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Linking critical consciousness and health: The utility of the critical reflection about social determinants of health scale (CR_SDH)

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ABSTRACT

Introduction: Critical consciousness (CC) theory has been proposed as a framework to inform health interventions targeting a wide variety of health conditions. Unfortunately, methodological limitations have made it difficult to test CC as a mediator of health outcomes. Specifically, standardized and widely accepted measures of health-related CC are needed. The goal of this study was to develop and test a measure of critical reflection on social determinants of health (SDH). This measure focused on critical reflection, an essential dimension of CC.

Methods: Community-based participatory research principles and a mixed methods design were used with three samples: (1) experts in SDH and CC, (2) 502 individuals completing online surveys, and (3) 602 men with histories of substance use disorder and incarceration. All participants were over 18 years of age. Analysis included descriptive frequencies, exploratory factor analyses (EFA), confirmatory factor analysis (CFA), generalized linear regression models, correlations, and Cronbach's alpha calculations.

Results: The Critical Reflection about SDH scale (CR_SDH) is a short, unidimensional, and reliable scale ($\alpha = 0.914$). Construct validity was supported and known-groups validity showed that the scale discriminated different levels of CR_SDH based on political views, educational level, knowledge of health inequities, and gender.

Conclusion: The CR_SDH is a standardized measure that can assess critical reflection about the impact of SDH on health among providers and consumers of health care. The CR_SDH can be used to identify critical reflection related training needs and inform decisions about development and testing of critical reflection related health interventions and health care policy.

1. Background

Over the past few decades, robust literature has shown that as much as 70% of health outcomes are explained by environmental and social factors (University of Wisconsin Population Health Institute, 2021). In other words, where we live, work, and play explain 70% of how long and how well we live. These factors are named in the literature as the Social Determinants of Health (SDH). Yet, health practitioners and health policies in the United States have historically focused on changing health outcomes by targeting individual behaviors and investing resources on specialized care of disease as opposed to addressing contextual barriers to health (Kickbusch, 2015; Dawes, 2021). Not surprisingly, despite

having the most expensive health care in the world, the United States consistently shows poorer health when compared to other wealthy nations (Rinhardt, Krugman, & Frist, 2021).

In order to improve health in the United States, it is critical to address SDH including combating discrimination and increasing equitable access to healthy foods, transportation, safe and stable housing, and health care among other structural factors (Daniel, Bornstein, & Kane, 2018). Over the past couple decades, progress has been made in increasing awareness about SDH in the literature, universities, and the halls of government (Office of Disease Prevention and Health Promotion (n.d.)). Unfortunately, there is still significant public resistance to policies that seek to address social determinants of health (SDH) (Harvard T.H. Chan

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School of Public Health, 2015; Robert & Booske, 2011). This resistance may be explained by a lack of awareness about the impact of SDH on health outcomes that produce health inequities (Dawes, 2021). Thus, when applying critical consciousness (CC) to the health domain, one important aspect of critical consciousness is an individual's ability to critically reflect on how SDH can impact individual and community health outcomes. In essence, increasing awareness of SDH can promote health equity by increasing one's willingness and ability to effectively combat health inequities, potentially affecting personal and communal health outcomes (Jemal & Bussey, 2018; Wallerstein, 2002; Watts, Diemer, & Voight, 2011).

Unfortunately, it is unclear whether interventions based on CC theory impact health outcomes. Although novel interventions have attempted to improve health by raising CC, few studies have tested whether CC-related constructs are impacted or whether CC mediates changes in health outcomes (Jemal, 2017; Windsor, Pinto, Benoit, Jessell, & Jemal, 2014). A significant methodological challenge, the lack of standardized measures, has limited this research. (Windsor, Jemal, & Benoit, 2014). There are major inconsistencies in how scholars define CC that may produce divergent theories and assessments of CC (Diemer, Rapa, Park, & Perry, 2014; Hatcher et al., 2011; Jemal, 2017). In these cases, CC scholars cannot confidently know whether or not they are assessing the same construct as each other when referencing CC. Moreover, the lack of agreement makes it difficult to compare results across studies or to link CC to outcomes (Jemal, 2017). As such, the importance of critical consciousness as a key phenomenon of interest may be minimized unless measures of a clearly defined CC-construct are developed and tested. Thus, the goal of the current study was to develop and test a new CC-based measure of critical reflection about SDH following community-based participatory research (CBPR) principles and a mixed methods design.

1.1. SDH and health inequities

SDH are social factors that affect health. The World Health Organization (WHO) defines SDH as non-medical factors, forces, systems and/or conditions under which people are born, grow, work, and live (e.g., socioeconomic policies, social norms, political systems) that shape conditions of daily life that influence health outcomes (WHO, 2021). Examples of SDH include the social-economic environment, demographic characteristics, and stigma (Allen, Jennings, Taylor, & Shipp, 2011). Research shows that SDH explain a wide variety of health outcomes as well as health inequities (Came & Griffith, 2018). For instance, people of color are more likely to live in areas with toxic levels of lead when compared to their White counterparts. This in turn has a disproportionately negative effect on their health (Davis et al., 2016). Intersecting socio-structural factors and inequities disproportionately harm marginalized communities by excluding them from opportunities through discrimination, inadequate housing, neighborhood segregation, community violence, lack of green space, and limited access to quality health care services (Jemal, 2017). Stigmatization by health care providers exacerbates these problems (Jemal, 2018; Barr, 2014). For example, Black and White women are equally likely to have a mammogram, but health care providers are less likely to adequately communicate screening results to Black patients (Jones et al., 2007). At the level of an individual, SDH (e.g., affordable housing, working conditions) impact people's daily lives, influencing their risk of illness or injury and ability to access quality preventive and curative health care (Jemal, 2018). Inequities between groups of people with shared socially constructed identities (i.e., race, gender, income) shape social hierarchies within society. An individual's social location within the power matrix ultimately affects their health because SDH disproportionately burden those with intersecting marginalized identities (Jemal, 2018). Thus, SDH that exist at the macro level shape an individual's life progression at the micro level in inequitable ways.

1.2. Critical consciousness theory

Freire's (1976) CC theory is a philosophical, theoretical, and practice-based framework. It encompasses an individual's understanding of and action against the structural roots of personal and societal problems (e.g., low self-esteem, substance use, community violence, and mass incarceration). CC theory presents a model for achieving health equity when applied to socio-structural determinants of health (e.g., stigma, substandard housing, and lack of access to employment and health care; Barr, 2014). Lack of CC within a community promotes an environment in which inequities impact both individuals and systems. SDH exists at the intersection of macro processes and micro consequences. CC theory bridges the micro-macro divide because the major principles of CC theory help reveal concealed problems by identifying contradictions in socially constructed realities illuminating the underlying power structures and struggles. An example of these contradictions would be a person confined to their home by the criminal justice system while simultaneously maintaining steady employment. Moreover, a major tenant of CC theory is empowerment and action to promote equity and social justice (Halman, Baker, & Ng, 2017).

Accepting that health disparities are deeply connected to structural inequity and racism is essential to dismantling health inequities. Those who clearly understand that non-individual level factors (e.g., unequal access to employment, housing, and health insurance) connect to health outcomes may engage more effectively in individual and collective action (Green, Tripp, & Hoffman, 2020). How we frame the cause of this issue, determines how we approach potential solutions. If poor health is attributed to individual responsibility and behaviors, the individual is blamed, and potential interventions are individually focused (Windsor, Pinto, et al., 2014). For example, if obesity is attributed to a failure to adhere to guidelines regarding healthy eating, exercise, and weight management, providers may interpret failure to adhere to recommendations as lack of understanding, resistance, or unwillingness to comply. Conversely, if obesity is evaluated from a socio-structural perspective, other factors that negatively impact health come into focus (e.g., lack of access to healthy foods and safe, green spaces). Attributing negative health outcomes to the individual, diminishes the need to examine power dynamics and whether/how the systems we work within provide decreased opportunities for the success of marginalized populations (Green et al., 2020). Failure to examine a system's inadequacies produces a lack of accountability for providing quality health care services across demographics and stymies potential change by allowing invisible, inequitable socio-structural factors to continue unchallenged (Jemal, 2018).

As Baldwin (1962) stated, "not everything that is faced can be changed. But nothing can be changed until it is faced." CC can be used to center SDH around justice and inequity to deepen our collective understanding of power, privilege, and the inequities embedded in social relationships to foster an active commitment to social justice. CC is about facing inequity and contributing to major structural and cultural transformations (Jemal & Bussey, 2018). Ostensibly the goal of linking CC and health is to understand inequities in health and ultimately take action to improve health outcomes and reduce health inequities. Consequently, the development of CC has been hypothesized as a mediator of the impact of SDH (Anonymous1, 2018), thereby informing social action against the sources of inequities (Windsor et al., 2014, 2014b; Diemer, McWhirter, Ozer, & Rapa, 2015; Freire, 1976). Thus, CC framework prepares people to address SDH, the root causes of health inequities.

Freire argued that the development of CC was an activity in which marginalized people could engage (Freire, 1976). Thus, much of the literature has examined CC with marginalized populations (Diemer et al., 2014; Watts et al., 2011). However, other authors have noted the importance, feasibility, and utility of raising CC among privileged populations (Jemal, 2017; Garcia, Kosutic, McDowell, & Anderson, 2009). The latter has argued that privilege and oppression are different

sides of the same issue, and hence, must be addressed together through CC raising (Jemal, 2017). Thus, it is critically important to develop measures of CC in order to test critical action and reflection among both marginalized and privileged populations.

1.3. Existing measures of critical consciousness

An extensive literature review for measures of CC revealed that meaningful progress has not occurred in this area as it pertains to health inequities. Nevertheless, measures of CC developed for other societal inequities identified two significant issues that warranted consideration as the Authors developed the CR_SDH. First, scholars have used various combinations of several dimensions to operationalize CC, including reflection, action, and motivation (Jemal, 2018; Diemer et al., 2021). Consequently, the Authors needed to determine which of these dimensions to include in their health inequities scale. Next, the Authors needed to decide whether their scale should be general or have specific scale content. The literature on these issues does not provide consensus (Jemal, 2018; Diemer et al., 2014).

First, regarding which dimensions of CC to include in the scale, the literature on CC, as it pertains to issues other than health inequities, revealed that diverse approaches have been proposed and developed (Jemal, 2018; Diemer et al., 2021). Existing literature has found that critical reflection and critical action are related but better measured separately (Peterson, 2014). Consequently, the Authors are developing two separate scales: One on critical reflection about SDH and another on critical action. This paper discusses the psychometrics of the Critical Reflection about SDH scale (CR_SDH). Subsequent efforts will focus on critical action.

Next, regarding whether the CR_SDH should be general or have specific scale content, the literature indicates that CC is content-specific (Diemer et al., 2014), and measures of CC are often tailored accordingly. For example, Shin, Smith, Welch, and Ezeofor (2016) evaluated CC related to racism, heterosexism, and classism. They developed a scale focused on content, arguing that a high level of awareness about these issues is required to engage in effective critical action. When CC scales are not content-specific, content validity issues may arise. As Diemer et al. (2014) noted, when scales intend to measure “oppression” but exclude some forms of oppression (e.g., heterosexism, ageism), the scale is limited. Consequently, the Authors included scale-specific content in the CR_SDH.

Based on the arguments presented above, the Anonymous Community Collaborative Board (ACCB; www.anonymous.org), a group of 20 researchers, consumers of health, service providers, and community members, followed CBPR principles in implementing measurement development methods to develop and test the CR_SDH. The CR_SDH focused content on reflection about health and did not include action.

1.4. ACCB: implementing CBPR principles

CBPR evolved from community organization models and the intellectual traditions of critical and social theories (Strickland, 2006). CBPR builds on the principles of community organization but differs in that greater emphasis is placed on community involvement, in all stages of the research, to generate community power (Cashman et al., 2008). In the current study, the ACCB implemented CBPR by blending scientific and community knowledge.

The ACCB established a CR_SDH Development Committee to propel the process of scale development. The CR_SDH Development Committee was a racially diverse group that included 13 ACCB members who received extensive training on CC theory, intervention science, substance use disorder, health inequities, and research methods. They worked for 18 months to develop the initial item pool. The ACCB worked through weekly committee meetings and monthly full board meetings to discuss the progress of scale development. The studies were approved by the Institutional Review Board (IRB) at the Anonymous University and

conformed to the principles embodied in the Declaration of Helsinki.

2. Methods

Careful and well-established measurement development methods were employed and included item generation based on the scientific literature and experiential knowledge; examination of the factor structure and internal consistency; and validation through a known-groups analysis, confirmatory factor analysis, and correlations with concepts related to CC (DeVellis, 2016).

2.1. Study 1: item generation

A mixed methods approach was implemented to develop and test the CR_SDH factor structure. The CR_SDH development committee conducted a thorough review of the literature on SDH, CC theory, measure development, and reviewed 2 years of ethnographic data. They then engaged in dialogue to develop a conceptual framework to guide item development. The committee was broken into three pairs who worked independently to respond to the following prompt: “List statements that a person who has high CC about SDH would agree or disagree with. Please think of statements at the individual, meso, and macro levels.” The individual level was defined as one’s understanding of how SDH impacts one’s individual health. The meso level was defined as understanding how SDH impacts the relationships one has with others and organizations, and how these relationships impact one’s individual health and the health of one’s community. The macro level was defined as understanding how social issues impact health. The three groups met to combine the lists they created independently and continued to brainstorm. The combined list was then compared to the literature and existing measures and further modified by the committee. Finally, the list was submitted to the entire ACCB for review and additional feedback. A list of 81 statements (available as supplemental material) was approved for the subsequent expert validation stage.

After approval by the IRB, a pool of 20 experts in CC or health inequities was identified from the literature. Ten of these experts were randomly selected and contacted via email to provide feedback on the validity and utility of a conceptual model utilizing CC to understand SDH, and to sort the measure’s items into individual, meso, and macro-levels of understanding. The experts provided informed consent and their feedback through Qualtrics, an online survey and data collection platform. Experts were given a \$30 gift card as incentive for their time. Data were collected over the course of two weeks. Eight of these 10 (80%) randomly selected experts completed the survey by categorizing statements as individual, meso, or macro and providing written feedback about each item. No demographic information was collected to protect their identity. Items that experts identified as problematic (e.g., double-barreled, unclear, redundant), were deleted or revised independently by two doctoral-level research assistants and then compared for reliability and to reach consensus with the first author. This phase reduced the list from 81 items to 38.

The revised items were entered into Qualtrics survey software for clarity testing. Because this scale targets a wide range of people, including those with low education levels, the CR_SDH Development Committee sampled adults ($n = 7$) who had neither graduated from high school nor received a general education degree (GED). Respondents were asked to rate the ease of understanding each item on a 4-point Likert scale (1 = “very easy to understand” to 4 = “very hard to understand”) and to provide written feedback on how realistic the respondents felt the statement was based on their lived experiences. All respondents provided informed consent to participate and received a \$20 gift card for their time. A frequency analysis was conducted to remove items that were rated low in clarity by respondents with lower educational levels (mean item scored under 3 on a 5-point readability scale). Respondents’ written feedback was analyzed to enhance an item’s applicability. This process reduced the number of items on the list

from 38 to 32.

2.2. Study 2: factor structure, internal consistency, and known groups validity

Upon IRB approval, data were collected anonymously online from 502 individuals above the age of 18 using Amazon's TurkPrime. The Authors sought a diverse sample with respect to level of education, gender, race, occupation, and political views, characteristics that the Authors considered likely to impact reflection about health inequities. Research shows that data collected from participants through TurkPrime is reliable and replicable (Rouse, 2015; Thomas & Clifford, 2017). TurkPrime participants attend to validation questions assessing attention at higher rates than participants from other sampling methods. Participants were asked to rate how strongly they agreed with the items on a 6-point Likert scale (1 = "completely disagree" to 6 = "completely agree"). The survey included demographic variables, the 32 CR_SDH revised items, and a survey validation item ("Please select somewhat agree for the answer to this question") to ensure respondents were thoroughly reading items and not responding at random. Demographic data included gender, race, ethnicity, age, education level, and household annual income. All demographics except age are categorical. Gender was recoded as male and female, removing other categories because of an insufficient number of responses. Race was also recoded, creating a series of dummy variables for each racial category and leaving White as the reference. Household income was broken into annual income below \$29,999, between \$30,000 and \$59,999, and above \$60,000. Participants identified their political views on a scale from very liberal to very conservative. For the variable "Reflection of health inequity" participants were asked to rate how knowledgeable they are about health inequity on a scale ranging from 1 = not knowledgeable at all to 5 = extremely knowledgeable. Voting was a binary variable indicating whether the individual reported having voted or not voted in 2015.

2.2.1 Factor structure and internal consistency

Complete data were downloaded into IBM SPSS Statistics software, version 27, and prepared for an exploratory factor analysis (EFA). Missing data was minimal, and data violated assumptions of normality. Thus, principal axis factoring was used to account for the skewed data (Osborne, Costello, & Kellow, 2008). Requirements for item retention were set a priori, including a moderate loading (0.40) onto one factor and no cross loading within 0.20 of one another. Items that did not meet this requirement were eliminated (Osborne et al., 2008). Based on convention, factors with an eigenvalue greater than 1.00 were retained in the factor structure (DeVellis, 2016). Internal consistency was assessed with Cronbach's alpha (Cronbach, 1951).

2.2.2. Known-groups validity data analysis

Known-groups validity was determined by comparing the mean CR_SDH scores according to levels of categorical variables. The Authors tested for differences in CR_SDH according to gender, race, education, marital status, income level, voting in past year, political views, knowledge about health inequities, being a health worker, and age. We tested the hypothesis that significantly higher CR_SDH scores would be obtained by women, non-Whites, those with higher levels of education and income, who were married or had liberal political views, reporting having voted in the past year, reporting higher reflection about health inequities and being a health worker. These variables were selected a priori by members of the CR_SDH based on the knowledge they built through the scale development process blending scientific and experiential knowledge.

We tested our hypothesis by using a simple linear regression where these variables were entered into the model one at a time. A multiple linear regression was then done by putting them all together in a single model to control for confounding of these variables with each other. We

considered all these associations with CR_SDH as a priori thus we did not consider any variable selection in the multiple linear regression analysis. All variables were included regardless of statistical significance.

2.3. Study 3: validation of the CR_SDH derived from EFA using a second data set

Several procedures were done to validate the unidimensional scale of the CR_SDH that was abstracted from the EFA. The validation set was composed of an external data set obtained from a marginalized population that was collected as part of a larger intervention study (Windsor et al., 2018). This consisted of a sample of 602 formerly incarcerated men over age 18 with a history of substance use disorder. Respondents received a \$20 cash incentive to complete a baseline questionnaire with assistance from a trained research assistant using Research Electronic Data Capture tools hosted at the Anonymous University (Grant # UL1TR002240). To determine internal consistency of the items, the Authors used the polychoric correlations of items with each other instead of Pearson correlations because the distributions of the items were highly skewed and had limited numbers of categories. Since polychoric correlations cannot be calculated when one variable has numerous levels/values, polyserial correlations were calculated between the total score and each item. From the polychoric correlation matrix, ordinal alpha was computed as an overall measure of internal consistency.

To determine whether the items represented a single dimension, we performed confirmatory factor analysis (CFA) hypothesizing a single latent factor underlying the items. Diagonally-weighted least squares estimation of parameters was used due to the ordinal level of measurement of the items and skewness of the distribution. Normality is not assumed. We examined different fit indices with accepted cut-off such as the standardized root mean square residual (SRMR < 0.06), adjusted goodness of fit index (AGFI > 0.95) and Bentler-Bonett's normed fit index (NFI > 0.95) to determine fitness of the one-dimensional model (Hu & Bentler, 1999).

Construct validity was assessed using convergent and discriminant validity. We selected the most appropriate scales measuring concepts that are correlated with CC and that were available in the dataset. Unfortunately, there was no other existing measure of CC available. For convergent validity, CR_SDH was expected to correlate strongly with solidarity orientation score, general self-efficacy, and struggle orientation score. The Authors expected traditional cultural orientation score and competitive cultural orientation to negatively correlate with CR_SDH. See Table 1 for more information about the measures.

There was a very small percentage of missing data for all the CR_SDH items and measures that were examined for correlation ($\leq 40/602 = 6.6\%$). For the procedures performed for the validation of the CR_SDH, observations with missing data were deleted listwise. Due to less than 10% deleted observations, the Authors believe that the validation results were not seriously affected. SAS Ver 9.4 was used to perform the steps for validation of CR_SDH.

3. Results

3.1. Sample characteristics

A total of 13 people worked to develop the measures' items. This was a diverse group that included three researchers (2 social workers and one sociologist), four social work practitioners, one lawyer, three people with lived experiences, and two public health experts. Demographic data used for Study 2 on EFA, internal consistency, and predictive validity included 502 PrimeTurk users. Data were evenly distributed, with sufficient variation to test associations adequately. Political views had an even distribution across the three categories. The Study 3 sample on CFA and correlations included 602 formerly incarcerated men with a history of substance use disorder. The mean age for the CFA sample was

Table 1
Measures used in the validity testing.

| Standardized Measure (Reference) | Description | Alpha (α) | Correlation Hypothesis with CR_SDH |
|--|--|--------------------|---|
| Struggle Cultural Orientation (Friedman et al., 2013). | Scale has 10 items and measures how much a person subscribes to a cultural orientation that emphasizes working together as a community to combat oppression. | .91 | Strongest, moderate, positive, and significant. |
| Solidarity Cultural Orientation (Friedman et al., 2013). | Scale has 9 items and measures how much a person subscribes to a cultural orientation that emphasizes solidarity with other community members. | .83 | Strongest, moderate, positive, and significant. |
| General Self Efficacy Scale (GSE-6) (Rommel et al., 2013). | Scale has 10 items and assesses a person's expectations of personal mastery, or their belief that they can overcome challenges. | .85 | Moderate, positive, and significant. |
| Traditional Cultural Orientation (Friedman et al., 2013). | Scale has 15 items and measures the degree to which a person gravitates toward traditional, heteronormative, and Christian values. | .84 | Moderate, negative, and significant. |
| Competitive Cultural Orientation (Friedman et al., 2013). | Scale has 11 items and measures the degree to which a person's cultural orientation emphasizes individualism and competition. | .87 | Moderate, negative, and significant. |

45.1, the majority were Black (79%), had annual income less than \$1000 (54%), and had never been married (67%). Table 2 displays descriptive data for the samples from all studies.

3.2. EFA and internal consistency

The EFA resulted in the elimination of 24 items that failed to meet the loading requirement (≥ 0.40) or cross-loaded into more than one factor within 0.20 of one another. The final product was a unidimensional measure with 12 items, shown in Table 3 with loadings and eigenvalues. Factor loadings ranged from 0.64 to 0.76. Since the values are not too different from each other, this supports that the sum of the items (equally weighted) would be a good summary score. Internal consistency was excellent with a Cronbach $\alpha = 0.914$.

3.3. Known-groups validity

Table 4 shows the estimated regression coefficients (and standard errors), which represented mean differences when a reference category is compared to other categories. Bivariate analysis showed that mean CR_SDH differed considerably between gender ($p = 0.0030$), educational level ($p < 0.0001$), income level ($p = 0.0460$), voting in past year ($p < 0.0001$), political views ($p < 0.0001$), reflection about health inequities ($p < 0.0001$) and being a health worker ($p = 0.0016$). Higher CR_SDH scores corresponded to increasing levels of reflection about health inequities. Those who were slightly knowledgeable, moderately knowledgeable, very knowledgeable, and extremely knowledgeable had mean CR_SDH that were higher than the lowest level by 5.56, 5.81, 8.06 and 9.49, respectively. Mean CR_SDH also increased with higher education levels. Compared to those who did not complete high school, mean CR_SDH scores were higher by 2.83, 4.92 and 7.29 for those who had completed high school, had some college, and were college graduates, respectively. A large difference in mean CR_SDH was also observed

Table 2
Descriptive statistics for each study sample.

| Variables | Study 1 Sample | Study 2 Sample | Study 3 Sample |
|--------------------------------------|---|--|--|
| | Item development (N = 13) N(%) or M(SD) | Internal consistency and EFA (N = 502) N(%) or M(SD) | Construct validity (N = 602) N(%) or M(SD) |
| Gender | | | |
| Male | 5 (38) | 104 (21) | 602 (100) |
| Race ^a | | | |
| White | 6 (46) | 393 (78) | 47 (08) |
| Black | 7 (54) | 57 (11) | 475 (79) |
| Latinx | 3 (23) | 47 (09) | 66 (11) |
| Asian/Others | 0 (00) | 51 (10) | 48 (08) |
| Education | | | |
| Did not complete high school | 0 (00) | 68 (13) | - |
| Completed high school/GED | 2 (15) | 53 (11) | |
| Some college | 0 (00) | 102 (20) | |
| College degree | 11 (85) | 279 (56) | |
| Marital status | | | |
| Never married | 4 (31) | 240 (49) | 402 (67) |
| Household annual income | | | |
| Below 30K | 5 (38) | 221 (44.) | 510 (94) |
| 30K to 59K | 4 (31) | 175 (35) | 26 (05) |
| 60K and above | 3 (23) | 106 (21) | 9 (02) |
| Political views | | | |
| Conservative | 0 (00) | 193 (38) | - |
| Moderate | 2 (15) | 116 (23) | |
| Liberal | 11 (85) | 193 (38) | |
| Voted in the past year | | 320 (64) | |
| Health inequities reflection | | | |
| Extremely knowledgeable | - | 35 (07) | - |
| Very knowledgeable | | 99 (19) | |
| Moderately knowledgeable | | 231 (46) | |
| Slightly knowledgeable | | 98 (19) | |
| Not knowledgeable at all | | 39 (08) | |
| Work in the field of health | 11 (85) | 134 (26) | - |
| Age | 41.5 (23) | 34.6 (14) | 45.1 (11) |
| CR_SDH | - | 61.1 (09) | 59.5 (13) |
| Struggle Cultural Orientation | - | - | 23.2 (04) |
| Solidarity Cultural Orientation | - | - | 17.4 (03) |
| GSE-6 | - | - | 31.2 (05) |
| Traditional Cultural Orientation | - | - | 27.9 (06) |
| Competitiveness Cultural Orientation | - | - | 07.4 (03) |

^a Respondents were asked to list all racial and ethnic groups where they belong.

between those having liberal views and those with conservative views (diff = 5.25). Voting in the past year was also associated with 3.31 difference in mean CR_SDH compared to non-voters. On average, females and highest income level had higher CR_SDH scores than males (diff = 2.76) and lowest income group (diff = 2.00), respectively. These results were consistent with our hypotheses about the relationship of these variables with CR_SDH.

When all variables were put together in the regression model, political views ($p < 0.0001$), educational level ($p = 0.0004$) reflection on health inequities ($p = 0.0016$) and gender ($p = 0.0078$) remained strongly associated with CR_SDH. There was a smaller difference in mean CR_SDH between those who voted in the past year and who did not after controlling for other variables. The association of income and being a health worker with CR_SDH became weak; these were apparently

Table 3
CR_SDH item loadings in the EFA (Study 2).

| Items | Factor loading |
|--|----------------|
| Affordable and quality housing can help improve the well-being of communities and community members. ^c | .756 |
| Having access to an affordable doctor, whom I trust, in my neighborhood can improve my health. ^a | .745 |
| Building trusting relationships can improve my health. ^b | .731 |
| Putting myself in someone else's shoes improves my awareness of issues within the community. ^b | .726 |
| The food selection in the neighborhood grocery store contributes to my community's health. ^c | .685 |
| The quality of air and water in my neighborhood can impact my health. ^c | .668 |
| Good education can have a positive impact on the community's health. ^c | .667 |
| Having affordable public transportation in communities improves access to necessary resources for quality living (for example, doctors' offices, grocery stores). ^c | .653 |
| A clean neighborhood is a healthier neighborhood. ^c | .653 |
| I believe people must take care of our planet. ^c | .646 |
| I think it is important to keep my neighborhood clean. ^c | .644 |
| I feel healthier when I am getting along with others. ^a | .642 |

Extraction Method: Principal Axis Factoring. Eigenvalue = 6.167. Variance explained = 51.39%.

^a Individual level items.

^b Meso level items.

^c Macro level items.

strongly confounded or mediated by other variables in the model. Our results showed weak or no association of CR_SDH with age, race and marital status.

3.4. Results of validation of CR_SDH using a second data set (study 3)

3.4.1. Internal consistency

The polychoric correlation matrix is shown in Table 5. The polychoric correlations of items with each other were moderate to strong,

Table 4

Crude and adjusted estimates and standard errors of coefficients for simple and multiple linear regression models (Study 2).

| Model terms ^b | Crude | | | Adjusted ^a | | |
|----------------------------|----------|---------|---------|-----------------------|---------|----------------------|
| | Estimate | Std err | p-value | Estimate | Std err | p-value ^c |
| Female | 2.76 | 0.92 | 0.0030 | 2.34 | 0.87 | 0.0078 |
| Age | -0.03 | 0.03 | 0.2065 | -0.00 | 0.03 | 0.9694 |
| Black ^d | 0.80 | 1.22 | 0.6398 | -1.19 | 1.20 | 0.7472 |
| Hispanic | -0.39 | 2.39 | | -0.44 | 2.27 | |
| Asian | 1.61 | 1.39 | | 0.44 | 1.32 | |
| Completed HS | 2.83 | 1.49 | <0.0001 | 3.32 | 1.53 | 0.0004 |
| Some college | 4.92 | 1.27 | | 4.15 | 1.33 | |
| Graduated from college | 7.29 | 1.09 | | 5.15 | 1.20 | |
| Married | 1.19 | 0.80 | 0.2974 | 0.87 | 0.83 | 0.3767 |
| Divorced/separated/widowed | -0.03 | 1.29 | | 1.70 | 1.35 | |
| 30K - 59K | -0.52 | 0.85 | 0.0460 | -1.06 | 0.83 | 0.3549 |
| 60K and above | 2.00 | 1.00 | | 0.16 | 0.96 | |
| Voted in the past year | 3.31 | 0.77 | <0.0001 | 1.94 | 0.80 | 0.0150 |
| Moderate | 0.79 | 0.96 | <0.0001 | 1.84 | 1.08 | <0.0001 |
| Liberal | 5.25 | 0.83 | | 4.94 | 0.94 | |
| Slightly knowledgeable | 5.56 | 1.56 | <0.0001 | 3.63 | 1.51 | 0.0016 |
| Moderately knowledgeable | 5.81 | 1.42 | | 2.81 | 1.43 | |
| Very knowledgeable | 8.06 | 1.56 | | 5.13 | 1.57 | |
| Extremely knowledgeable | 9.49 | 1.92 | | 6.69 | 1.93 | |
| Health worker | 2.68 | 0.85 | 0.0016 | -0.53 | 0.87 | 0.5444 |

^a Adjusted for all other variables in the list.

^b Reference groups: Gender – male, Race – White, Education – Did not complete HS, Marital status – Single, Income level – <30K, Political views – Conservative, Reflection of health inequities – Lowest level, Health worker – No.

^c P-values from Type III test for fixed effects of the independent variable. For those variables with more than 2 categories, these are not comparisons to the reference group.

^d Respondents who belonged to more than 1 race or ethnicity were coded in the following order: 1) white and another race/ethnicity, code as white; 2) if black and another but not white, code as black; 3) if Hispanic/Latino and another but not white and not black, code as Hispanic; 4) all others are combined into Asian and others mixed ethnicities.

with values ranging from 0.548 to 0.906. There were strong correlations of each item with the total CR_SDH score where the lowest was 0.677 and highest was 0.808. Using the Wald test, all tests for the hypothesis of no correlation had p-value<0.001. Ordinal alpha was 0.948, suggesting very high internal consistency of the items.

3.4.2. Confirmatory factor analysis (study 3)

CFA with one latent variable was tested to determine whether the CR_SDH items were unidimensional. Model fit indices for DWLS estimation were as follows: SRMR = 0.0572, AGFI = 0.99033, and Bentler-Bonett NFI = 0.9906 (Table 6). These values exceed accepted standards for a good fit of the model for the data. This supports that CR_SDH is a unidimensional measure.

3.4.3. Construct validation (study 3)

Correlational analyses supported the CR_SDH' construct validity. Specifically, CR_SDH was moderately correlated with struggle orientation score (r = 0.521), solidarity orientation score (r = 0.369), and general self-efficacy (r = 0.258), as hypothesized in Table 1. Weak correlations of CR_SDH with competitive cultural orientation score (r = -0.109) and traditional cultural orientation (r = 0.088) were seen. The directions of these correlations were as hypothesized, except for traditional cultural orientation, indicating concurrent and divergent validity of CR_SDH. The Authors hypothesized that the strongest correlation would occur between CR_SDH and struggle orientation, and their hypothesis was supported by the data.

4. Discussion

The current study describes the development and psychometrics testing of the CR_SDH, a tool that can measure critical reflection about one's perceptions about the impact of SDH on health outcomes. The impact of SDH and CC theory on health outcomes has gained increased attention as a framework with potential for addressing health inequities and promoting health equity (Jemal, 2018). Unfortunately, progress in this area has been slowed by the lack of standardized, widely accepted

Table 5
Polychoric correlation matrix of the items in the CR_SDH Scale (n = 562).

| CR_SDH Items | T | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 | I10 | I11 | I12 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CR_SDH (Total) ^a | 1.00 | 0.800 | 0.825 | 0.834 | 0.745 | 0.737 | 0.824 | 0.871 | 0.891 | 0.840 | 0.793 | 0.831 | 0.803 |
| I1 Affordable and quality housing | 0.800 | 1.000 | 0.828 | 0.736 | 0.628 | 0.590 | 0.721 | 0.759 | 0.774 | 0.713 | 0.701 | 0.742 | 0.736 |
| I2 Having access to doctor | 0.825 | 0.828 | 1.000 | 0.841 | 0.689 | 0.682 | 0.761 | 0.782 | 0.789 | 0.745 | 0.704 | 0.745 | 0.727 |
| I3 Building trusting relationships | 0.834 | 0.736 | 0.841 | 1.000 | 0.740 | 0.684 | 0.739 | 0.787 | 0.814 | 0.743 | 0.707 | 0.722 | 0.735 |
| I4 Putting self in others' shoes | 0.745 | 0.628 | 0.689 | 0.740 | 1.000 | 0.677 | 0.709 | 0.680 | 0.678 | 0.638 | 0.550 | 0.604 | 0.628 |
| I5 Food selection in neighborhood | 0.737 | 0.590 | 0.682 | 0.684 | 0.677 | 1.000 | 0.710 | 0.686 | 0.725 | 0.584 | 0.548 | 0.584 | 0.564 |
| I6 Quality of air and water | 0.824 | 0.721 | 0.761 | 0.739 | 0.709 | 0.710 | 1.000 | 0.811 | 0.817 | 0.789 | 0.741 | 0.771 | 0.703 |
| I7 Good education has impact on health | 0.871 | 0.759 | 0.782 | 0.787 | 0.680 | 0.686 | 0.811 | 1.000 | 0.881 | 0.854 | 0.814 | 0.850 | 0.788 |
| I8 Affordable public transportation | 0.891 | 0.774 | 0.789 | 0.814 | 0.678 | 0.725 | 0.817 | 0.881 | 1.000 | 0.854 | 0.813 | 0.838 | 0.806 |
| I9 Clean neighborhood is healthy | 0.840 | 0.713 | 0.745 | 0.743 | 0.638 | 0.584 | 0.789 | 0.854 | 0.854 | 1.000 | 0.870 | 0.903 | 0.821 |
| I10 Take care of planet | 0.793 | 0.701 | 0.704 | 0.707 | 0.550 | 0.548 | 0.741 | 0.814 | 0.813 | 0.870 | 1.000 | 0.906 | 0.823 |
| I11 Importance of clean neighborhood | 0.831 | 0.742 | 0.745 | 0.722 | 0.604 | 0.584 | 0.771 | 0.850 | 0.838 | 0.903 | 0.906 | 1.000 | 0.866 |
| I12 Healthier when getting along others | 0.803 | 0.736 | 0.727 | 0.735 | 0.628 | 0.564 | 0.703 | 0.788 | 0.806 | 0.821 | 0.823 | 0.866 | 1.000 |

Ordinal alpha = 0.972. All correlations have p < 0.001 using the Wald test.

^a Correlations with the CR_SDH total score are polyserial correlations.

Table 6
Fit indices for structural equation model with one latent variable (n = 562).

| Fit index | Value |
|---------------------------------|--------|
| Root Mean Square Residual (RMR) | 0.1120 |
| Standardized RMR (SRMR) | 0.0572 |
| Goodness of Fit Index (GFI) | 0.9933 |
| Adjusted GFI (AGFI) | 0.9903 |
| Bentler-Bonett NFI | 0.9906 |

Table 7
Pearson correlation coefficients of CR_SDH with other measures.

| Measure | n | R | p-value |
|----------------------------------|-----|--------|---------|
| Struggle orientation | 551 | 0.521 | <0.0001 |
| Solidarity orientation | 553 | 0.369 | <0.0001 |
| Self-efficacy | 378 | 0.258 | <0.0001 |
| Competitive cultural orientation | 560 | -0.109 | 0.0096 |
| Traditional cultural orientation | 540 | 0.088 | 0.0403 |

measures of health-related critical reflection. The CR_SDH described in this manuscript helps fill that void. CR_SDH focuses on critical reflection alone, an essential dimension of CC, rather than action alone or reflection plus action.

The development and testing of CR_SDH followed CBPR principles and was informed by a rigorous theoretical framework (Freire, 1976). The CR_SDH showed strong reliability and validity (Boateng, Neilands, Frongillo, Melgar-Quinonez, & Young, 2018). EFA was used to analyze 32 items included in the scale. From these items, 20 were eliminated because they did not meet the loading requirements. The final CR_SDH was a 12-item unidimensional short scale that showed excellent reliability and included items at the micro, meso, and macro levels (Table 3). We consider this to be one of the strengths of the CR_SDH since it captures a balanced understanding about the impact of multi-level structural factors on health.

EFA and CFA analyses confirmed the scale's unidimensional factor structure with different samples (Tables 3, 5–7), indicating that the CR_SDH can be used with privileged and marginalized individuals alike. The factor loadings for items in the scale are close to one another; thus, the sum of the items is a convenient and reliable measure for an overall scale, instead of using a factor score (Table 3).

The CR_SDH was studied in two distinct samples. One sample was mostly White and educated and the other was highly marginalized, indicating that CR_SDH can measure critical reflection with both privileged and marginalized groups. It is important to note that these items do not capture reflexivity of those who are privileged on the circumstances of the those who are marginalized or require the privileged to

reflect upon circumstances affecting the marginalized. For those items referring to community or neighborhood, it is likely that respondents are only considering people who look like them and/or compose their homogenous social circles. This scale captures reflection and/or understanding that environmental and socio-historical factors beyond the individual's behavior affect health. For example, responding strongly agree to the item, "The food selection in the neighborhood grocery store contributes to my community's health," is a representation of CC regardless of the person having White privilege and class privilege and notwithstanding that "my community" probably insinuates other White people with high socioeconomic status. Correlation analyses with theoretically-related, albeit distinct, measures (Tables 1 and 7) supported the scale's discriminant validity. Concurrent validity was also supported, as the CR_SDH had the highest correlation with the Struggle Cultural Orientation scale, as hypothesized. This indicates the scale measures a concept that is most closely related to beliefs that people must work together as a community to combat discrimination. The only correlation running contrary to hypotheses was that with the Traditional Cultural Orientation. However, this association was weak in magnitude (r = 0.088). Consequently, the Authors do not have confidence in this finding and plan to investigate this relationship further.

The data showed that the CR_SDH can distinguish between groups in expected ways. For instance, political views predicted CR_SDH scores. People with liberal views had higher CR_SDH scores than people reporting conservative views. Given that conservative individuals tend to subscribe to more traditional cultural and individualistic ideologies, it is expected that they would score lower in the CR_SDH. The successful completion of the CR_SDH by both privileged and marginalized groups, its capacity to distinguish between groups in expected ways, and its correlation with other measures of similar but distinct concepts support its use for measuring critical reflection about SDH.

4.1. Potential uses

The newly established CR_SDH can be used to establish the reflection domain of CC specific to health outcomes. Thus, although it is correlated with the Struggle Cultural Orientation, an established scale, the CR_SDH has the advantage of measuring critical reflection related to SDH because it is both specific to health and solely focused on the reflection domain of CC.

The CR_SDH can be used as a mediator of intervention outcomes for interventions seeking to increase reflection about SDH. For example, the Authors are currently utilizing the CR_SDH in an ongoing field trial of an innovative intervention that seeks to increase CC of formerly incarcerated people with a history of substance use disorders living in marginalized communities (Anonymous2 et al., 2018). Their expectation is that the CR_SDH will continue to be used in future research to determine whether novel interventions can improve health outcomes by raising

CC. Further, the CR_SDH can be used to assess health professionals' critical understanding about SDH. This information can identify training needs and examine the appropriateness of intervention development to increase CC among health professionals.

4.2. Limitations

Further validity testing comparing the CR_SDH with other measures of critical reflection will enhance evidence for construct validity. More testing with other populations will enhance the scale's generalizability. This scale does not assess respondents' awareness or reflection of the inequity of structural factors (i.e., that the burden of SDH disproportionately impact people with marginalized social identities) but only the awareness that structural factors have a significant impact on health. The CR_SDH does not capture critical action related to SDH, nor does it capture all contexts in which SDH occur. Future research should address this gap given the important role played by action in CC. The CR_SDH was validated with a sample of marginalized individuals. Future research must validate the CR_SDH with privileged samples. Finally, test-retest reliability must be assessed before the scale is used in longitudinal studies.

5. Conclusion

Research shows that SDH explain a wide variety of health inequities (Came & Griffith, 2018), and the new generation of health interventions are increasingly seeking to address drivers of health at multiple levels (Alegria, Lloyd, Ali, & DiMarzio, 2021). CC has been suggested as a useful framework to address health inequities, though it has been understudied in part due to methodological limitations in its measurement (Anonymous, 2018). The CR_SDH described and evaluated in this manuscript helps fill this void by providing a standardized measure of critical reflection about the impact of SDH on health outcomes. This should facilitate subsequent studies of CC based interventions on health outcomes, and the development of additional CC measures that help advance this field.

Data sharing

De-identified participant data and other study materials are available upon request from the first author at lwindsor@illinois.edu. These data may be used for research purposes only.

Ethics

All procedures performed in studies involving human participants were in accordance with the ethical standards of the IRB at the University of Illinois at Urbana-Champaign, protocol # 15717, and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Only participants who were consented into the study were included.

Declaration of competing interest

None of the authors has any conflict of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2022.101034>.

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