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Risk assessment of criminal offenders in Ghana: An investigation of the discriminant validity of the HCR-20^{V3}

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ABSTRACT

The frequency with which assessment for risk of criminal offending is requested across mental health and criminal justice systems in Western countries is historically unprecedented. However, information concerning risk assessment practices and research in Sub-Saharan Africa is virtually nonexistent. In filling this gap, the present study discusses the prospects and challenges of risk assessment for criminal offending in Ghana, focusing on the criminal justice system, mental health system, and institutional record keeping. Secondly, data obtained from interviewing prisoners, their parents/legal guardians, and prison officers were used to score the Historical-Clinical-Risk Management-20 version 3 (HCR-20^{V3}) to discriminate between recidivists (n = 60) and non-recidivists (n = 60). The results reveal significant and positive correlations between HCR-20^{V3} ratings and recidivism that ranged from 0.35 (clinical presence) to 0.69 (historical relevance). The area under curve (AUC) values of the HCR-20 ratings similarly ranged from 0.69 (clinical presence ratings) to 0.88 (historical presence ratings). The historical presence and relevance ratings achieve good and a near-balanced sensitivity and specificity (e.g., 75 versus 88), with the latter also adding incrementally to the discrimination. The clinical and risk management ratings, however, did not add incremental validity to the discrimination. Although the exclusion of the items measuring mental and personality disorders, the small sample size and the use of retrospective design have the potential to undermine the findings reported here, this preliminary study on structured risk assessment in Ghana demonstrates the feasibility of administering risk assessment instruments by interviewing multiple informants.

1. Introduction

Assessment of persons at heightened risk of offending is an integral part of decision-making process in the legal, psychiatric, forensic, and correctional settings in Western countries. Risk assessment practices prior to mid-20th century, the so-called unstructured clinical judgment, was prone to error and bias mainly because the evaluators rely on their clinical experiences to select and combine risk factors that are often unrelated to violence (Campbell, French, & Gendreau, 2009). The extant meta-analytic investigations have shown that predictions based on unstructured clinical judgment are not significantly different from chance (Ægisdóttir et al., 2006; Grove, Zald, Lebow, Snitz, & Nelson, 2000; Mossman, 1994). Consequently, risk assessment research grew exponentially in the past two decades, culminating into the development of several risk assessment tools to predict offending and reoffending tendencies with a high degree of certainty. These tools, which currently number over 120 (Singh & Fazel, 2010), are reportedly used by mental health professionals across 44 countries in 6 different continents (Singh et al., 2014). This study is aimed at investigating the utility of the Historical-Clinical-Risk Management-20 version 3 (HCR-20^{V3}; Douglas, Hart, Webster, & Belfrage, 2013) in discriminating between recidivists and non-recidivists in Ghana, Sub-Saharan African country.

2. Structured approach to risk assessment

The development of structured risk assessment instruments basically follows two approaches: Actuarial and structured professional

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judgment (SPJ). The actuarial approach utilizes fixed and strict rules to select and combine risk factors and specifies risk decisions *a prior* using algorithms, graphs or actuarial tables. The actuarial approach does not permit the inclusion of other risk factors, regardless of their usefulness, insofar as they were not part of the risk factors used to the validate the risk assessment measures (e.g., Violence Risk Scale, Static 99). This nomothetic approach ignores the influence of dispositional, situational and contextual variables in the criminal pathway. Instead, it combines risk factors for every individual in the same manner, assigning the same empirical weight and summing the risk factors using the same algorithm (Howe, Rosenfeld, Foellmi, Stern, & Rotter, 2016). This approach has been criticized for focusing exclusively on factors that (1) do not capture the complexities of criminal behaviors, (2) cannot be targeted with intervention to cause a decrease in the risk of offending, and (3) do not permit assessment of changes in risk level over time, the so-called static risk factors (e.g., age, gender; Campbell et al., 2009).

In contrast, the SPJ (also known as structured clinical judgment) superimposes a flexible structure on how risk factors are selected and combined, and how risk level is determined. The assessment process takes into account individual and situational factors (e.g., idiographic approach), even though some of the risk factors are pre-determined. SPJ instruments incorporate not only static factors but criminogenic or dynamic factors. Dynamic risk factors (e.g., negative emotional states, and criminal thinking) are imminent precipitants of subsequent criminal behaviors and can be targeted with appropriate and planned interventions in correctional and forensic mental health settings to cause a reduction in individual's risk level (Serin, Chadwick, & Lloyd, 2016).

The HCR-20 (Webster, Eaves, Douglas, & Wintrup, 1995) is one of the SPJ instruments that assesses the risk of offending with a high degree of accuracy. As the most widely used risk assessment instrument across the globe (Singh et al., 2014), the HCR-20 aligns risk factors into the past, present and future, and it is intended for use in adults with a history of violence and/or offenders with mental illness (Howe et al., 2016). However, the HCR-20 has been administered in settings (e.g., pre-trial setting) with no or limited evidence of mental disorders and institutional records, making it one of the flexible risk assessment instruments (Belfrage, And, & Strand, 2000; Smith, Kelley, Rulseh, Sörman, & Edens, 2014). Over 200 empirical studies, based on over 150 independent datasets from 25 countries, indicated that version 2 of the HCR-20 has good predictive validity with a broad range of outcome variables (e.g., rearrest), good interrater reliability, and concurrent validity with other risk assessment instruments (see Howe et al., 2016; Strub, Douglas, & Nicholls, 2014). The HCR-20^{V2} has been translated into 20 different languages and is formally adopted and used by institutions in North America, Europe, and Australasia (Guy, 2008). It has recently been revised to version 3 (i.e., HCR-20^{V3} Douglas et al., 2013) to consolidate recent theoretical and professional considerations in the field such as the emphasis on idiographic rather than nomothetic risk assessment. Preliminary studies have reported good to excellent interrater reliability (Douglas & Belfrage, 2014; Doyle et al., 2014; Green et al., 2016; Howe et al., 2016; Smith et al., 2014; Strub et al., 2014), concurrent validity with version 2 (Douglas & Belfrage, 2014; Howe et al., 2016; Strub et al., 2014), and convergent validity with other risk assessment measures (Hogan & Olver, 2016). The HCR-20^{V3} reportedly predicted recidivism (i.e., violent, nonviolent and general recidivism) and aggression in a sample of offenders with mental illness, and civil psychiatric patients (Doyle et al., 2014; Green et al., 2016; Hogan & Olver, 2016; Strub et al., 2014; Strub, Douglas, & Nicholls, 2016), with area under curve (AUC) value for the presence and relevance ratings ranging from 0.59 to. 82, and 0.68 to.71, respectively.

Notably, the risk assessment field is dominated by studies conducted in Western countries. Although this trend is gradually changing given the inputs from non-Western countries, particularly from East Asia (e.g., Chu, Ng, Fong, & Teoh, 2012; Zeng, Chu, & Lee, 2015), relatively little is known about risk assessment practices in Ghana and other (Sub-Saharan) African countries. Ghana is a West African state sharing border with Cote d'Ivoire to the west, Burkina Faso to the north, and Togo to the east, and is home to about 25 million people. The country ceased to be a British colony after becoming the first Sub-Saharan country to gain independence in 1957. Due to historical ties, the criminal justice system (CJS) and other institutions in Ghana are mirrored after British system although the institutions have undergone significant changes since independence (Adjorlolo, Agboli, & Chan, 2015). Given the dearth of studies on forensic psychology and psychiatry in Africa and for that matter Ghana (Adjorlolo, 2016b; Adjorlolo, Chan, & Agboli, 2016; Ogunlesi, Ogunwale, De Wet, Roos, & Kaliski, 2012), the study proceeds with a brief discussion of the opportunities for and challenges of risk assessment and risk management (i.e., intervention programs to mitigate the risk of offending) practices in Ghana. The discussions, which focused on the criminal justice system (i.e., courts and prisons), mental health system, and institutional record keeping, are primarily informed by relevant literature and legal provisions in Ghana, in addition to the first author's practical knowledge and experience with the Ghanaian system.

3. Risk assessment of criminal offenders in Ghana: Opportunities and challenges

Consistent with the practices of other (common law) jurisdictions, judges and magistrates in Ghana are mandated by law to request for information on whether a suspect's / an offender's risk to the public and/or self are sufficiently high to justify critical decisions such as denial of bail. Section 96 (5c) of the Criminal and Other Offenses (Procedure) Act, 1960 (henceforth Act 30) specifically states that a suspect shall not be admitted to bail unless the presiding judge/magistrate is satisfied that he/she will not commit another offense. There are, however, concerns that this legislation hardly informs or plays a crucial role in judicial decision-making process, especially given that assessment for risk for violence are not often requested. Pretrial forensic assessment requests are mostly confined to mental capacity examination (i.e., competency to stand trial and insanity defense; see Adjorlolo, Chan, & Agboli, 2016). In general, there seems to be a general lack of awareness about the relevance and potential utility of structured and evidenced-based risk assessment practices in justice delivery in Ghana. On the other hand, judges and magistrates in the criminal justice system appeared to have been assessing the risk a suspect posed to society without recourse to expert opinion. Indeed, there are instances where judges have refused to request for an expert opinion when there are clear indications to do so. To illustrate briefly, Charles Antwi, a man suspected of attempting to kill the president of Ghana in 2015, was summarily imprisoned in < 48 h despite reports that he made several illogical claims (e.g., the presidential belongs to him and was stolen by the president) that suggest defective mental states. Relatedly, a judge, without any formal assessment or expert knowledge in mental health, openly and plainly denied a request for mental state examination of a defendant standing trial for the murder a Member of Parliament of Ghana (For a review of these cases, refer to Adjorlolo, 2016b). These events partly illustrate how the judges sometimes make unilateral decisions in cases that require expert testimonies. Obviously, judges and magistrates, per their training, lack or do not have the requisite knowledge and skills needed to conduct risk assessment, and so are supposed to seek the opinion of professionals or experts with respect to the risk an individual posed to self and/or society.

Risk assessment is also pertinent in the correctional (i.e., prisons) and mental health institutions in determining, for instance, an individuals' security level, as well as their supervision and monitoring needs. Risk assessment reports can also assist professionals to develop case management plans, make treatment referrals, allocate resources more judiciously and efficiently and monitor changes in risk level over time. However, there is no formal and structured risk assessment protocol currently in use in the correctional and mental health institutions in Ghana. Allocation of individuals to different security levels (e.g.,

high, medium or low) is mostly based on prior experiences, knowledge, and the nature and type of offense committed. Discharge planning at the mental health institutions does not include information on patients' likelihood to act violently or aggressively. Aggressive acts are documented to facilitate inter-professional communication and to aid in the administration of drugs with sedating effects. Across the correctional and mental health institutions, no offender treatment programs (e.g., cognitive-behavior therapy) based on empirically validated offender treatment models such as the Risk-Need-Responsivity model (Andrews, Bonta, & Hoge, 1990) and Good Lives Model (Ward & Stewart, 2003) are designed and implemented to reduce the risk offending. At the prisons, the reform and rehabilitation programs are mostly "vocational rehabilitation" programs whereby inmates are taught to acquire skills in carpentry, block manufacturing, and shoe making. Other "treatment" program includes engagement in religious activities where counseling services are offered. Treatments at the mental health institutions are primarily pharmacological, involving mostly typical psychotropic drugs with limited psychological and social interventions (Adjorlolo, 2016b; Adjorlolo, Abdul-Nasiru, Chan, & Bambi, 2016). Alternative treatments for patients displaying aggressive and violent tendencies in the correctional and mental health institutions include seclusion and physical punishment (e.g., weeding the prison compound, cleaning or undertaking other errands).

In addition to the inadequate number of mental health professionals (see Adjorlolo, 2016b; Adjorlolo, Chan, & Agboli, 2016), the lack of professionals with expertise specifically in forensic mental health services is one of the factors accounting for the neglect of pertinent psycho-legal issues such as risk assessment and risk management. Across sub-Saharan Africa, forensic mental health services are provided by professionals without any specialized training in forensic issues (Njenga, 2006; Ogunlesi et al., 2012). The assessments are often based on general psychiatric practices and assessment tools, without due consideration to the well-established risk and protective factors of offending, and the numerous, evidence-based risk assessment tools. These tools are coded using information from multiple sources, but primarily from institutional files.

Indeed, institutional files from different institutions such as the criminal justice, health care, educational, vocational, and social service contain pertinent data that are often used complete risk assessment instruments, including the HCR-20^{V3}. The authors of these instruments have advised that evaluators should endeavor to gather information on individuals from multiple sources. The validity of the assessment process is contingent upon complete and accurate records of the relevant risk factors. Although concerns have been raised about the completeness and accuracy of institutional record keeping in Western countries (Farrington & Ttofi, 2014; Schwalbe, Fraser, Day, & Cooley, 2006), the problem is far more pronounced and compounded in Ghana and other developing countries. The prevailing problem in Ghana includes unavailable/missing, incomplete, inaccurate, and uncoordinated records. Paper record system still dominates the criminal justice and mental health systems. Although attempts have been made to computerized the record keeping, this is yet to be integrated into routine practice. Officials in the criminal justice and mental health systems appeared to be overburdened by the quantum of work that they seem to have insufficient time to undertake thorough investigations to authenticate and verify any information entered in official records. Moreover, several relevant portions of clinical folders, for instance, are sometimes left blank due to lack of time to solicit the needed information, or simply because they are considered irrelevant to the therapeutic process. Police and prison records do not contain information needed to score risk assessment instruments such as upbringing, family background, age at index offense, and encounter with the mental health system. At the time of data collection for this study, it was observed that the prisoners' files contain only demographic information such as age, occupation, contact address, type of offense, date of sentencing, as well as a detailed description of prisoners' physical appearance (e.g., height, weight, size or circumference of the head).

Notwithstanding these challenges, it is possible to engage in risk assessment research and practice to contribute to public safety in Ghana. This can be achieved by using interview methodology to gather relevant data from examinees and collateral sources. Interviews with multiple informants can provide verification checks to ensure a somewhat accurate data to score the risk assessment instruments (for initial work, see Smith et al., 2014). In this study, interview data were used to score the HCR-20^{V3} to discriminate between recidivists and non-recidivists.

4. Method

4.1. Research setting and participants

This study was based on data collected from ex-offenders serving a new prison term (i.e., recidivists) and those who were not (i.e., non-recidivists). The study was conducted at James Camp Prison, located in Ghana's capital, Accra. The Camp was established to train adult male inmates in agriculture and other vocations. It also acts as a transit center for inmates from other prisons who are due for release. The camp was chosen because of security reasons since it does not house extremely violent and dangerous offenders. The inclusion criteria to administer the HCR-20 were willingness to give consent, and availability and willingness of a parent or legal guardian to be interviewed. A measure of executive functioning, Behavioral Assessment of Dysexecutive Syndrome (BADS; Wilson, Alderman, Burgess, Emslie, & Evans, 1996), was administered as part of the study. Additional inclusion criteria to administer the BADS were (1) ability to read and follow simple commands in English, and (2) completing at least nine years of formal education. Participants with histories of speech, motor, or perceptual deficits likely to interfere with assessment, as well as neurodevelopmental disorders such as autism spectrum disorders, and learning disability were excluded.

A total of 61 recidivists were invited for the study but one was excluded on the basis of lack of formal education and perceptual deficit (i.e., impaired vision). Over 200 non-recidivists were contacted for inclusion in the study. However, more than half (n = 130, 65%) declined the invitation, citing reasons such as lack of time, no interest in the study, and geographical barrier. Of the remaining 70 (35%) who agreed to participate in the study, six were excluded for lack of formal education, three for unwillingness of a parent or legal guardian to be interviewed, and one for been convicted of a sexual offense. The latter exclusion criterion was adopted to maintain sample purity since none of the recidivists was convicted of a sexual offense. The recidivists (M = 31.93, SD = 8.04, range 21 to 50) and non-recidivists (M = 32.01, SD = 5.10, range 24 to 50) do not differ significantly in age ($p > .05$).The time to event, defined as the time interval (months) between release from prison and re-imprisonment, for recidivist (M = 10, SD = 3.40), and involvement in the study, for non-recidivist (M = 9, SD = 2.21) did not differ significantly between the groups ($p > .05$). The groups do not differ significantly on educational level ($p > .05$). Legal labels were used to classify each offense because it was difficult to investigate each court proceedings to determine whether the offenses provided in the prison institutional files were accurate or mislabeled. The 'index offense' for almost half of the participants (n = 58, 48%) was theft, followed by robbery (n = 32, 27%), assault (n = 12, 10%), threat of violence (n = 7, 6%), and handling stolen goods (n = 6, 5%). The same number of recidivists and non-recidivists were convicted of theft (n = 29, 48%) and nearly the same number were convicted of assault (i.e., n = 17, 28% versus n = 15, 25%). There were nine (15%) robbery cases among the recidivists compared with three (5%) among non-recidivists. With respect to the crimes leading to re-imprisonment, more than half was theft (n = 33, 55%), followed by robbery (n = 11, 18%), assault (n = 6, 10%), and handling stolen goods (n = 5, 8%). The majority of the participants (90%) profess affiliation

to Christian religion, a trend consistent with national census data (Adjorlolo, Adu-Poku, Andoh-Arthur, Botchway, & Mlyakado, 2015).

4.2. Measures

Data were collected using the HCR-20^{V3} which comprised 20 items, ten of which capture historical factors relating to the past (H-scale, e.g., substance abuse), five clinical items measuring dynamic correlates of offense behaviors (C– scale, e.g., insight) and five risk management items (i.e., R-scale, e.g., personal support). For thorough discussions on key changes between HCR-20^{V2} and HCR-20^{V3}, including an overview of the latter, refer to existing sources (e.g., Douglas et al., 2013). Briefly, although the contents appear structurally and conceptually the same, version 3 requires that the relevance of the risk factors are estimated, in addition to their presence. The presence of the items are rated "No" (the factor is not present or does not apply) "Possibly" (the factor is possibly or partially present), or "Yes" (the factor is present), and their relevance scored as "Low" (the factor is of low relevance to violence), "Moderate" (the factor is moderately relevant to violence), or "High" (the factor is highly relevant to violence). For research purpose, the presence and relevance ratings can be transposed into numerical values of 0, 1, and 2 respectively. The outcome variable was recidivism, specifically general recidivism.

4.3. Procedure

In addition to interviews with recidivists and nonrecidivists (hence after participants), prison officers and parents or legal guardians, the participants institutional files were consulted for pertinent information such as age, type of offense, and date of sentencing and release. An interview guide consisting of HCR-20^{V3} items and their corresponding indicators was devised in line with the instructions provided in the test manual. For example, indicators of a history of problems with traumatic experiences (H8) include parental, primary caregiver, and non-parental abuse and neglect, witnessed or exposed to family violence, and severe child abuse. The interview process required that the interviewees recall previous events. The prison officers were carefully selected to ensure reliable and valid data were obtained. One officer who has supervised the inmates before their release contributed significantly to the data collection process. Where he seems to have limited knowledge of a particular participant, another officer was interviewed. In all, a total of ten (10) officers were interviewed on the risk management items such as problems with professional services and plans (R1), living condition (R2), personal support (R3), supervision response (R4), stress or coping (R5), as well as institutional behaviors such as problems with insight (C1), violent ideation or intent (C2), instability (C3), supervision response (C5), and violent and aggressive behaviors. Effort was made to structure the interview process to take into account contextual factors specific to the prison establishment. For instance, as noted previously, there was no treatment program for the prisoners. Thus in determining the expected levels of compliance and responsiveness (R4), the interview focused on inmates compliance with and response to the vocational rehabilitation programming. Instability (C3) interview items include affective instability (e.g., serious irritability or anger), behavioral instability (e.g., acting irresponsibly), and cognitive instability (e.g., blaming others or self always for incarceration). Similarly, problem with insight (C1) focused on problems with insight into criminal behaviors, understanding or awareness of one's potential to engage in criminal behaviors, conditions, and factors that may affect the risk of reoffending.

With respect to the parents/legal guardian, the interview focused mainly on the participants historical behaviors such as history of problems with violence (H1), other antisocial behavior (H2), relationships (H3), employment (H4), substance use (H5), traumatic experiences (H8), and violent attitudes (H9). The interviews were conducted over the phone to overcome geographical barriers, transportation, and other costs. The participants were also interviewed on the historical, clinical, and risk management factors. In addition, they were administered a neuropsychological measure of executive functioning (i.e., BADS), as noted previously. The interviews and neuropsychological assessment were conducted in the presence of a prison officer for security reasons. Although evaluators can assess the presence or absence of mental disorders using questionnaires or behavioral checklists, medical documentation is needed to validate the information gained from the assessment (Smith et al., 2014). Consequently, due to lack of enough information to score H6 (history with major mental disorder), H7 (history of problems with personality disorder), and C3 (recent problems with symptoms of major mental disorder), their presence and relevance ratings were omitted. The data collection process last averagely for 90 min per participant, 30 min per parent or guardian, and 30 min per prison official per participant. Where necessary and applicable, information from different sources were examined to identify any inconsistencies that need further probing. Although the presence of an indicator may suggest the presence of the associated risk factor, more than three indicators were needed for a recording of presence and relevance to be made. The study received ethical approval from Ethics Committee for Humanities, University of Ghana, Ethics Committee of City University of Hong Kong, as well as institutional approval from the prison administration. Data were collected by the first author, who is a clinical psychologist, with specialization in clinical neuropsychology.

4.4. Data analytic strategy

Statistical significance was set at 0.05 unless indicated otherwise. Because the HCR-20 is not validated on Ghanaian samples, corrective normative data is unavailable. As a result, the use of raw scores from this measure may affect the relative range between the variables such that relationships may appear differentially on the basis of the statistical properties of each variable (Adjorlolo, 2016a, 2016c; Roebuck-Spencer & Sherer, 2008). To circumvent this challenge, the raw scores were standardized by converting them to z-scores and subsequently to *T*-scores using the formula $T = (z * 10) + 50$ (Iverson, 2011). This yield a mean of 50 and standard deviation of 10 (Table 1). An interaction term was created by multiplying the presence and relevance ratings (i.e., presence*relevance) to determine the extent to which these ratings interact to predict or relate to the outcome variable.

A series of statistical analyses was performed. Point biserial (r_{pb}) and Pearson product moment correlations were used to investigate the relationships between recidivism and the HCR-20 ratings, and HCR-20 subscales, respectively. The discriminant validity of the HCR-20 was investigated using receiver operating curve (ROC). The ROC is a graphical technique of plotting sensitivity (true positive rate) of a test on the *y*-axis against 1 − specificity (false positive rate) which is not necessarily influenced by the base rate of the outcome of interest, in this case recidivism (Mossman, 2013). The area under curve (AUC) value of the ROC is often

Table 1
Mean, standard deviations, and range of the participants scores on HCR-20^{V3}.

	Recidivists		Non-recidivists	
	M (SD)	Range	M (SD)	Range
HCR-20^{V3} Presence				
Historical	56.55 (9.09)	34.56–72.67	43.45 (5.65)	34.56–55.99
Clinical	53.51 (10.97)	37.52–80.15	46.49 (7.50)	37.52–69.50
Risk	53.89 (9.51)	36.59–79.07	46.11 (8.97)	36.59–60.19
Total	56.19 (8.34)	32.94–75.35	43.81 (7.36)	32.94–59.26
HCR-20^{V3} Relevance				
Historical	56.82 (9.14)	37.50–75.90	43.18 (4.86)	37.50–54.30
Clinical	54.05 (11.38)	39.45–82.19	45.95 (6.23)	39.45–60.82
Risk	54.23 (9.74)	38.00–79.53	45.77 (8.39)	38.00–61.08
Total	56.55 (8.54)	35.82–79.31	43.45 (6.44)	35.82–59.01

used as a measure of overall performance or predictive accuracy of risk assessment instruments. The value ranges between 0.5 (no/chance predictive validity) and 1.0 (maximum predictive validity). In the risk assessment field, AUC values of approximately 0.65 to 0.70 are considered moderate to large, and approximately 0.70 and above are regarded large (Douglas, Yeomans, & Boer, 2005; Rice & Harris, 2005). However, it has been argued that these interpretations can mislead people to believe that risk assessment instruments have moderate to large predictive or discriminant validity (Szmukler, Everitt, & Leese, 2012). Consequently, this study adopted Swets (1988) criteria to interpret these values. Accordingly, AUC value of 0.5 = noninformative; 0.5 < AUC ≤ 0.7 = less accurate; 0.7 < AUC ≤ 0.9 = moderately accurate; 0.9 < AUC ≤ 1 = highly accurate, and AUC = 1 = perfect test. Sensitivity, defined as the probability of a positive test result, and specificity, defined as the probability of a negative test result, of the measures were estimated using the optimal cutoff points for the various measures. These cutoff points were determined based on Youden Index, *J,* defined as the maximum vertical distance between the ROC curve and the chance (diagonal) line. That is, J = maximum [sensitivity + specificity −1](Youden, 1950).

Lastly, hierarchical logistic regression analysis was conducted to determine the discriminant validity of the presence ratings, as well as to investigate the incremental validity of relevance ratings to the presence ratings in discriminating between recidivists and non-recidivists. In the analysis, the presence ratings were entered in the first block and relevance ratings in the second block. AUC values, sensitivities, and specificities were calculated for each block from the predicted probability value. For a better comprehension, the odd ratios were converted to percentages using the formulae [(OR – 1) X 100%]. Hosmer and Lemeshow goodness-of-fit test was to determine the fit of the various models, whereas Negelkerke R^2 was used to estimate the proportion of variance explained by the models.

5. Results

5.1. Correlation between the HCR-20 items and recidivism

Table 2 contains the correlations (r_{pb}) and AUC values of the individual HCR-20 items.

The historical presence subscale items correlated significantly and positively with recidivism ($ps \leq 0.05$), with correlations ranging from 0.18 to 0.59. The AUC values of the historical subscale items were significant (all $ps \leq 0.01$), ranging from 0.60 to 0.85. Three clinical presence items showed significant correlations with recidivism (i.e., r_{pb} = 0.19 to 0.33), with and AUC values ranging from 0.65 to 0.67. The risk management presence items were also significantly and positively related to recidivism (i.e., r_{pb} = 0.19 to 0.36), with AUC values that ranged from 0.62 to 0.67.

5.2. Correlations among the HCR-20 scales and recidivism

As shown in Table 3, the HCR-20 subscales, total scales and interaction terms were significantly associated with recidivism, with correlations (r_{pb}) ranging from 0.35 (clinical presence subscale) to 0.69 (historical relevance subscale; all $ps < 0.01$). The HCR-20 subscales, totals, and interaction terms were significantly and positively intercorrelated (all $ps < 0.01$).

5.3. Discriminant validity of the HCR-20

Table 4 shows the AUC values of HCR-20 presence and relevance subscales, total scales and their interaction terms which were all statistically significant (all $ps < 0.001$). The AUC values typically ranged from 0.69 (clinical presence subscale) to 0.90 (historical presence*relevance). In terms of accuracy, only the historical presence × relevance was highly accurate. The clinical presence was the least accurate whereas the others were moderately accurate. At some recommended cut-off point, the historical presence and relevance, and their interaction demonstrated good sensitivities and specificities. The historical presence subscale achieved a near-balanced sensitivity (78%) and specificity (88%). The presence total score showed excellent sensitivity (93%) but at the expense of specificity (67%).

5.4. Incremental validity of relevance ratings

For simplicity, only the significant hierarchical logistic regression analysis results were reported (Table 5). The presence ratings significantly discriminated between recidivists and non-recidivists ($p < .001$). Importantly, historical relevance ratings added incrementally to the discrimination. Due to high correlations between the HCR-20 subscales and total scores (Table 3), a separate incremental validity analysis was conducted for the total scores. The model containing the presence total score was significantly different from zero, χ^2 (1) = 56.48, $p < .001$, providing good model fit to the data (χ^2 (8) = 8.25, $p = .409$, Nagelkerke $R^2 = 0.50$). The overall accuracy was 78% (80% for non-recidivists, 77% for recidivists). The AUC value (0.87) and sensitivity (93%) were also very good but specificity was

Table 2
Correlations with and AUC values of general recidivism for HCR-20 subscale items.

HCR-20 items		Presence	AUC(CI)	Relevance	AUC(CI)	Interaction	AUC(CI)
H1	Violence	0.58*	0.81**(0.736–0.889)	0.59*	0.81**(0.732–888)	0.57*	0.82**(0.746–0.898)
H2	Antisocial behavior	0.59*	0.81**(0.736–0.889)	0.60*	0.82**(0.744–897)	0.58*	0.84**(0.763–0.910)
H3	Relationships	0.57*	0.80**(0.726–0.883)	0.51*	0.77**(0.684–852)	0.56*	0.80**(0.717–0.878)
H4	Employment	0.57*	0.85**(0.726–0.884)	0.56*	0.79**(0.713–0.876)	0.61*	0.82**(0.736–0.893)
H5	Substance use	0.38*	0.69**(0.594–0.786)	0.51*	0.76**(0.670–845)	0.52*	0.75**(0.661–0.838)
H8	Traumatic experiences	0.36*	0.68*(0.587–0.777)	0.33*	0.66*(0.566–0.761)	0.36*	0.68**(0.583–0.775)
H9	Violent attitudes	0.54*	0.78**(0.699–0.863)	0.58*	0.80**(0.721–881)	0.55*	0.81**(0.731–0.889)
H10	Treatment/supervison response	**0.18**	0.60(0.493–0.696)	**0.23**	0.60(0.495–689)	0.25*	**0.62**(0.514–0.715)
C1	Insight	0.32*	0.65*(0.554–0.750)	0.29*	**63**(0.531–0.730)	0.32*	**0.63**(0.527–0.727)
C2	Violent ideation	0.33*	0.67*(0.570–764)	0.42*	0.70**(0.611–0.798)	0.40*	0.71**(0.612–0.799)
C4	Instability	**0.19**	0.59(0.491–694)	0.27*	**0.62**(0.521–0.721)	0.27*	**0.62**(0.516–0.717)
C5	Treatment/supervision response	0.18	0.58(0.478–683)	**0.21**	0.59(0.491–0.694)	0.25*	**0.61**(0.510–0.711)
R1	Professional services	0.24*	**0.62**(0.517–0.718)	**0.19**	0.59(0.490–0.693)	0.24*	0.59(0.489–0.693)
R2	Living situation	0.27*	**0.63**(0.532–731)	0.31*	0.65*(0.553–0.750)	0.31*	0.66*(0.564–0.759)
R3	Personal support	0.36*	0.67*(0.578–0.770)	0.47*	0.74**(0.646–0.827)	0.38*	0.71**(0.618–0.804)
R4	Treatment/supervision response	**0.19**	0.59(0.485–0.689)	0.24*	**0.61**(0.508–0.710)	0.26*	**0.61**(0.513–0.714)
R5	Stress/coping	0.34*	0.66*(0.563–0.757)	0.34*	0.65*(0.551–0.748)	0.35*	0.64*(0.542–0.741)

Bold = significant at < 0.05.
** p ≤ .001.
* p < .01.

Table 3
Correlations, and Cronbach's Alpha of the study variables.

		1	2	3	4	5	6	7	8	9	10	11	12
1	General recidivism	1											
Presence scores													
2	Historical	0.66**	1										
3	Clinical	0.35**	0.53**	1									
4	Risk	0.39**	0.49**	0.53**	1								
5	Total	0.62**	0.91**	0.76**	0.75**	1							
Relevance scores													
6	Historical	0.69**	0.93**	0.50**	0.48**	0.85**	1						
7	Clinical	0.41**	0.50**	0.88**	0.55**	0.72**	0.51**	1					
8	Risk	0.43**	0.52**	0.57**	0.92**	0.76**	0.50**	0.62**	1				
9	Total	0.66**	0.86**	0.72**	0.73**	0.95**	0.90**	0.77**	0.79**	1			
Presence*Relevance													
10	Historical	0.67**	0.97**	0.52**	0.46**	0.88**	0.98**	0.50**	0.50**	0.88**	1		
11	Clinical	0.39**	0.50**	0.95**	0.54**	0.73**	0.50**	0.97**	0.60**	0.75**	0.50**	1	
12	Risk	0.41**	0.49**	0.55**	0.97**	0.75**	0.48**	0.60**	0.98**	0.76**	0.46**	0.58**	1
13	Total	0.64**	0.89**	0.75**	0.73**	0.98**	0.89**	0.7**	0.77**	0.99**	0.90**	0.77**	0.75**

Note. $N = 120$, General recidivism = Nonrecidivists (0) versus recidivists (1).
** $p < .01$.

Table 4
Receiver operating curve analysis of HCR-20^{V3}.

Test	AUC(95% CI)	*p*-value	Cut-off	Sensitivity	Specificity	Accuracy level
HCR-20^{V3} Presence						
Historical	0.882 (0.810–0.933)	< 0.001	> 48.85	75	88	Moderate
Clinical	0.692 (0.601–0.773)	< 0.001	> 53.51	38	93	Less
Risk	0.708 (0.618–0.788)	< 0.001	> 41.31	87	47	Moderate
Total	0.866 (0.792–0.922)	< 0.001	> 44.64	93	67	Moderate
HCR-20^{V3} Relevance						
Historical	0.832 (0.841–0.953)	< 0.001	> 44.70	90	78	High
Clinical	0.719 (0.629–0.797)	< 0.001	> 50.13	47	85	Moderate
Risk	0.729 (0.641–0.806)	< 0.001	> 42.62	83	60	Moderate
Total	0.886 (0.815–0.936)	< 0.001	> 48.86	78	85	Moderate
Presence*Relevance						
Historical	0.903 (0.848–0.958)	< 0.001	–	88	80	High
Clinical	0.712 (0.620–0.804)	< 0.001	–	50	87	Moderate
Risk	0.726 (0.635–0.817)	< 0.001	–	83	58	Moderate
Total	0.883(0.823–0.943)	< 0.001	–	80	83	High

Note. HCR-20^{V3} = Historical Clinical Risk Management-20 Version 3.
Accuracy level based on Swets's (1988) criteria: AUC value of 0.5 = non-informative; 0.5 < AUC ≤ 0.7 = less accurate; 0.7 < AUC ≤ 0.9 = moderately accurate; 0.9 < AUC ≤ 1 = highly accurate, and AUC =1 = perfect test.

relatively low (67%). Importantly, a unit increase in the presence total ratings was associated with a 21% chance of experiencing the outcome variable, [χ^2 (1) = 30.75, $p < .001$, Exp(b) = 1.21, CI = 1.13–1.30]. There was a significant improvement in the model after the addition of the relevance total rating, χ^2 (1) = 8.59, $p = .003$. The model was a good fit to the data (χ^2 (8) = 7.68, $p = .466$, Nagelkerke $R^2 = 0.56$), with a marginal increase in the classification accuracy; overall 82% (85% for nonrecidivists, 78% for recidivists). The AUC value observed was 0.89, with a sensitivity of 78% and specificity of 85%. Interestingly, relevance total score was the only predictor that contributed significantly to the discrimination [χ^2 (1) = 7.46, $p = .006$, Exp (b) = 1.26, CI = 1.09–1.49]. Accordingly, a unit increase on this score was associated with 26% chance of recidivism.

6. Discussions

The present study aimed to contribute to the literature on risk assessment from non-Western context, specifically Ghana, a sub-Saharan African nation. The study discussed the prospects and challenges of risk assessment endeavors, focusing mainly on the criminal justice and mental health systems, and institutional files. Importantly, the study demonstrated the feasibility of administering risk assessment instruments using interview data obtained from multiple informants. The results showed that the HCR-20 historical presence ratings could provide invaluable information to identify inmates who are potential candidates for recidivism. The historical relevance domain similarly added significant incremental validity to the presence ratings to discriminant between recidivists and non-recidivists. The sensitivities and specificities of the historical presence and relevance factors and their interaction term were good, surpassing those reported by a previous study (Doyle et al., 2014). Impliedly, using these domains to predict recidivism could result in low false positives and false negatives. Taken as a whole, the usefulness of historical factors concurred with the findings in the risk assessment field (Doyle et al., 2014; Green et al., 2016) as well as the conclusion reached by meta-analytic investigations in the criminology literature indicating that historical factors are generally predictive of recidivism (e.g., Piquero, Jennings, Diamond, & Reingle, 2015). Historical risk factors generally emerge early in the criminal pathway and are relatively stable across time and space, thereby increasing the likelihood that they could be easily identified and accurately reported by interviewees.

The study examined the utility of dynamic and risk management factors to determine if they could play a significant role in the adoption and implementation of evidence-based offender treatment programs

Table 5
Logistic regression of incremental validity of HCR-20 relevance scores in predicting general recidivism.

	Model I			Model II		
	B	SE	Exp(B) (95%CI)	B	SE	Exp(B) (95%CI)
Presence						
Historical	0.22***	0.05	1.24 (1.137–1.352)	0.06	0.07	1.06 (0.918–1.226)
Clinical	−0.01	0.03	0.99 (0.936–1.05)	−0.08	0.06	0.92 (0.816–1.041)
Risk	0.03	0.03	1.03 (0.971–1.088)	−0.02	0.07	0.98 (0.856–1.125)
Relevance						
Historical				0.21*	0.08	1.23 (1.049–1.445)
Clinical				0.09	0.07	1.10 (0.959–1.254)
Risk				0.03	0.07	1.03 (0.888–1.186)
Constant	11.64	2.19		−13.86	2.54	
-2LL	99.96			87.66		
Chi-Square	χ^2 (3) = 66.40, $p < .001$			χ^2 (6) = 78.70, $p < .001$		
Hosmer-Lemeshow	χ^2 (8) = 4.51, $p = .809$			χ^2 (8) = 4.16, $p = .842$		
Nagelkerke R^2	0.57			0.64		
Classification(%)	Overall = 80, Reci. = 78, Nonreci. = 83			Overall = 85,Reci. = 81,Nonreci. = 88		
AUC	0.890 (0.820–0.940)			0.915 (0.850–0.958)		
Sensitivity	75			82		
Specificity	90			90		
Accuracy	Moderate			High		

Note: $N = 120$, Reci. = Recidivists, Nonreci. = Nonrecidivists.
* $p < .05$.
*** $p < .001$.

across the Ghanaian prison establishments. The result showed that the clinical and risk management presence and relevance ratings evinced significant but moderate discriminant validities, thus corroborating previous findings (Green et al., 2016; Hogan & Olver, 2016). The sensitivities and specificities were either low or unevenly reported, further limiting the discriminant validity of these ratings. More precisely and in agreement with previous studies (e.g., Strub et al., 2014), the clinical and risk management relevance domains did not add incrementally to discriminate between recidivists and non-recidivists. In this study, it seems that the characteristics of the participants, the changes introduced to the dynamic subscales, and some attributes of dynamic factors may have contributed to the limited discriminate and insignificant incremental validity of the clinical and risk management factors. Illustrating, in addition to the changes introduced to the dynamic subscales, it is somewhat difficult to observe and document the presence and relevance of dynamic items especially by non-professionals (e.g., prison officers) due to their unstable and rapidly changing nature. Similarly, inmates are more likely to behave quite differently in a secure institution than they would in the community. And so data from the prison officials may not truly estimate inmates' institutional behaviors (e.g., institutional aggression) and future plans. Furthermore, it seems also that restructuring the clinical subscale by excluding the indicators of mental health functioning contributed to the relatively low predictive validity of the clinical subscale.

Nevertheless, this finding reechoed previous observation that dynamic risk factors are less useful in predicting general compared with violent recidivism (Doyle et al., 2014; Gray, Taylor, & Snowden, 2008). This is partly because dynamic factors (e.g., emotional lability) are rapidly changing features that easily precipitate and signal the timing of offending, specifically violent offending (Hanson & Harris, 2000). In contrast, the tendency to engage in theft and robbery, the main crimes committed by the participants in this study, and instrumental crimes, in general, require some sort of calculation and planning (Adjorlolo & Chan, 2015). Notwithstanding the foregoing, it should be noted, however, that the relevance items were intended to help evaluators to decide on how the presence factors could potentially discriminate between recidivists and non-recidivists, relate to recidivism or offending. Thus their correlations with the outcome variable and other factors of the HCR-20 are very encouraging (see also Strub et al., 2014). Taken as a whole, the findings reported here largely compare with those reported in the Western-based literature, suggesting that interview-based approach to score risk assessment is a feasible strategy to conduct risk assessment research.

The findings of the study should be evaluated in view of the following limitations. Interview based methodology has no systematic mechanisms to verify the responses of the interviewees, although attempts were made to validate the responses. Problems associated with retrospective designs such as recall bias could also significantly influence the interviewee's responses to the various items. The presence of security personal at the time of the interview could potentially influence the responses provided by the participants. The study adhered to ethical principles governing human research, particularly with respect to vulnerable population. More importantly, although the participants signed a consent form voluntarily, we could not rule out the possibility that they consented to the study because of fear of the consequences of non-participation. This could affect the responses provided by the participants. Resource and time constraints prevented the use of another interviewer to investigate inter-interviewer reliability. This further limits the findings, although previous studies using institutional files have repeatedly shown that the HCR-20 can be coded by different raters (Doyle et al., 2014). The exclusion of the items measuring mental and personality disorders, has the propensity to undermine the validity of the entire HCR-20, in addition to the small number of participants. Moreover, due to the nature of the research design (i.e., retrospective design), and the characteristics of the sample (i.e., more nonviolent crime) the extent to which interview-based risk assessment could prospectively predict violent, nonviolent and general recidivism is not known.

In conclusion, there are no justifiable reasons why developing countries, specifically African countries, can not benefit from risk assessment practices. As noted previously, risk assessment could contribute significantly to justice delivery, offender rehabilitation, and ultimately public safety. Indeed, admittance into bail in Ghana is not automatic as the presiding judge or magistrate is legally required to subject an accused to the conditions of bail, including the risk of future offense as stipulated in Section 96(7) of Act 30. Anecdotally, some individuals admitted to bail have committed new offenses, interfered with investigations by terrorizing, intimidating and threatening witnesses or victims. These incidents could possibly be reduced or prevented with the help of evidence-based risk assessment. Risk assessment

could also help in decision making about the risk an individual posed to society, who should receive treatment and what type of treatment. Thus, it is recommended that efforts should be made to possibly include and undertake risk assessment practice and research in Ghana and other African countries.

Recommendations to facilitate and harness the potential of formal risk assessment include (1) educating the judiciary, and correctional system on the relevance of formal and structured risk assessment, (2) training mental health professionals in forensic mental health issues, and (3) improving record keeping and integrating electronic record keeping into routine work practice should be prioritized. From the foregoing, until issues concerning data availability are resolved to an appreciable degree, the methodology adopted in the present study could serve as an alternative approach to undertaking risk assessment research and practice on the continent.

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