, such as demonstration of aggression, hostile intent bias, and/or impulsivity in certain situations. These behaviors would have had to have been shown across the range of vignettes (i.e., consistently and reliably, in appropriately different situations). In contrast, supposing that a given individual attempted suicide in the three months following a baseline (such sensitive information can be captured using computer-assisted self-interviewing), relationships could be sought with baseline behaviors that showed, for instance, lack of engagement or interest in the dialogs, inability to express preferences, or slowed reaction time. Still other mappings would result for additional intervening events, such as arrest for a reason other than battery (perhaps drunk driving), acquisition of a new substance use habit, or separation or divorce. With sufficient breadth of vignettes, predictive models developed initially with a sample of participants could be refined based on each subsequent participant's baseline and interim behaviors. The ultimate intent for predictive behavior models is to benefit clinical intervention and even prevention.

3 Tool Development

3.1 Moving beyond Existing Best Practices for Assessment of Social Skills

All U.S. military personnel returning from deployment are supposed to complete a self-report postdeployment health assessment and a reassessment after three and six months, to determine if they have developed physical or psychological health illnesses. These instruments, though, do not directly assess social competency. Additionally, predeployment neurocognitive assessment [22] is now mandated by the U.S. military, thereby establishing a baseline that could be used for comparison against postdeployment assessment to gauge the extent of any possible injury (but see [23]). This assessment is designed to detect executive functioning, attention, impulse control, working memory, and reasoning and decision-making ability through a battery of cognitive and emotional tasks, but it does not tap into interpersonal relations, negotiation skills, emotional intelligence, empathic ability, or recognition of other's intent.

To augment neurocognitive assessment, virtual vignettes—including all relevant virtual objects, persons, actions, sounds, and settings needed for the designed situations—are proposed to situate individuals and elicit behaviors so that social skills competencies or deficits could be demonstrated. Numerous existing applications involve virtual vignettes for training and assessment of interaction skills. These applications have been geared toward a wide variety of behaviors, including interpersonal skills and emotional control among adolescents, simulated patients for bioterrorism preparedness and for pediatric clinical diagnosis, simulated mentally ill consumers encountered by law enforcement officers, and general research participants or medical patients for training researchers to obtain informed consent (for just one review, see

[24]). In these applications, individuals interact with characters rendered on the screen through voice, text, menu selection, and/or cursor activity, and the characters respond appropriately with speech, movement, and expression.

With the proposed tool, not just basic cognitive constructs would be addressed, such as are measured using neurocognitive tests, but also higher-level skills, such as are needed in real-world situations. Behavioral constructs representative of social skills deficits include poor emotion expression recognition, impulsivity, insensitivity to penalties, hostility bias, gender stereotyping, acceptance of dating or partner violence, and risky decision making. Hence, virtual vignettes would need to require complex responses from the individuals. Multiple versions of multiple vignettes would be developed, addressing the range of social skills competencies. Vignettes would have to be tailorable to cover the range of individuals' experiences, backgrounds, working and living environments, and social skills deficits.

3.2 Designing and Developing Virtual Vignettes

Designing and developing virtual vignettes is effortful but not complicated. To inform the design, a developer must consider several factors. First, the developer must ensure that the range of vignettes covers the range of social competency skills that need to be addressed. This effort involves subject-matter expertise and creativity in situations presented, as well as variation in possible responses that are available to the user at any decision point. Second, the developer must determine how to follow and assess the user's behavior within a vignette. This task is accommodated by mapping variable values to the social skills competencies and updating them as the interaction progresses, as the user employs or fails to employ appropriate skills [15]. Third, the developer must allow any dialog flow to branch at decision points based on the individual's input, so that the dialog remains unscripted; this may be accomplished by the use of an augmented transition network [20] that manages the dialog state. Eliciting dialog structures for virtual vignettes requires several steps, including interviews with experts to understand key drivers of the dialog flow that are found to lead to adverse consequences, translation of these data into subtopics and conditional statements that define how and when key drivers cause subtopics to be discussed, and definition of grammars that cover the range of possible utterances by either dialog partner.

A developer should expect there to be many subtopics to discuss in any situation, given initial conditions and a narrative for the situation. Extensive branching between subtopics, an influence of having discussed one subtopic on discussions of another subtopic, considerable emotional content and cognitive dissonance exhibited by the individual, and complicated conditional statements all affect the flow of the dialog. For such complex applications one approach is to use a series of linked tables that developers populate with experts' help that systematically organize models of how each virtual character should behave (i.e., its language, gestures, and emotional responses) in response to all of the predicted inputs from the user and within all of the different simulated conditions. That is, behavior models would specify how the emotional, physiological, cultural, and cognitive states of the virtual characters change based on user input and time course, and how they would be influenced by contextual

factors such as the social role played by the virtual character and the setting of the dialog [21,25]. Rendering of the characters and setting could be done via nearly any commercial game engine, and non-dialog interaction (e.g., manipulating virtual objects in the virtual environment) realized via object-based selection maps. The many existing applications employ varying techniques to implement their virtual vignettes but all involve some type of underlying behavior modeling.

3.3 Validating through Baseline Assessment and Follow-up

No existing application, however, is now used to directly predict future behaviors. To validate a situated assessment tool and gauge its predictive capacity, individuals would engage in the virtual vignettes at baseline, and their interim behaviors between baseline and some time post-baseline would be captured, as described above. Relevant events such as demonstration of psychological illness or risky behavior, as well as important background characteristics, would influence how baseline performance feeds into predictive models. Validity checks against standard practices would use methods that have previously been employed [26], including descriptive statistics for individuals' level of engagement and principal components analysis to identify latent constructs of virtual vignette performance measures. The data from each successive individual would refine predictive models.

Situated assessment using virtual vignettes is expected to have predictive power for at least two reasons. First, it is known how to develop virtual vignettes and assess current skill. It is reasonable to believe current skill would influence future actions. Second, because of the greater realism than neurocognitive assessment and the greater dynamism than static vignette assessment, virtual vignettes may enable the determination of how—or within what bounds—an individual would behave in the future under different conditions, given how that individual is behaving now. Furthermore, based on previous findings [26] that showed differential performance on the virtual vignettes prior to any intervention between adolescents who had or had not previously been diagnosed with conduct disorder, it is not unlikely that different groups of individuals (returning personnel, autistic children) would also perform differentially.

3.4 Developing Clinical Guidance for Use by Clinical Staff

A guide for the effective use of this tool—to tailor intervention—would be useful for clinical staff. The clinical use guide would describe how the outcomes from the set of vignettes presented to an individual indicate specific clinical needs. For instance, if the individual were to demonstrate a hostile intent bias through his/her actions, by misinterpreting gestures and facial expressions or by guiding the dialog toward confrontational branches, but not demonstrate any impulsivity in his/her decisions, then a clinician could use this information to focus subsequent intervention onto that biased behavior. It would be important to ensure that the guide also considered what derives from other assessments, so as to check consistency (e.g., between an assessment of impulsivity by one of the neurocognitive tests and that done through the virtual vignettes). These use factors would be developed in consultation with clinical experts.

4 Summary

A tool as is proposed here is needed during clinical interventions for individuals demonstrating or at risk of social skills deficits caused by psychosocial problems—catching potentially socially adverse behaviors *before* they actually occurred. There is such a need for both military and civilian populations. The main challenge is the development of powerful enough predictive behavior models. Assessment, then, would take place within a safe, replicable, adaptable virtual environment simulating real-world social interactions. The tool would be applicable to clinical personnel in the field or at primary and behavioral health care settings. As a screener, the tool would be meant to provide information that could improve the quality of life, psychological health, and fitness for duty or readiness for reintegration.

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