

2023

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Recommended Citation

Lucas Molitor, W., Ikiugu, M. N., Stade, L. M., & Wardian, J. L. (2023). Validating the Assessing Student Competence and Knowledge of Social Determinants of Health (ASCK-SDH) Instrument. *Journal of Occupational Therapy Education*, 7 (2). Retrieved from <https://encompass.eku.edu/jote/vol7/iss2/3>

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Abstract

The impact of the social determinants of health (SDH) on health outcomes is receiving increased attention. Health profession students need to learn about SDH; however, there are no validated tools to measure student competence in assessing SDH. There is a need for a brief, valid instrument to measure student competency and knowledge of SDH. This study is a secondary analysis of data collected pre (N=394) and post (N=387) for an interprofessional learning event. We utilized principal component analysis (PCA) with varimax rotation to determine the internal structure of the tool. The original measure consisted of 11 items; the analysis resulted in two factors. Based on the two factors it was determined the three items from Factor 2 were not contributing to the scale; therefore, they were removed. The final measure, Assessing Student Competence & Knowledge of Social Determinants of Health (ASCK-SDH), consists of eight items rated on a 4-point Likert scale. The measure indicated high internal consistency at pre (Cronbach's $\alpha=0.81$) and post (Cronbach's $\alpha=0.89$) tests. The ASCK-SDH tool provides a valid instrument to measure student competence and knowledge about SDH and can be used to assess learning.

Keywords

Social determinants of health, health education, interprofessional education

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Acknowledgements

We would like to thank the students that engaged in this research through the interprofessional learning event along with the faculty that helped to support and organize this event. We also would like to acknowledge Drs. Nissen, Avoseh, Kupershmidt, and Kenyon for their involvement in reviewing the original version of this instrument.

Validating the Assessing Student Competence and Knowledge of Social Determinants of Health (ASCK-SDH) Instrument

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ABSTRACT

The impact of the social determinants of health (SDH) on health outcomes is receiving increased attention. Health profession students need to learn about SDH; however, there are no validated tools to measure student competence in assessing SDH. There is a need for a brief, valid instrument to measure student competency and knowledge of SDH. This study is a secondary analysis of data collected pre (N=394) and post (N=387) for an interprofessional learning event. We utilized principal component analysis (PCA) with varimax rotation to determine the internal structure of the tool. The original measure consisted of 11 items; the analysis resulted in two factors. Based on the two factors it was determined the three items from Factor 2 were not contributing to the scale; therefore, they were removed. The final measure, Assessing Student Competence & Knowledge of Social Determinants of Health (ASCK-SDH), consists of eight items rated on a 4-point Likert scale. The measure indicated high internal consistency at pre (Cronbach's $\alpha = 0.81$) and post (Cronbach's $\alpha = 0.89$) tests. The ASCK-SDH tool provides a valid instrument to measure student competence and knowledge about SDH and can be used to assess learning.

Evidence supports that non-medical factors, referred to as the social determinants of health (SDH), influence health outcomes more than medical care alone (World Health Organization [WHO], 2022). Social factors including low socioeconomic status, race/ethnicity that represent a minoritized population, living in an impoverished neighborhood, and having less education, place individuals at higher risk of developing

a chronic medical condition (Pantell et al., 2019). As such, occupational therapy students would benefit from gaining knowledge of the SDH and addressing these factors in education and healthcare practice to help to reduce health disparities while improving the quality of life for individuals, groups, and communities. Educating health professionals to address the SDH is a critical step in health promotion and in moving toward broader health equity across populations and communities (Artiga & Hinton, 2018; Stefanacci & Riddle, 2018) and has been identified as an important area for occupational therapy professionals (Synovec & Aceituno, 2020) and educators (American Occupational Therapy Association [AOTA], 2018) to address. However, few methods exist for assessing knowledge of the SDH among medical and health science students which necessitates research to explore this gap.

Background

The SDH are defined as the “conditions in the environments where people are born, live, learn, work, play, worship, and age,” and influence health outcomes and quality of life (Healthy People 2030, 2022, para. 1). Healthy People 2030 discusses SDH in terms of a) economic stability; b) education access and quality; c) health care access and quality; d) neighborhood and built environment; and e) social and community context. Concerning occupational therapy, engagement in occupation along with access to occupational opportunities have been linked to health outcomes and it has been identified that having skills in analyzing contextual and cultural factors will benefit occupational therapy professionals and those they serve (Menendez et al., 2021). Such factors often relate to social and economic influences in daily life (i.e., the SDH). Priorities for education in occupational therapy highlight a need to educate occupational therapy students that are equipped to work with diverse populations and for educational programs to develop learning materials and methods that promote inclusion and equity (AOTA, 2018).

In a 2022 survey of American physicians, nearly all physicians reported that health outcomes are affected by at least one SDH and 80% believe that the United States (U.S.) cannot improve health outcomes without addressing SDH (The Physicians Foundation, 2022). A lack of standardized tools to screen for SDH has been identified among physicians (63%) and a lack of training on how to discuss SDH with patients (59%), which inhibits their ability to address patients’ SDH challenges (The Physicians Foundation, 2022).

The impact of SDH on health outcomes is receiving increased attention. A systematic review found that teaching the SDH in health professions education is typically done through community engagement, experiential learning through community or clinic-based learning, and/or school-wide curricula including didactic, small group work, and case-based instruction (Doobay-Persaud, 2019). Assessments were generally self-reported and often measured affective change; two studies in the review used objective clinical skills examinations (Doobay-Persaud, 2019).

Existing Assessment Measures

There are a few examples of scales that have been used to evaluate student competence and confidence in assessing SDH; however, currently, there is no validated measure. A research team developed an 8-item measure used with 314 U.S. medical students in conjunction with a longitudinal health equity curriculum to measure self-reported knowledge of the SDH and confidence in working with underserved populations (Cronbach $\alpha >0.80$; Denizard-Thompson, 2021). Another SDH measure was developed, but not validated, for an interprofessional activity that included 408 students and 11 scale items used to assess students' level of knowledge and comfort in addressing SDH during health care delivery (Cronbach $\alpha=0.67$; Lucas Molitor et al., 2021). Without valid measurement tools to assess knowledge of the SDH, researchers have instead implemented qualitative analysis of student learning (Bultas et al., 2016; Lewis et al., 2019; Ozone, 2020).

Research highlights the variability in the terms used to teach students about the SDH and how SDH are incorporated into curricula (Sharma et al., 2018). We found that existing methods to assess SDH were geared towards client risk factors or were designed to highlight the impact of the SDH within a community (Rural Health Information Hub, 2022). Many of the available tools are structured to assess specific SDH, including living situations, transportation, employment, or education. The Centers for Medicare and Medicaid (2021) has compiled a list of tools, designed for the assessment of clients that are listed by specific assessment domain. Morone (2017) concluded there is a need for validated comprehensive risk screening and assessment tools for use with patients. To ensure competency in addressing SDH in practice, there is a need for a brief, valid instrument to measure student competency and knowledge of SDH within educational programs.

Method

This study is a secondary analysis of data collected during an interprofessional learning event, the results of which are reported elsewhere (Lucas Molitor et al., 2021). Data from the original study were collected at two time points (before the interprofessional event = pretest, and after the interprofessional event = posttest) which were used to validate the SDH measure. Institutional Review Board approval was received from the lead author's institution before data collection.

Instrument Development

The SDH measure described in this paper was developed by the lead author to mitigate the need for an instrument to assess student competency and knowledge of the SDH. The tool was developed using the following process:

1. a thorough review of the literature to determine constructs related to the SDH,
2. review of published surveys that measured knowledge of SDH within and outside of higher education, and
3. gathering feedback and making revisions based on feedback received from faculty and content experts.

The WHO's Conceptual Framework for Action on the Social Determinants of Health (Solar & Irwin, 2010) was used as the foundation for the development of the instrument. This framework illustrates how social and environmental factors influence health and well-being. In this approach stratification within populations is described based on SDH including socioeconomic status, level of education, work status, gender, and race/ethnicity among other factors which relate to an individual's risk for or likelihood of developing health-compromising conditions.

Participants

Participants were students in undergraduate and graduate health science and medical education programs at two universities located in the Midwest region of the U.S. Fourteen health professions disciplines were represented in the participant population, including students enrolled in the following programs: addiction counseling and prevention, communication science disorders, clinical psychology, dental hygiene, dietetics, health science, medical laboratory science, medicine, nursing, occupational therapy, physical therapy, physician assistant, pharmacy, and social work. Students engaged in an interprofessional learning event. Participant recruitment criteria is reported elsewhere (see Lucas Molitor et al., 2021). Conducting factor analysis requires a large sample. It is recommended to include 300 cases (Bryant & Yarnold, 1995). This requirement was met through recruitment across several programs.

Data Analysis

Data were analyzed using IBM SPSS for Windows, Version 27 (IBM Corp, 2020). The analysis began by ensuring the data met the assumptions for the selected analyses. Exploratory analysis indicated the data were normally distributed and did meet the required assumptions. We then utilized principal component analysis (PCA) with varimax rotation to determine the internal structure of the tool. Internal consistency reliability was calculated for each identified factor. The goal of PCA is to extract important information into principal components (Abdi & Williams, 2010). We selected PCA over Principal Axis Factor Analysis, as we did not expect there were latent variables. Data from both pre and post-tests were analyzed to determine if similarity of findings existed for the two-time points.

Results

Data from the SDH Tool were collected at pretest (N=394) and posttest (N=387). Principal component analysis with varimax rotation was run on the 11-item questionnaire which measured student competence and knowledge of the SDH. Before analysis was initiated the suitability of the data for PCA was assessed. The Kaiser-Meyer-Olkin (KM) Measure was 0.80 (pretest) and 0.89 (posttest). It is reported that KMO values ≥ 0.80 are considered good and indicate the adequacy of sampling (Portney, 2020). Bartlett's test of sphericity was statistically significant at pretest $\chi^2(55) = 1175.51, p < 0.001$, and posttest $\chi^2(55) = 2074.49, p < 0.001$, which indicated the data were suitable for PCA.

Three variables at pretest and two variables at posttest had eigenvalues greater than one. Retaining factors with eigenvalues greater than 1.0 demonstrated 49% of the original variance at pretest and 61% at posttest for the two factors identified. Eigenvalues ≥ 0.5 are strong (Portney, 2021). We determined that two components should be retained. Community values above 0.4 indicate the variable will contribute to the factor structure (Portney, 2020). Our data indicated that at pretest communalities ranged from 0.44 - 0.79 and ranged between 0.53 - 0.89 for component one at posttest. Results of rotated component matrix analysis at pre and posttest for each of the two factors are seen in Table 1.

Table 1

Rotated Component Matrix for PCA with Varimax Rotation for a Two-Component Measure

Item	Component	Component	Communalities	Component	Component	Communalities
	1	2		1	2	
	Pretest	Pretest		Posttest	Posttest	
1	.61	-.13	.38	.80		.64
2	.10	.65	.44		.71	.51
3		.81	.67		.84	.70
4	.67		.45	.76		.58
5	.72		.53	.84		.71
6	.79		.62	.89		.79
7	.44		.19	.54	.14	.30
8	.75		.58	.85		.71
9	.76		.58	.87		.76
10	.60		.39	.68		.46
11	-.13	.65	.55		.66	.45

The original measure consisted of 11 items. The analysis resulted in two factors (components). We determined Factor 1 (items 1, 4-10) represented perceptions of contributing SDH components. These items were retained and are included in the final instrument (see Table 3).

The remaining items (items 2, 3, 11) constituted Factor 2 and represented perceptions of how interventions should be approached. These items were:

- Item 2: *Physical and mental health should be addressed as separate factors,*
- Item 3: *Cultural factors that may be impacting a client play no role in healthcare delivery, and*
- Item 11: *There is no difference between the ability of an interprofessional team and a single professional to assess SDH in a client.*

Based on the two factors, it was determined to remove the three items which were extracted in Factor 2.

Internal Consistency Reliability

We assessed the internal consistency reliability for the measure. Although variation in acceptable values exists between sources, in general, Cronbach's α values <0.5 are considered to have poor internal consistency reliability, values of 0.6 are thought to be questionable, a value of 0.7 is acceptable, and values ≥ 0.8 show high internal consistency reliability (Taber, 2018). We analyzed the three items from Factor 2 and the remaining eight items from Factor 1 separately (see Table 2). Results indicated questionable internal consistency at pre and posttest for the three items included in Factor 2. Analysis for items from Factor 1, which make up the finalized measure, indicated high internal consistency at pre and posttests. This finding supported the decision to remove the three items from Factor 1 from the final measure.

Table 2

Internal Consistency Reliability for the Assessing Student Competency and Knowledge of Social Determinants of Health (ASCK-SDH) Measure

Factor	Pretest	Posttest
	Cronbach's α	
1*	0.81	0.89
2**	0.59	0.59

Note. * = items 1, 4-10, ** = Items 2, 3, 11 from Table 1.

Final Measure

Following PCA, three items were removed. The final measure, Assessing Student Competence & Knowledge of Social Determinants of Health (ASCK-SDH), consists of eight items that learners rate on a 4-point Likert-type scale (see Table 3).

Table 3

Final Assessment: Assessing Student Competence Knowledge of Social Determinants of Health (ASCK-SDH)

Item	Strongly Disagree	Disagree	Agree	Strongly Agree
Instructions: Rate each item by indicating your level of agreement in the space provided.				
1. Lifestyle factors, including health behavior, diet, and exercise should be incorporated into healthcare recommendations.				
2. A client's level of education and socioeconomic status are important considerations in healthcare delivery.				
3. Healthcare recommendations should include areas the client finds meaningful in his/her life.				
4. Cultural factors that may be impacting a client should be considered in healthcare delivery.				
5. Physical and mental health should be viewed as dependent upon each other.				
6. Healthcare providers should address factors such as transportation and access to health services during healthcare delivery.				
7. Understanding if a client has stable housing and access to food will influence healthcare decisions.				
8. Interprofessional healthcare teams are in a better position to assess social determinants of health than single professionals.				

Discussion

The purpose of this study was to determine if these data support a validated tool to assess student competency and knowledge about SDH. This secondary analysis of data collected pre (N=394) and post (N=387) for an interprofessional learning event was subjected to PCA with varimax rotation to determine the internal structure of the tool. The eight items in the final measure were found to have high internal consistency at pre (Cronbach's $\alpha=0.81$) and post (Cronbach's $\alpha=0.89$) tests.

We found the utilization of the validated measure to be feasible when implemented in health science and medical student interprofessional education. Assessment measures that are "practical, realistic, and sensible" are considered to contain components of a 'good' assessment (Norcini et al., 2011, p. 211). Because the tool is brief, it is ideal for use within a variety of contexts and curricula. As the purpose of assessment in higher education is to enhance learning, it is critical to design and implement measures that can adequately capture student knowledge (Institute of Medicine, 2014; Norcini et al., 2011). When learning experiences are structured in this way, students may become motivated to seek additional knowledge (Norcini et al., 2011).

Validated assessment of student competence and knowledge of SDH is beneficial to education programs when determining the effectiveness of teaching methods and education programs, curricular guidance, and demonstrating accreditation standards are being met. Evaluation methods for student learning, as well as program and academic outcomes, must be robust and comprehensive (Doobay-Persaud, 2019; Hunter & Thomson, 2019). Accreditation bodies often require objective evidence of student learning activities and assessments to determine the quality of healthcare education programs. The ASCK-SDH allows educational programs a validated measure of SDH. The ASCK-SDH is not an instruction method or discipline-specific, therefore it can be applied to the broad variety of teaching methods used in health science education.

Strengths & Limitations

A strength of this study is that it was conducted with a large sample across a diverse population of students in varying professional disciplines that engaged in interprofessional learning. Despite this, the population was gathered from two Midwestern universities, which limits the generalizability of findings. In addition, students were in the didactic phase of their professional program. Additional research which explores the utility of this instrument during clinical, field, or community experiences may assist in strengthening the use of the instrument to a broader population.

Implications for Occupational Therapy Education

Increasingly occupational therapy is expanding to address the health, well-being, and occupational opportunities of communities and populations. Promoting the health of these individuals and populations requires that occupational therapy and other health professional students understand how social factors influence health outcomes. For this reason, measurement of knowledge and confidence are important factors in determining efficacy of educational events and activities. Because clients are less likely to follow

through with medication, diet, or physical exercise recommendations when they face economic or employment barriers (The Physician Foundation, 2022) occupational therapy students can improve the outcomes of their clients by learning strategies that address both medical and social factors of health. This is especially important as a growing number of policies and initiatives relevant to occupational therapy practice across practice environments are becoming available to help shape healthcare practice and improve health outcomes (Artiga & Hinton, 2018). Future research is needed to explore occupational therapy students' knowledge and comfort in addressing the SDH during experiential portions of their educational curricula including community engagement activities, Level I and II Fieldwork, and during the capstone experience.

Conclusion

The development of measures to assess student knowledge of the SDH is needed within health science and medical education. Due to the lack of brief assessments available we developed and validated a tool that was found to be valid and reliable. As social factors are increasingly linked to health outcomes, the development of methods to incorporate this content into educational curricula and assess knowledge is growing in importance. Research is needed to continue to determine methods of improving healthcare professionals' knowledge of the SDH.

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