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The Prison Adjusted Measure of Aggression (PAMA): Psychometric characteristics of a new tool measuring change in aggressive behaviors in correctional settings

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ABSTRACT

There is a need for instruments that can be used in correctional settings to measure changes in aggressive behaviors over a limited time period. This study aimed to validate an instrument (the Prison Adjusted Measure of Aggression, PAMA) that assesses specifically the past month's aggressive *behaviors* and is adapted for use in correctional facilities. The psychometric properties of the self-rated and interview versions of the PAMA were explored and compared to those of two well-established measures of aggression: The Staff Observation Aggression Scale (SOAS); and the self-rate Aggression Questionnaire-Revised Swedish Version (AQ-RSV). The study group comprised 93 male and 59 female inmates, who were followed for two months. During the study, the prevalence of aggressive acts was observed and reported by SOAS. On two occasions, at monthly intervals, subjects reported their own aggressive behaviors using AQ-RSV and the self-report version of the PAMA; also, a psychologist conducted interviews according to PAMA. This study's main finding was that the self-rated version of PAMA is a valid measure of different types and dimensions of aggression (physical and verbal aggression, hostility) and has acceptable psychometric properties. Therefore, PAMA could potentially be of value for use in correctional services evaluating aggression managing treatment interventions.

1. Introduction

In studies of aggressive behavior, offender populations are particularly interesting. The costs and consequences of violent crime have warranted a significant amount of research on offender populations, in which the relationship between aggressive behaviors, mental disorders, neurological factors, and criminality has been extensively investigated (e.g., Falk et al., 2013; Gilbert et al., 2013; Golden et al., 1996). As the understanding of risk factors for aggressive behavior and criminality is evolving, the focus in this area should shift toward developing and evaluating relevant treatment strategies that lead to evidence-based intervention programs. However, realizing this goal requires a reliable instrument, which may allow for properly monitoring aggressive behaviors and evaluating treatment effects within forensic settings.

It is important to be clear about related concepts when developing such an instrument, especially between aggressive and violent behaviors on one side, and anger on the other. While these words and concepts are used in similar contexts and sometimes as synonyms, there are important differences between them. *Anger* is commonly understood both as an emotional state that an individual feels at a defined moment and an emotional trait displaying how an individual generally feels (Lievaart et al., 2016). Aggression and violence are more closely related, as both are connected to behaviors aiming at hurting or controlling another person. There are several instruments measuring anger, of which the best known are the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1988) and the Novaco Anger Scale (NAS; Novaco, 1994, Mills et al., 1998). In terms of aggression, one of the most popular instruments is the Aggression Questionnaire (AQ; Buss and Perry, 1992; Surís and Coccaro, 2008). A common feature of these instruments is that they all generally measure anger and aggression, and are most often used with non-clinical subjects. Another common feature is that they all are based on self-reported information, usually without any scale measuring the validity of the individual answers. Self-report questionnaires heavily rely on the respondent's capability to remember and admit to aggressive behavior. Accordingly, answers may be distorted by social desirability and recall bias (Gothelf et al., 1997; Surís and Coccaro, 2008; Nijman et al., 2006). Self-report measures have also been criticized for their dependence on respondents' adequate reading

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ability (Edens et al., 2000). Furthermore, certain groups, such as prison populations or individuals with an antisocial personality disorder, may lack insight into their own role in creating conflicts and behaving aggressively (Nijman et al., 2006; Coccaro et al., 1997). Therefore, it is not a surprise that studies show that these instruments have shortcomings when used in forensic settings (Schamborg et al., 2016; Lievaart et al., 2016; McEwan et al., 2009; Hornsveld et al., 2009, 2011).

Another option is to measure anger and aggressive behaviors by having an independent observer rate the occurrence of these behaviors. The aim of observational instruments, such as the Staff Observation Aggression Scale – Revised (SOAS-R; Nijman et al., 1999), is to obtain a description of separate aggressive events in an objective, instrumental way (Surís and Coccaro, 2008; Nijman et al., 2006). In general, observational measures are time-efficient, related to well-defined behaviors, and easy to use (Nijman et al., 2006). However, many of these instruments are developed within a risk management paradigm with the primary aim to predict and manage aggressive outcomes and not to measure changes in aggressive behavior (e.g. O'Shea and Dickens, 2015). An additional challenge is that they depend on an unbiased, attentive and, above all, constantly present observer who is careful to record all aggressive incidents (Nijman et al., 2006, 2005). These conditions are often difficult to provide in forensic settings, especially in prisons where the number of detainees largely exceeds the number of employees, why there is several situations in which observational instruments are far from optimal.

Overall, the majority of validated self-report instruments have proven to be able to satisfactorily measure prevalence of aggression and anger (e.g. Bjerrum Moeller et al., 2015), but much less is demonstrated when it comes to their ability to measure changes in aggressive behaviors, especially within shorter timeframes due to, for example, treatment programs aiming at reducing these behaviors. Although observational instruments are available, their use is limited within, for example, prison and probation services because the structure and organization of forensic facilities make it difficult to continuously observe inmates. Examples of such limitations include the number of staff vs. number of inmates; high density of inmates in restricted areas; and daily routines, along with inmates' movement between different areas of the prison.

In the present study, correctional officers were asked to report observed aggressive behaviors in prison inmates. During the same period, inmates were asked to report their own aggressive behaviors, with a previously validated measure (AQ-RSV; Prochazka and Ågren, 2001) and with a new measure (the Prison Adjusted Measure of Aggression; PAMA). In addition, a psychologist assessed their aggressive behaviors by the psychologist-rated interview version of the PAMA.

1.1. General aim

The general aim was to establish the psychometric properties of the PAMA, a standardized measure of aggressive behaviors that can be administered as a primary or secondary measure of outcome in future controlled trials of potential treatments (such as pharmaceuticals, psychotherapy, and physiotherapy; or alternative treatments, such as nutrition and yoga).

1.2. Specific aims

1. To assess reliability by calculating internal consistency of the self- and psychologist-rated versions of the PAMA
2. To calculate test-retest reliability of the self- and interview-rated versions of the PAMA
3. To test convergent validity of the self- and psychologist-rated versions of the PAMA, using AQ-RSV as a reference
4. To test convergent validity of the self- and psychologist-rated versions of the PAMA, using SOAS-PA as a reference

2. Method

2.1. Study population

Collaboration was sought with the Swedish Prison and Probation Service in the Western region of Sweden and was established with two correctional facilities, in which the study was carried out. Of these two correctional facilities one were for men (Högsbo), and the other for women (Sagsjön), both located in Gothenburg, Sweden. Högsbo is a medium-security facility (security class two), whereas Sagsjön is a medium- and low-security facility (security classes two and three). Both Högsbo and Sagsjön primarily specialize in treating offenders with substance abuse. Inmates with limited or no proficiency in the Swedish language were excluded from participation, as well as those with less than three months time remaining on their sentence. There were no other exclusion criteria.

In the course of the study (18 months at Högsbo, and 30 months at Sagsjön), 155 male inmates and 101 female inmates had at least three months remaining at the correctional facility. Some of them were excluded, due to limited or no proficiency in Swedish, and an additional number declined to participate in the study. However, there was no information available as to the number of inmates excluded due to language difficulties. A total of 93 male inmates and 59 female inmates were recruited. Accordingly, the approximate (and somewhat underestimated) inclusion rate shows that of all eligible inmates, 60% of men and 58% of women participated in the study.

2.1.1. Characteristics of the sample

The mean age for the male inmates was 33.7 years (*SD* 10.5), whereas the mean age for the female inmates was 39.8 years (*SD* 10.8). Background information was missing for unknown reasons in a few cases. For example, information about current sentence was left blank for five male, and three female, inmates. Therefore, the following information corresponds to 88 male, and 56 female, inmates. Mean length of the current sentence was 19.5 months (*SD* 16.9, minimum = 3, maximum = 120) for male inmates, and 23.2 months (*SD* 27.8, minimum = 4, maximum = 144) for female inmates. Many inmates were convicted of multiple offenses in their current sentence. All convictions were categorized in accordance with the classifications of the Swedish National Council for Crime Prevention (Brottsförebygganderådet, 2013) as belonging to the following types: Offenses against life and health (such as homicide, assault, aggravated assault); acquisitive crimes (such as theft, robbery, shoplifting); traffic violations (such as driving under the influence, reckless driving); drug-related offenses (such as possession, distribution, smuggling); fraud (such as extortion, fencing); offenses against liberty and integrity (such as unlawful threats, deprivation of liberty, violation of integrity); and Weapons Act Offenses (such as unlawful possession of firearms or knives). Offenses that did not fit into any of the above categories were categorized as other offenses (such as vandalism, tax crimes, violent resistance, obstruction of justice, embezzlement, arbitrary handling of a child). Table 1 displays the proportion of inmates within the different categories.

Table 1
Distribution of different types of offenses in current sentence.

	Males (n = 88)	Females (n = 56)
Offenses against life and health	10.8%	28.6%
Acquisitive crimes	59.2%	39.3%
Traffic violations	57.2%	14.3%
Drug-related offenses	73.3%	44.6%
Fraud	32.3%	8.9%
Offenses against liberty and integrity	9.7%	8.9%
Weapons Act offenses	20.6%	5.4%
Other offenses	22.7%	21.4%

Information on prior convictions was missing for 10 male inmates and eight female inmates, so the prevalence of prior conviction(s) was calculated for 83 male and 51 female inmates. Almost half of the female inmates (47.1%), but only about one-tenth of the male inmates (13.3%), had no prior convictions, while 17.6% of the female, and 9.6% of the male inmates, had one prior conviction. The majority of male inmates (77.1%) had two or more prior convictions, whereas only 35.5% of female inmates had two or more prior convictions.

2.1.2. Attrition and missing data

Five male inmates left the study early at their request. An additional 11 male inmates were moved to other correctional facilities during participation in the study, and therefore unable to complete all (repeated) measures. One female subject was moved to another correctional facility at her request, and two female subjects could not fill out the self-report questionnaires due to mental health problems and cognitive difficulties. Therefore, the number of subjects may vary depending on the type of analysis. Measures that the subjects completed before they left the study or moved to another correctional facility were included in the statistical analyses. Only measures in which items were left blank or answered incorrectly (such as when two different answers were circled) were excluded from the statistical analyses.

2.2. Instruments

2.2.1. Staff Observation Aggression Scale-Prison Adjusted (SOAS-PA)

The SOAS is an observation measure that assesses state aggression. It was first developed in 1987 to measure the frequency, nature and severity of aggressive behavior in psychiatric wards (Palmstierna and Wistedt, 1987). In 1999, Nijman et al. revised and validated the instrument as SOAS-R. It has fair to good inter-rater reliability and validity (Nijman et al., 2005). However, being an incident-based scale, the reliability greatly depends on the staff readiness to document all aggressive incidents (Nijman et al., 2005).

The possible utilization of this instrument in correctional settings was previously and independently from our study discussed within the Swedish Prison and Probation Services. Since the SOAS-R was developed for use in psychiatric settings, the instrument required adaptation to correctional settings, leading to the SOAS-PA. Adjustments included changes in the following descriptions:

- the provocation (for example, “staff required patient to take medication” was changed to “staff required urine tests, incarceration, visitation, interrogation”)
- the means used by the client in the aggressive incident (rule-breaking behavior was added as an option: “behavior such as late arrival/absence from work or school, refusing to participate, or leaving in the middle of a conversation or activity”)
- the target of aggression (for example, “other patient” was rephrased to “other inmate”)
- the consequence for the victim (for example, “need for treatment by a physician” was changed to “needed treatment/debriefing,” and options such as “not known” were added)
- the measure taken to stop aggression (for example, all options regarding involuntary medical treatment were excluded, and social consequences for the client were added, such as “client removed from work/school”)

Prior to the study, correctional officers were educated about different forms of aggression, as well as how to complete the SOAS-PA forms. Any aggressive behavior that subjects exhibited during the two months of the study was to be recorded in a separate notification, as a separate SOAS-PA report. Each aggressive behavior identified was noted as one SOAS-PA report. Each week, if no aggressive incidents had been witnessed, site managers were to complete a “zero report”. Because of the adjustments made to the original scale, the SOAS-PA forms did not include severity ratings, so different scores for severity were not assigned. Instead, the SOAS-PA forms were used only as a measure of the prevalence of aggressive acts.

2.2.2. The Aggression Questionnaire – Revised Swedish Version (AQ-RSV)

The AQ-RSV is based on the American Aggression Questionnaire (Buss and Perry, 1992), which is the most extensively researched self-report measure on aggression (Surís and Coccaro, 2008). The inventory is intended to capture both trait and state aggression (Prochazka and Ågren, 2001), which means that AQ-RSV scores can change over time. However, it has not been validated to measure changes in aggression over a short period of time. AQ-RSV consists of 29 items that measure four aggression factors: Hostility, Anger, Verbal and Physical Aggression. Items are rated on a four-point scale, based on how often they occur: seldom/never = 1, sometimes = 2, often = 3, almost always/always = 4. The AQ-RSV has been standardized to Swedish conditions, and its psychometric characteristics show acceptable levels of internal consistency in the total scale (Cronbach's alpha 0.85), the Physical Aggression subscale (Cronbach's alpha 0.85), and the Hostility subscale (Cronbach's alpha 0.75). The Anger and Verbal Aggression subscales show weaker internal consistency (Cronbach's alphas of 0.69 and 0.53, respectively) (Prochazka and Ågren, 2001).

2.2.3. Life History of Aggression (LHA) – self-report and interview versions

The LHA scale (Coccaro et al., 1997) assesses level of aggressive and antisocial behaviors in a lifetime perspective, and is as such primarily a measure of trait aggression. In this study, it was administered as a baseline measure of life history of aggression. The instrument, which was primarily developed for personality-disordered individuals in veteran care, has been used in different clinical and research settings (Surís and Coccaro, 2008). It was originally designed as a semi-structured assessment interview (Coccaro et al., 1997), but it was administered in two ways in this study: as a self-report questionnaire (referred to as *self-report version*) as well as a semi-structured interview (referred to as *interview version*). Research on personality-disordered subjects and normal controls in the United States has proven the LHA, particularly its Aggression subscale, to be a reliable, valid measure of an individual's life history of aggression (Coccaro et al., 1997). Using data from more than 200 subjects, a high internal consistency was assessed for the total score (Cronbach's alpha 0.88) and for the subscales Aggression (Cronbach's alpha 0.87) and Consequences/Antisocial Behavior (Cronbach's alpha 0.74). However, internal consistency of the Self-directed Aggression subscale was lower (Cronbach's alpha 0.48). This was greatly influenced by gender (higher in women) and type of group (increased in a group of personality-disordered subjects, while not reported in controls at all) (Coccaro et al., 1997). In Sweden, the LHA has been tested in an outpatient group and in populations of forensic psychiatric patients (Hofvander et al., 2010; Nilsson et al., 2011) and a sample of young violent offenders (Hofvander et al., 2017).

The LHA scale consists of 11 items. The items are distributed over three subscales: A five-item Aggression scale, a four-item Consequences/Antisocial Behavior scale, and a two-item Self-directed Aggression scale. The Aggression scale measures overt aggression and includes items on temper tantrums, verbal and indirect aggression, nonspecific fighting, and physical assault against people. The Consequences/Antisocial Behavior scale consists of items on school disciplinary problems, problems with supervisors, and antisocial behavior that did/did not result in police involvement. The Self-directed Aggression scale includes items on self-injurious behavior and suicide attempts.

Items are rated on a six-point scale, based on the total number of occurrences since age 13: no events = 0, one event = 1, two or three events = 2, four to nine events = 3, 10 or more events = 4, and more events than can be counted = 5. The LHA score is the sum of ratings on all 11 items (total score) or on the specific items in a certain subscale (subscale score). LHA total scores range from 0 to 55; Aggression

subscale scores range from 0 to 25; Consequences/Antisocial Behavior scores range from 0 to 20; and Self-directed Aggression scores range from 0 to 10. LHA total scores > 15, or Aggression subscale scores > 12, might indicate an atypically high occurrence of lifetime aggression. Individuals with scores higher than these could benefit from treatment aimed at managing aggressive behaviors (Coccaro et al., 1997).

2.2.4. Prison Adjusted Measure of Aggression (PAMA) – self-report and interview versions

The PAMA is an adapted version of the LHA scale, in which subjects are asked to rate the occurrence of aggressive and antisocial behaviors during the past month (and is as such more akin to state aggression). Whereas the original LHA scores are not expected to change significantly over a short period of time, such as months, PAMA scores are supposed to be sensitive to such changes. Adaptations were made by the Forensic Psychiatry Group at the Sahlgrenska Academy and included the timeframe and wording of the last four items, which were adjusted to correctional settings (such as for example, using the term *correctional officers* instead of *police*). However, PAMA's principal format remained the same as the original LHA scale (number and sequence of items, rating of items, types of subscales and distribution of items over subscales). Like the LHA, the PAMA was completed through both a semi-structured interview led by a psychologist and a self-report questionnaire. However, unlike the LHA, the PAMA was completed at two different occasions in the study: At one month into the study, and then again after another month, or in other words, within a two months frame with two measurements.

2.3. Study procedure

Inmates were continuously recruited to the study from January 2013 to May 2014 (Högsbo) and to May 2015 (Sagsjön). The study duration was approximately two months. Upon entering the study, all inmates completed the LHA self-report and interview version. SOAS-PA forms were completed throughout the study and divided into two periods. The first period included all forms from the first month of participation, and the second period included all forms from the second month of participation. One month into the study, inmates completed the self-report and interview versions of the PAMA, as well as the AQ-RSV. After yet another month, inmates once again completed the self-report and interview versions of PAMA, together with the AQ-RSV. They all left the study after the second month. Fig. 1 illustrates the study procedure and clarifies at which stage the different measurements were obtained.

Self-report measures were distributed and generally completed before the semi-structured interviews were conducted. An appointed site manager distributed and collected the self-report questionnaires and collected the SOAS-PA forms. Each time self-report questionnaires were distributed, subjects were allowed a few days to complete them. An experienced psychologist conducted the semi-structured interviews that lasted an average of 30 min.

2.4. Statistical procedures

Tests of normality (Kolmogorov-Smirnov and Shapiro-Wilk tests) were conducted to investigate whether or not data was normally distributed. Results indicated that data violated the assumption of normality. Accordingly, non-parametric tests were performed. All statistical analyses were conducted in a two-tailed manner, using an alpha value of < 0.05. All statistical tests were performed with IBM SPSS Statistic, v. 20.

2.4.1. Reliability

Internal consistency was calculated using Cronbach's alpha for the PAMA, both total scales, and subscales, in all assessments. A commonly acceptable level of Cronbach's alpha is above 0.7 (Nunnally, 1978), but scales with lower alphas are not unusual (DeVellis, 2013). Since Cronbach's alpha is sensitive to the number of items in a scale, and the Self-directed Aggression subscale only consists of two items, mean inter-item correlations were also computed for this scale. Analyses of correlations between the self-reported and interview versions of the PAMA, as well as test-retest reliability data, collected from male and female inmates, were analyzed together, since no gender differences were expected to be found in these statistical steps. Correlations between the self-reported and interview versions of the PAMA, and test-retest reliability were calculated by intra-class correlations (ICC) with confidence intervals at the 95% level. The model used was a two-way random effect model (2,1) with absolute agreement. Single-measure ICC values were interpreted in accordance with Fleiss' (1986) recommendations: > 0.75 was excellent, 0.40–0.75 was fair to good, and < 0.40 was poor.

Test-retest reliability is a basic psychometric descriptive of an instrument's stability over time. However, since PAMA is intended to assess fluctuations in aggressive behaviors over short time periods, test-retest reliability was only considered relevant to test for inmates whose behavior emerged as stable due to SOAS-PA observations. Therefore, only inmates who had observable aggressive acts during both periods, or had no observable aggressive acts during either period were included in the PAMA test-retest analysis.

2.4.2. Convergent validity

Bivariate Spearman rank order correlations between each version of PAMA, including the subscales, AQ-RSV and SOAS-PA, were calculated to test convergent validity. Male and female subjects were analyzed separately.

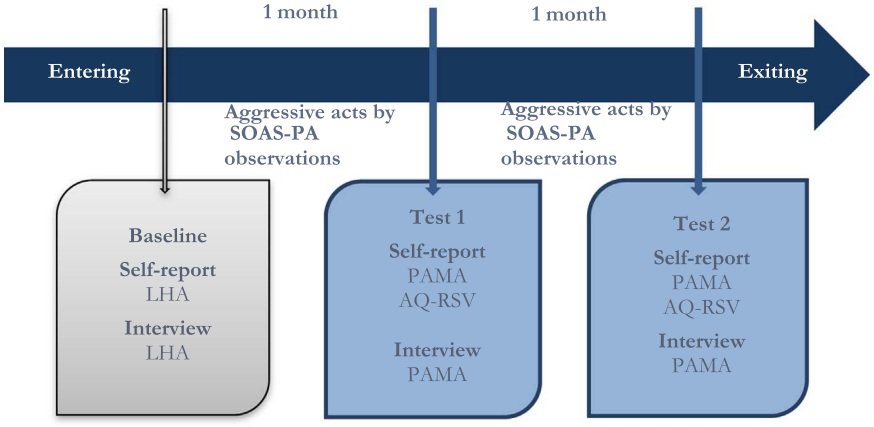

Fig. 1. The study procedure.

Table 2
Descriptive statistics on the interview and self-reported versions of LHA for male and female inmates.

LHA	**Interview version** Mean/ *SD* (*n*)		**Self-report version** Mean/ *SD* (*n*)	
	Male inmates	Female inmates	Male inmates	Female inmates
Total scale	33.00/8.74 (93)	24.1/12.5 (59)	28.76/ 12.16 (80)	22.4/12.6 (52)
• Aggression	18.53/5.72 (93)	14.1/6.7 (59)	16.86/7.16 (88)	13.7/7.6 (56)
• Self-directed Aggression	0.98/1.53 (93)	2.0/2.5 (59)	1.14/1.65 (88)	2.2/2.7 (57)
• Antisocial Behavior	13.49/3.62 (93)	8.0/5.5 (59)	10.69/5.28 (83)	6.9/4.9 (53)

2.5. Ethical considerations

The project received ethical approval from the regional Ethical Review Board, Dnr 432–12. Prior to entering the study, subjects were informed, both orally and in written form, about the study procedure and the conditions of participation. Written informed consent was obtained from all subjects. Subjects were free to leave the study at any time, and they did not have to provide a reason for wanting to leave. Upon completion of the study, subjects received a phone card valued at 200 SEK (equal to approximately USD$25).

3. Results

3.1. Descriptive statistics

The LHA interview version established baseline scores for life history of aggression. However, for descriptive purposes, means and standard deviations for both versions of LHA were calculated (Table 2).

It is noteworthy that the self-reported total scores of life history of aggression, as well as the subscale scores of Aggression and Antisocial Behavior, were lower than the ones assessed by the interviewer for both men and women. On the other hand, self-reported Self-directed Aggression scores were slightly higher than that assessed by the interviewer.

3.2. Research aims 1 and 2: reliability

As previously stated, the male and female study samples were analyzed together in establishing inter-rater and test-retest reliability of the different versions of PAMA because these analyses are not thought to be gender-dependent. However, the internal consistency of PAMA was analyzed, both separately and together for genders, accepting the possibility that male and female inmates may interpret items differently.

Table 4a
ICCs between the self-report and interview versions of PAMA.

Scale	(*n*)	ICC	CI
PAMA Period 1 total	(130)	0.22**	0.05 – 0.38
• Aggression	(133)	0.22**	0.06 – 0.38
• Self-directed Aggression	(135)	0.10	−0.07 to 0.27
• Antisocial Behavior	(134)	0.22**	0.05 – 0.37
PAMA Period 2 total	(132)	0.40***	0.25 – 0.54
• Aggression	(133)	0.43***	0.28 – 0.56
• Self-directed Aggression	(135)	0.14*	−0.03 to 0.30
• Antisocial Behavior	(134)	0.39***	0.23 – 0.52

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

3.2.1. Internal consistency

Table 3 presents internal consistency for the self- and psychologist-rated versions of PAMA.

Internal consistency was acceptable in all total scales and in the majority of subscales. Inmates' self-ratings of PAMA were more consistent than ratings based on interviews. Female inmate ratings (self or interview) showed greater internal consistency than did male inmate ratings. In both, the self-report and interview versions of PAMA, the scales containing the most items (the Aggression subscale and the total scale) were generally coupled with the strongest Cronbach's alpha. This result was expected, since Cronbach's alpha is sensitive to the number of items in a scale. The Self-directed Aggression subscale in both PAMA versions showed an unacceptably low internal consistency for male inmates. However, despite the low item number in this subscale, it had an acceptable level for female inmates' self-reported version (in both periods) and for their interview version in period 2.

3.2.2. Correlations between self-report and interview versions

Intra-class correlations (ICCs) were calculated to examine the relationship between the self-report and interview versions of PAMA. Results are displayed in Table 4a.

However, during the first PAMA interview with inmates (following their first PAMA self-report), 10 inmates indicated that they misunderstood the instructions and reported aggressive behaviors in a total lifespan perspective again (caused by the very similar structure of LHA and PAMA). Therefore, ICCs were recalculated after the exclusion of the data from these inmates (Table 4b).

All ICC values in period 1 were poor, whereas three of four ICC values in period 2 were fair or close to fair. Exclusion of those who indicated wrong reports during period 1 on PAMA resulted in a more consistent relationship between the self-report and interview versions of PAMA. The Self-directed Aggression subscale showed poor ICC values in both periods, but the PAMA total scale, and the Aggression and Antisocial Behavior subscales had a fair association between the self-report and interview versions.

Table 3
Cronbach's alpha for the two different versions of PAMA.

	Period 1 Cronbach's alpha			**Period 2** Cronbach's alpha		
Scale	**All inmates (*n*)**	**Male inmate (*n*)**	**Female inmates (*n*)**	**All inmates (*n*)**	**Male inmates (*n*)**	**Female inmates (*n*)**
PAMA self-report total	0.94 (131)	0.94 (78)	0.95 (53)	0.86 (133)	0.87 (77)	0.86 (56)
• Aggression	0.94 (134)	0.93 (80)	0.95 (54)	0.84 (133)	0.86 (77)	0.82 (56)
• Self-directed Aggression	0.82 (136)	0.44 (80)	0.87 (56)	0.97 (135)	1.00 (79)	0.97 (56)
• Antisocial Behavior	0.86 (135)	0.85 (80)	0.88 (55)	0.67 (135)	0.59 (79)	0.74 (56)
PAMA interview total	0.83 (141)	0.73 (83)	0.90 (58)	0.78 (138)	0.71 (81)	0.87 (57)
• Aggression	0.67 (141)	0.60 (83)	0.76 (58)	0.70 (139)	0.65 (81)	0.77 (58)
• Self-directed Aggression	0.44 (141)	-[a] (83)	0.44 (58)	0.57 (139)	-[a] (81)	0.80 (58)
• Antisocial Behavior	0.82 (141)	0.63 (83)	0.94 (58)	0.54 (138)	0.20 (81)	0.91 (57)

[a] Incomputable because at least one of the variables is constant.

Table 4b
ICCs between the self-report and interview versions of PAMA after deleting data from inmates who misinterpreted the instructions for the first self-report (n = 10).

Scale	(*n*)	ICC	CI
PAMA Period 1 total	(120)	0.37***	0.20 – 0.51
• Aggression	(123)	0.34***	0.18 – 0.49
• Self-directed Aggression	(125)	0.21*	0.03 – 0.37
• Antisocial Behavior	(124)	0.33***	0.16 – 0.48
PAMA Period 2 total	(122)	0.40***	0.24 – 0.54
• Aggression	(123)	0.43***	0.27 – 0.56
• Self-directed Aggression	(125)	−0.01	−0.19 to 0.16
• Antisocial Behavior	(124)	0.39***	0.23 – 0.53

* $p < 0.05$.
*** $p < 0.001$.

3.2.3. Test-retest reliability

The test-retest reliability of the self-reported and interview versions of PAMA was calculated to investigate if PAMA in repeated use is a reliable measure of aggressive behavior. As the test measures the reliability of the reports when the measured concept (aggressive behavior) is the same in both test periods, inmates who fluctuated in aggressive behaviors over time (according to SOAS-PA) were excluded. Two female and two male inmates received SOAS-PA reports in both periods (indicating similar behavior during both test periods). All other SOAS-PA reports for aggressive behavior were from only one period. For example, during the first period, SOAS-PA reports were left for four female and five male inmates, who had no reports from the second period. Likewise, SOAS-PA reports were found for one female and four male inmates who had no reports from the first period. Therefore, 13 inmates (five females and eight males) were excluded from test-retest analyses, due to fluctuations over the study period with regard to their aggressive behaviors. The 10 inmates who stated that their PAMA report was not reliable during the first period of measurements were also excluded from these analyses (one of whom belonged to the group with fluctuations in aggressive behaviors). Results are presented in Table 5.

Results showed that each scale of the self-rated PAMA had excellent test-retest reliability, except for the Antisocial subscale, in which the ICC value was fair. The interview version of PAMA had good test-retest reliability, except for the Self-directed Aggression subscale, for which reliability was poor.

3.3. Research aim 3 and 4: convergent validity

Correlational analyses between the self-reported AQ-RSV and the self-report and interview versions of PAMA were performed to test convergent validity. Those 10 inmates who stated that there was a misreporting of PAMA during period 1 were excluded. The interview version of PAMA showed a somewhat stronger correlation with AQ-RSV reports in male inmates (Table 6a), while the correlation between the self-reported or interview versions of PAMA and the AQ-RSV were fairly similar for the female inmates (Table 6b).

Table 5
Test-retest reliability of the PAMA self-report and interview version.

Scale	(*n*)	ICC	CI
PAMA self-report total	(105)	0.85***	0.78–0.89
• Aggression	(107)	0.87***	0.81–0.91
• Self-directed Aggression	(112)	0.83***	0.76–0.88
• Antisocial Behavior	(110)	0.64***	0.51–0.74
PAMA interview total	(116)	0.78***	0.69–0.84
• Aggression	(117)	0.75***	0.66–0.82
• Self-directed Aggression	(117)	0.25**	0.07–0.41
• Antisocial Behavior	(116)	0.65***	0.53–0.74

** $p < 0.01$.
*** $p < 0.001$.

Table 6a
Spearman correlations between PAMA and AQ-RSV in the male inmate sample.

Period 1	Anger (*n*)	Physical Aggression (*n*)	Verbal Aggression (*n*)	Hostility (*n*)	**AQ-RSV total** (*n*)
PAMA self-report					
Total	0.50*** (61)	0.34** (63)	0.11 (69)	0.42*** (69)	0.41** (53)
• Aggression	0.48*** (63)	0.40** (65)	0.14 (71)	0.44*** (71)	0.49*** (55)
• Self-directed Aggression	0.02 (63)	0.05 (64)	−0.18 (70)	−0.01 (71)	0.13 (54)
• Antisocial Behavior	0.29* (63)	0.04 (64)	−0.04 (70)	0.31** (71)	0.10 (54)
PAMA interview					
Total	0.59*** (63)	0.31* (64)	0.20 (70)	0.53*** (71)	0.53*** (53)
• Aggression	0.57*** (63)	0.31* (64)	0.17 (70)	0.50*** (71)	0.49*** (53)
• Self-directed Aggression	-[a] (63)	– (64)	– (70)	– (71)	– (53)
• Antisocial Behavior	0.38** (63)	0.30* (64)	0.25* (70)	0.38** (71)	0.48*** (53)
Period 2	Anger	Physical Aggression	Verbal Aggression	Hostility	**AQ-RSV total**
PAMA self-report					
Total	0.49*** (66)	0.41** (62)	0.20 (66)	0.36** (65)	0.48*** (56)
• Aggression	0.51*** (66)	0.35** (62)	0.22 (66)	0.39** (65)	0.48* (56)
• Self-directed Aggression	0.09 (68)	0.10 (63)	0.04 (68)	0.05 (67)	0.07 (57)
• Antisocial Behavior	0.22 (68)	0.29* (63)	0.10 (68)	0.21 (67)	0.31* (57)
PAMA interview					
Total	0.52*** (68)	0.50*** (63)	0.27* (68)	0.37** (67)	0.58*** (57)
• Aggression	0.56*** (68)	0.52*** (63)	0.29* (68)	0.41** (67)	0.61*** (57)
• Self-directed Aggression	0.14 (68)	0.18 (63)	−0.09 (68)	0.05 (67)	0.12 (57)
• Antisocial Behavior	0.26* (68)	0.25* (63)	0.08 (68)	0.24 (67)	0.32* (57)

[a] Incomputable because at least one of the variables is constant.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Male inmates' PAMA total scale and Aggression subscale scores, both in the self-rated and in the interview-rated versions, generally showed moderate, or close to moderate, correlations with the total scale, and the Anger, Physical Aggression and Hostility subscales of AQ-RSV. Female inmates' data from period 2 showed stronger associations between PAMA versions and AQ-RSV. Female inmates' PAMA total scale, and Aggression and Antisocial Behavior subscales showed moderate, or close to moderate, correlations with AQ-RSV total scale, Anger, Physical Aggression, and a weaker but still significant correlation with the Hostility scale. Another gender difference was related to the PAMA subscale Self-directed Aggression, which did not correlate with AQ-RSV in the male study sample, while showing weak but significant correlations with the AQ-RSV Hostility scale in the female study sample.

Bivariate Spearman rank order correlations were also calculated between scores on both versions of PAMA, including the subscales and

Table 6b
Spearman correlations between PAMA and AQ-RSV in the female study sample.

Period 1	Anger (*n*)	Physical Aggression (*n*)	Verbal Aggression (*n*)	Hostility (*n*)	**AQ-RSV total** (*n*)
PAMA self-report					
Total	0.42** (47)	0.29 (44)	0.23 (48)	0.35* (47)	0.39* (38)
• Aggression	0.51*** (48)	0.24 (45)	0.34* (49)	0.40** (48)	0.48** (39)
• Self-directed Aggression	0.23 (49)	0.12 (46)	0.02 (51)	0.34** (49)	0.16 (40)
• Antisocial Behavior	0.30* (48)	0.23 (45)	0.20 (50)	0.20 (48)	0.27 (39)
PAMA interview					
Total	0.41** (49)	0.19 (46)	0.27 (51)	0.27 (49)	0.38* (40)
• Aggression	0.40** (49)	0.15 (46)	0.31* (51)	0.24 (49)	0.36* (40)
• Self-directed Aggression	0.32* (49)	0.36* (46)	−0.11 (51)	0.34* (49)	0.38* (40)
• Antisocial Behavior	0.24 (49)	0.25 (46)	−0.02 (51)	0.30* (49)	0.34* (40)
Period 2	Anger	Physical Aggression	Verbal Aggression	Hostility	**AQ-RSV total**
PAMA self-report					
Total	0.51*** (48)	0.48*** (49)	0.24 (50)	0.40** (52)	0.56*** (46)
• Aggression	0.59*** (48)	0.48*** (49)	0.30* (50)	0.35* (52)	0.58*** (46)
• Self-directed Aggression	0.09 (48)	0.18 (49)	0.08 (50)	0.36** (52)	0.23 (46)
• Antisocial Behavior	0.50*** (48)	0.34* (49)	0.31* (50)	0.29* (52)	0.49** (46)
PAMA interview					
Total	0.58*** (48)	0.55*** (49)	0.25 (49)	0.42** (51)	0.56*** (46)
• Aggression	0.58*** (48)	0.55** (49)	0.28 (50)	0.41** (52)	0.56*** (46)
• Self-directed Aggression	0.23 (48)	0.23 (49)	−0.20 (50)	0.22 (52)	0.24 (46)
• Antisocial Behavior	0.41** (48)	0.42** (49)	0.09 (49)	0.31* (51)	0.43** (46)

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

the quantity of SOAS-PA forms (Table 7).

In period 1, both the self-report and interview versions of the total PAMA scale and Aggression subscale for male inmates significantly correlated with the amount of observed aggressive behaviors. Correlations were of moderate or close to moderate strength. In period 2, only the interview version of PAMA significantly correlated with SOAS-PA. In this case, correlations were small or close to moderate. The Self-directed Aggression and Antisocial Behavior subscales did not correlate with SOAS-PA, which might be explained by the fact that subtle and introverted dimensions of aggressive behavior are difficult to observe and capture. For example, self-injurious behavior or suicide attempts were never reported in the SOAS-PA. There were no correlations between PAMA and the reported frequency of observed aggressive behavior in the female study sample.

Table 7
Spearman correlations between PAMA and the quantity of SOAS-PA forms in the male inmate sample.

Scale	(*n*)	**SOAS-PA Period 1** Spearman rho	(*n*)	**SOAS-PA Period 2** Spearman rho
PAMA self-report total	(78)	0.27*	(77)	0.17
• Aggression	(80)	0.31**	(77)	0.19
• Self-directed Aggression	(80)	0.11	(79)	−0.03
• Antisocial Behavior	(80)	0.15	(79)	0.05
PAMA interview total	(83)	0.32**	(81)	0.24*
• Aggression	(83)	0.33**	(81)	0.27*
• Self-directed Aggression	(83)	-[a]	(81)	−0.03
• Antisocial Behavior	(83)	0.16	(81)	0.02

[a] Incomputable because at least one of the variables is constant.
* $p < 0.05$.
** $p < 0.01$.

4. Discussion

Extensive forensic research has reached the point in which evaluation of treatment strategies to decrease aggressive behavior in prison populations are a common research focus. To evaluate adequate therapies and treatment interventions, and their effect, there is a need for reliable instruments that can measure behavioral changes during a limited period, regardless of type of forensic setting. While observational instruments may be functional within forensic psychiatric care, they are much less functional within prison environments. To evaluate treatments for managing aggressive behavior within prison and probation services, reliable instruments are required that could capture changes in inmates' behavior through self-reported or interview-based information. The main aim of this study is to test the validity and reliability of an instrument (PAMA) that can capture changes in aggressive behavior within a prison environment and assess data by inmate self-reports.

4.1. Findings on reliability

4.1.1. Internal consistency

Internal consistency of both the self-report and interview versions of PAMA total scale and subscales were generally strong (higher or equal to Cronbach's alpha 0.7), except for the interview-rated Self-directed Aggression subscale. Similar results were obtained for the LHA, in which the subscale with the fewest items showed the weakest internal consistency (Coccaro et al., 1997). As previously mentioned, low internal consistency is common when a scale contains fewer than five items. The internal consistency of the Self-directed Aggression subscale could be improved by including more items measuring self-injurious behavior, and suicidal thoughts and attempts. However, as female inmates reported a greater prevalence for self-harm behavior, even these two items were able to capture self-directed aggression among female inmates with an acceptable level of reliability. According to an internal report from the Swedish Prison and Probation Services (Kriminalvård och statistik, 2014), about 0.1% of all inmates committed suicide between 2002 and 2012, and self-harm behavior was detected in 1.3% of all inmates during the same timeframe. Another report states that about one-third of female inmates in Swedish prisons meet criteria for an increased suicidal risk (Yourstone et al., 2014). People who injure themselves often see self-harm as a coping strategy to relieve anxiety and physiological pain (Lindgren, 2011). The prevalence of psychiatric problems is generally very high in inmate populations (Hofvander, 2017), and even higher for female inmates (Yourstone et al., 2014).

Since psychiatric illness, combined with self-harm behavior, increases the risk of suicide (Beckman et al., 2016), it is very important to implement preventive sanctions. If the Self-directed Aggression subscale of PAMA will be used in assessments of self-injurious behavior within activities such as the Prison and Probation Services, it is necessary to improve the subscale before it could be reliably used.

4.1.2. Correlations between the self-report and interview versions

Since aggressive and antisocial behaviors were assessed by both the inmates themselves and an interviewer, correlations between the two different assessments were calculated for each period. Correlations from the first period were unacceptably low between interview- and self-rated versions of PAMA. When examining the collected data in detail and discussing the results with the psychologist who carried out the interview and subsequent ratings, we may have found the reason for this discrepancy. The self-reported version of PAMA was completed before the interview. During the PAMA interview in period 1, a number of inmates indicated that they answered the self-report questions of PAMA from a total life-span perspective (in other words, the original LHA format). It seems as if the similar format of LHA and PAMA confused some of the inmates. We have identified 10 inmates from period 1 (7% of all subjects in these analyses) who answered the self-reported PAMA questions from a lifetime perspective. When excluding these inmates' from the inter-rater reliability analyses, the correlations improved between the self-report and interview versions from study period 1. Correlations, similar to the improved ones from study period 1, were detected in period 2, which could be a confirmation that a number of inmates misunderstood the instructions during data collection in period 1. These results clearly emphasize the importance of being explicit and obvious when it comes to instructions. We can conclude that there is a fair correlation between the interview and self-reported versions of the total PAMA scale, and the Aggression and Antisocial Behavior subscales, while the Self-directed Aggression subscale showed poor inter-rater reliability. However, it is important to note that there are no indications that inmates underestimated their aggressive antisocial behavior in the self-report version of PAMA.

4.1.3. Test-retest reliability

The scales on the self-rated version of PAMA generally showed higher test-retest reliability than the interview version. In the self-rated version, each subscale and the total scale showed excellent test-retest correlation. The only exception was found for the Antisocial Behavior subscale, which showed fair correlation between repeated measurements. In the interview version of PAMA, only the Self-directed Aggression subscale showed very poor correlation when repeatedly measured, while the other scales had good test-retest reliability.

The results of these reliability analyses indicate that the self-rated version of PAMA is a reliable measure of aggressive antisocial behaviors in prison environments, and possible even a reliable measure of self-harm behavior, at least in female offender samples.

4.2. Findings on convergent validity

In an attempt to establish convergent validity, the self-report and interview versions of PAMA were correlated with the self-report measure AQ-RSV, as well as the number of observed aggressive events, according to SOAS-PA.

The interview version of PAMA showed stronger associations with the AQ-RSV scales than what was the case for the self-rated version of PAMA for male inmates, while both versions were fairly correlated with AQ-RSV scales for female inmates. In both versions of PAMA, the total scale and the Aggression subscale showed moderate associations with the AQ-RSV total scale and the Anger and Physical Aggression subscales, however, more discernible for male than for female inmates. The Verbal Aggression Subscale of AQ-RSV was partly captured in the Aggression subscale of PAMA for females. A weak association between the Self-directed Aggression subscale of PAMA and the Hostility subscale of AQ-RSV was only found for female inmates. These results suggest that PAMA, which is built on considerably fewer items than AQ-RSV, is quite accurate and can capture the occurrence of different types of aggressive behavior (such as, physical and verbal aggression, hostility). Moreover, PAMA might even provide extra information about eventual self-harm and suicide behaviors in female inmates (not captured by AQ-RSV).

When it comes to correlations between PAMA and SOAS-PA, results from the male and female sample were not uniform. While it was possible to discern a pattern in the results from the male sample, no pattern could be found in the female sample. In the male sample, the PAMA total scale and Aggression subscale showed moderate, or close to moderate, correlations with SOAS-PA in both periods 1 and 2. In the female sample, no correlations were revealed. The results might be explained by the different ways in which men and women tend to express aggression. Men engage in physical and direct aggression, while women tend to be more verbally and indirectly aggressive (Eagly and Steffen, 1986; Archer and Coyne, 2005). Since overt and direct forms of aggressive behavior are more easily observed than the indirect forms, it is likely that they were registered more often in SOAS-PA than the more subtle forms of aggression. This means that if male and female subjects expressed aggression in qualitatively different and gender-typical ways, it would be more difficult to establish convergent validity in the female sample by using SOAS-PA as a measure of reference. However, only slightly more aggressive events were recorded in SOAS-PA in the male sample (21 SOAS-PA forms in a sample of 93 subjects: 22.6%) than in the female sample (11 SOAS-PA forms in a sample of 59 subjects: 18.6%).

Furthermore, since the SOAS has not been validated in correctional settings, its use must be discussed. Few observations of aggressive events were reported during the study period, suggesting that openly aggressive behaviors in correctional settings is rare. However, there are also some other plausible reasons that could lay behind the low rate of observed aggressive behaviors. Since completion of SOAS-PA is not part of the daily routine at the correctional facilities, staff could easily have forgotten to complete the SOAS-PA forms or aggressive acts could have occurred without being noticed by the staff. Noticed incidents, rule violations, and inmate misconduct are already recorded in the Prison and Probation Service's internal records. Completing a SOAS-PA form would add to the workload, which might have deterred staff from completing forms. Furthermore, Surís and Coccaro (2008) state that observational ratings of aggression can be affected by the observer's experience from exposure to aggression. Correctional officers are likely to have been exposed to relatively high levels of aggression, which could raise the threshold for what they consider as aggressive behavior, even if it was brought into their attention to follow the guidelines of SOAS-PA.

Never the less, based on the general results on convergent validity, we conclude that both versions of PAMA measure different aspects of aggressive behavior with acceptable validity.

4.3. Conclusion

The present study is one of the first that aims to introduce a self-reported measure (which also could be used as an interview instrument) of aggressive behaviors that can be employed in correctional settings to evaluate aggression-managing treatments and sanctions. The self-rated version of PAMA showed acceptable validity, suggesting that it captures different aspects of aggressive behavior. It also proved to be reliable when tested with regard to its internal consistency, and inter-rater and test-retest reliability.

4.4. Limitations

A practical problem was that the similar formats of LHA and PAMA

confused some of the inmates during the first PAMA measurement. These inmates indicated that they had reported their life history of aggression on the self-report version of PAMA, instead of their aggressive behavior during the past month. Accordingly, about 7% of collected data was unusable for several of the analyses.

Furthermore, the use of SOAS-PA as an instrument of reference can be questioned. Since the female study sample had fewer SOAS-PA forms on average than the male sample, it is plausible that the restricted range of scores on the SOAS-PA variable affected the outcome of the correlational analyses. As Pallant (2010, p. 124) states: "In order to provide an accurate and reliable indicator of the strength of the relationship between two variables, there should be as wide a range of scores on each of the two variables as possible."

There is uncertainty regarding the extent to which aggressive incidents were recorded in this study. Incident-based scales greatly depend on the staff's ability to document all aggressive incidents (Nijman et al., 2005). This requires that correctional officers can perceive target behavior as aggressive incidents. Adjustments were also made to the original instrument, which meant that SOAS-PA forms were not used to measure the level/intensity, but only the frequency of aggressive behavior. Ideally, efforts to validate the use of SOAS-PA in correctional settings should have been made prior to the present study.

Finally, the statistical analyses have certain limitations. Due to the multiple tests that were run, there was an increased risk for type 1 errors (false positives; detecting an effect that does not exist). The fairly small sample size also meant a limited statistical power and, accordingly, an increased risk for type 2 errors (false negatives; failing to detect an effect that actually does exist).

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Relevance for prison and probation services

The high LHA scores among both male and female inmates indicate that there is an extensive need for effective interventions to manage aggressive behaviors in this population. This study introduced a prison-adjusted, short aggression scale (the PAMA). Administering the 11-item instrument is easy, cheap, and does not require any personnel training when used in quick assessments. Results showed that its total scale, and the Aggression and Antisocial Behavior subscales, had acceptable psychometric properties in both the self-rated and interview-rated versions. While the Self-directed Aggression subscale was not reliable in the male inmate sample, it was fairly reliable in the female inmate sample. The PAMA can readily be administered as an outcome measure in future treatment studies undertaken by correctional services. In that sense, the results of this study can be used to promote advanced research on treatment interventions directed against aggressive antisocial behaviors within the prison environment.

Declaration

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