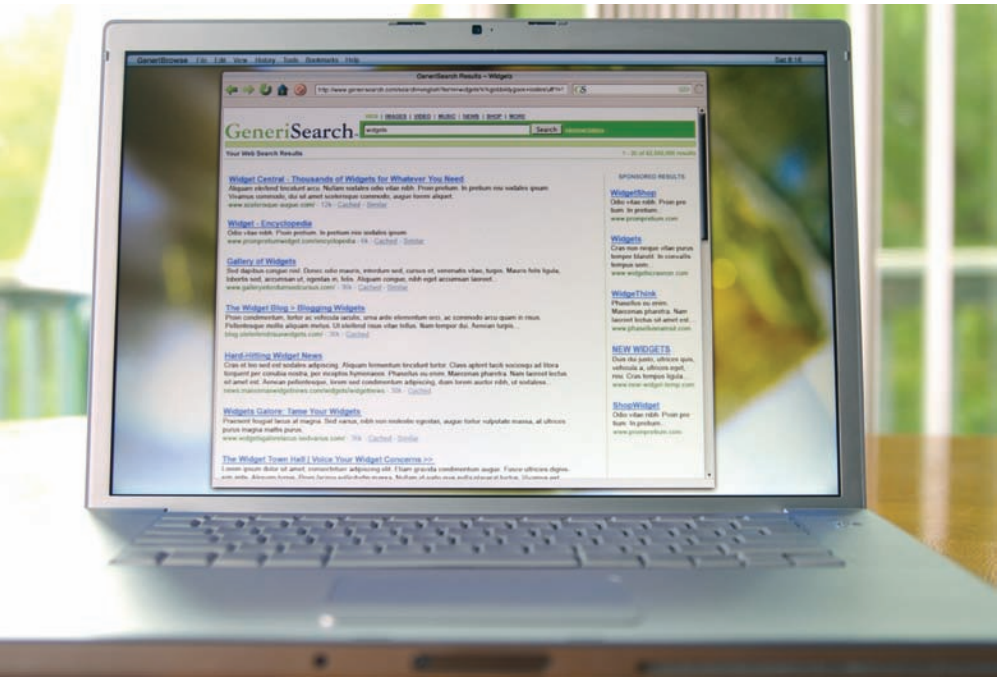
Update on Cognition



Technology, Society, and Mental Illness: Challenges and Opportunities for Assessment and Treatment

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ABSTRACT

Technology is rapidly changing society, and many activities now require the ability to use technology. This situation has the potential to lead to problems for several populations, including the elderly, the disadvantaged, and people with severe mental illness. In this column, we review the state of technology as it affects daily activities. We then review previous efforts to use technology positively for both the assessment and treatment of psychiatric conditions, including posttraumatic stress disorder and severe mental illness. We conclude that technology-based interventions and assessment strategies have the potential to deliver benefit to a wide array of older people and those with severe mental illness, including reaching people who would not have had access otherwise.

KEY WORDS

Cognitive remediation, disability, cognition, schizophrenia

INTRODUCTION

Technology is ubiquitous in society, and people with schizophrenia are challenged to interact with technological advances like the rest of the culture. These technological advances actually pose a great challenge to people with schizophrenia because they, much like older individuals, may not interact with technology to the same extent as other people do. At the present time, many services and processes that formerly had a human interaction component are nearly completely automated. Banking, shopping, paying bills, and filling prescriptions often require interaction with technology. As people who receive disability or retirement compensation, either from the Veterans Administration (VA) or the Social Security administration, are now required to have payments direct deposited, interactions with banks are required even to initiate cash transactions. Automated teller machines (ATM) are typically required to obtain cash, and some banks charge low-balance customers (as most retired or severely mentally ill people would be) a fee for writing or cashing checks.

Further, some pharmacies, including at some VA hospitals, do not accept in person drop-off of prescriptions. These rules then lead to the requirement that the patient either make an online request or interact with a telephone voice menu. Finally, enrollment as a patient at a new clinic often requires completion of information forms on a computer. This process sometimes occurs from the home or, in some cases, waiting rooms, which are now often equipped with computers into which patients are required to enter their information via electronic forms.

Cognitive changes seen in those with severe mental illness and aging individuals promote additional

challenges in interacting with technology. Literature suggests that the ability to perform functionally skilled acts of daily living, such as shopping and financial management, is correlated with cognitive performance.[1] These correlations are greatest in populations with global cognitive impairments, such as individuals with schizophrenia[2] or bipolar disorder.[3] In fact, the correlation between performance of functionally skilled acts and cognitive deficits is remarkably consistent across both different methods of assessing cognition and different performance-based assessment of functional skills.[4]

People with schizophrenia have experienced difficulties with obtaining employment since the early definitions of the condition. A review paper[5] of the functional outcomes of people with schizophrenia focusing on the first 100 years of research on schizophrenia (1895–1985) pointed out that despite notable changes in the treatments for schizophrenia, there was little alteration in the functional outcomes of people with schizophrenia. While one possible explanation for that consistent outcome was that the illness has such a profound impact on functioning that treatments have had no impact, another explanation involves technology and complexity. During the 20th century up to 1985, there was rapid technological progression, with the advent of movies, television, and computers. Since then the progression has been even more rapid, with mobile communication technology, personal computers, and the penetration of technology into all levels of society and nearly all daily activities. At this time, operation of a touch-screen computer is now considered unskilled labor, such as a position as a cashier at a fast food restaurant or convenience store. Thus, the considerable disadvantage conferred by cognitive impairments may also maximally impact the potential of people with schizophrenia to enter the job market, as even entry-level jobs now require rapid acquisition of technological skills.

TECHNOLOGY-BASED ASSESSMENT STRATEGIES

Given the importance of technology in society, it is no surprise that assessments of the potential for everyday functioning are moving in the direction of technology as well. For instance, assessments of the ability of children with attention deficit hyperactivity disoder (ADHD) to function in a classroom have involved the use of virtual reality (VR) technology.[6] Virtual classrooms allow for the simulation of the mulitiple concurrent demands of the classroom in an individualized assessment scenario. Similarly, many paper and pencil assessment strategies are quite amenable to translation into a VR format. For example, the functional capacity assessments previously described in this column[7] include simulated interactions requiring banking, money and medication management, and doctor-patient interaction that can be simulated with computers. Further, planning and transportation can examined in quite realistic fashion using VR technology.

VR assessments can also be delivered remotely. In contrast to paper and pencil assessments or standard computerized assessments delivered in a laboratory, many VR assessments can be administered in any location with suitable computer technology. Thus, mouse-operated VR can be accessed from any computer with an internet connection, and touch-screen versions could still be delivered at an assessment center, precluding the need for home or office visits for assessments.

We have developed one such assessment instrument that has the potential for high levels of usefulness for assessment of the ability to meet real-world demands. The Virtual Reality Functional Capacity Assessment Tool (VRFCAT) is a computer-based virtual-reality measure of functional capacity that relies on a realistic simulated environment to recreate routine activities of daily living. The VRFCAT's realistic, interactive and immersive environment consists of a tutorial and six versions of four mini scenarios, which include navigating a kitchen, catching a bus to a grocery store, finding/purchasing food in a grocery store, and returning home on a bus. Participants complete the scenarios through a progressive storyboard design. The VRFCAT is very relevant as an assessment of everyday functional capacity. Data covering 12 measures of accuracy and timing are collected and automatically downloaded, and factor scores are created to enhance data reduction, detection of impairments, and sensitivity to treatment. Early work using the VRFCAT with healthy elderly people and patients with severe mental illness[8] suggests that it has very good psychometric properties, such as good reliability and concurrent validity with conventional non-VR functional capacity assessments and cognitive outcomes. Current work funded in part by National Institute of Health (NIH) focuses on the ability of the VRFCAT to be sensitive to treatment-related change and age-related decline in functional skill.

Figure 1 provides example screen shots from the VRFCAT assessment procedure.

Another domain of importance in technology-informed assessment is that of ecological momentary assessment. This refers to the use of technology to sample behavior in real-world settings. Previous procedures employed pager-type technology, where the participant was contacted

FIGURE 1. Screen shots from the VRFCAT assessment procedure

and completed pre-selected questionnaires on a Palm-type device.[9] Current iterations of this technology include the use of smartphones with interactive menus.[10] These menus are adjusted to capture the potential activities based on the location of the individual (home vs. away), the other people present, and can sample both activities and mood. The latest advances in smartphone technology use the global positioning system (GPS) feature present on these devices. Thus, validity information on the in-person, immediately collected reports can be collected through comparison of the location of the device and the activities reported. Further, research to date has suggested an excellent rate of adherence to these assessments and positive results for the validity of the assessment strategies.

TECHNOLOGY TO IMPROVE TREATMENT STRATEGIES

There are have been multiple attempts to engage elderly individuals with limited lifelong computer and technology experience in activities designed to increase their competence and comfort with technology-oriented interactions. These programs have included placement of computers into residences and remotely-delivered training and scheduled interactions.[11] Often these programs focus on adaptation to new technological developments, such as the requirement to use automatic teller machine (ATM) transactions for banking or they promote social interactions through e-mail or social networking systems.

Computer technology has revolutionized the delivery of cognitive training, typically referred to as cognitive remediation. As we described before in this column,[12] sophisticated developments in the delivery of these interventions have increased the success of these interventions markedly. These interventions now have been shown, in conjunction with other psychosocial interventions, to lead to improvements in everyday functioning on the part of people with schizophrenia in as little as 12 weeks.[13]

Virtual reality treatments have been developed as well. Given the ability for VR technologies to realistically deliver a presentation of a real-world environment, these strategies have been employed to deliver exposure therapy to people with posttraumatic stress disorder (PTSD).[14] It is easy to conceive of VR treatments aimed at skills training in people with schizophrenia, where the realistic environment could allow for faster and more directly transferrable interventions aimed at performance of everyday living skills in real-world like situations. Pilot efforts to date have shown success in social skills training using VR technology.[15]

In summary, while technology represents a significant challenge to people with severe mental illness, there are exciting recent developments that utilize technology to increase the validity of assessment of functioning and have the potential to lead to new treatments. Virtual reality seems to have a place for both assessment and treatment and the promise of remote delivery could increase the efficiency of interventions for underserved populations.

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TAKE HOME POINTS

1. The chronic problems of unemployment in people with schizophrenia may be associated with difficulties in adapting to technological developments.
2. Even unskilled jobs today require the ability to master technology.
3. Virtual reality technology has arrived and provides the promise for development of immersive assessment and interventions aimed at multiple psychiatric conditions.
4. Other strategies, such as momentary assessment with smart phone technology, have the promise to increase the validity of assessment of everyday functioning and to promote efficacy of certain interventions, such as medication adherence.

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