



## Original article

## Measuring everyday adaptation after imprisonment: The post-release living inventory for ex-prisoners (PORLI-ex)

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## ABSTRACT

**Background:** The number of ex-prisoners worldwide has constantly been increasing in recent years. Currently, little is known about post-release daily adaptation, not to mention valid and reliable instruments for post-release daily routines pertinent to mental health.

**Objective:** This study aims to develop and validate a self-report instrument, hereafter referred to as Post Release Living Inventory for Ex-prisoners (PORLI-ex).

**Methods:** Three separate samples of ex-prisoners were recruited to complete an online survey (N=1,277, age range = 17–89 years, 53.2% male, 72% white).

**Results:** The final model evidenced acceptable goodness-of-fit and consisted of 45 items on nine dimensions, which loaded on three second-order factors: Consolidation (three dimensions; e.g., Institutional Routines), Replacement (two dimensions; e.g., Maladaptive Behaviors), and Addition (four dimensions; e.g., Socializing with Ex-prisoner Friends) ( $\alpha = .695-.915$ ). Convergent validity was demonstrated in the positive correlations with IADL, SOLI, MLQ, GSE-6, and MSPSS. Discriminant validity was demonstrated in the weak correlations with the LEC-5 and perceived social and personal cost of punishment. Criterion-related validity was demonstrated in the correlations with psychiatric symptoms and crime-related outcomes and incremental validity in the correlations with these measures independent of the scores on IADL, SOLI, MLQ, GSE-6, and MSPSS.

**Conclusion:** This study calls for more resources on fostering psychological strengths and resilience through regularizing basic daily life experiences on top of traditional interventions for risk management among the ex-prisoners.

Globally, around 30 million prisoners are released from prisons every year (DeLisi, 2016). Relative to those without prior imprisonment, ex-prisoners showed increased odds of psychosis, schizophrenia, post-traumatic stress disorder, substance dependency, ADHD, personality disorders, and suicide attempts with the odds of common mental disorders (anxiety, depression, OCD, etc.) nearly doubled than general population (Bebbington et al., 2021; Thomas et al., 2016). Deterred rehabilitation is positively related to subsequent reoffending behaviors and mental health problems (Fazel & Baillargeon, 2011; Ganapathy, 2018).

The USA has the highest incarceration rate across the globe (Research Institute for Crime & Justice Policy, 2020). The phenomena of “mass incarceration” refer to punitive criminal and social policies, such as War on Drugs and mandatory minimum sentences, which impose long sentences for specific offences even for those with first offence (Wildeman & Wang, 2017). Readjustment to life after imprisonment is a neglected public health concern due to the ambiguous division of responsibilities between ministries of health and ministries of justice (The Lancet, 2021). With an increasing population of ex-prisoners in the

community, post-release psychological adaptation could become a significant public health issue to be addressed by more structured research and evidence-based practices (Fazel & Baillargeon, 2011).

## Post-release daily routines

Across previous conceptual and empirical literature that highlighted different aspects of post-release adaptation, the core theme relates to everyday life experience. Indeed, daily routines could be the most observable behaviors that manifested the success of adaptation. Total institution suggests that all daily activities are regularized by central officials, and residents who are isolated from the wider community are treated alike and expected to perform the same institutional routines (Goffman, 1961). Even though total institution carries positive value in establishing healthy routines, it keeps prisoners away from the society to learn values and skills that hamper their adaptation to post-release daily living (Naderi, 2014). The impact of imprisonment could be evaluated in accordance with prisonization, decompensation, victimization,

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and stigma (Morgan et al., 2019). Prisonization refers to the processes through which inmates integrate prison subcultures (e.g., anti-institutional beliefs and behaviors), which have been found to be associated with increased recidivism and anti-social behaviors (Shlosberg et al., 2018). Decompensation highlights that the restrictive prison policy could relate to impaired psychological and physical functioning and disrupted social support and relationships. Reduced social support has been consistently shown to have a negative impact on community reentry (Chouhy et al., 2020; Kjellstrand et al., 2022). Another hallmark of prison life is victimization. Inmates experience varied types of victimization ranging from physical assault, sexual abuse, and intimidation to the destruction of property (Morgan et al., 2019). Victimization during imprisonment could negatively impact mental and physical health of prisoners and increase the risk of antisocial behaviors such as substance abuse and reoffending (Favril et al., 2020; Listwan et al., 2013; Teasdale et al., 2016).

Post-release adaptation is deterred by both daily routine disruptions and other daily stressors. Upon release, prisoners who have habituated to the prison rules confront the mismatch between the rigid institutional routines and new patterns of life outside prisons, making it hard to adapt to the routine social situations and triggering a sense of insecurity and anxiety (Martin, 2018; McKendy & Ricciardelli, 2021). Ex-prisoners' daily living can also be influenced by the complex post-release stressors. Release can mark a significant role and status transition from imprisonment to post-imprisonment settings based on the life-course perspective (Hutchison, 2009). Along with this transition is the change from a regularized, supervised, and structured lifestyle to a potentially irregular and unsupervised one, which could be attributable to absence of place of residence, material deprivations, inability to dislodge from gangs or criminals, roles played by family, absence of marketable skills, and demographics including age, gender, ethnicity, and social class (Ganapathy, 2018). Unstable housing and unemployment/ underemployment have been found to be parts of ex-prisoners' unstructured and irregular daily routines (Haynes et al., 2020; Lee, 2019). It is also more likely for unemployed or underemployed ex-prisoners to relapse to drugs and demonstrate chronic physical and mental disorders (Visher et al., 2011).

### Daily routines for mental health and desistance

The implications of disrupted post-imprisonment daily routines could be understood in terms of both psychological resilience and desistance. The Drive to Thrive (DTT) theory suggests that the sustainment of regular daily routines is one of the basic processes for demonstrating psychological resilience over time (Hou et al., 2018, 2021). During ongoing stress, people are challenged to sustain their daily routines while they are increasingly drawn to focus on the stressors or their own distress. Daily routines will either be disrupted or terminated because traumatic and chronic stress usually predisposes individuals to an ecology that restricts individuals from practicing regular daily routines. Primary daily routines refer to behaviors that are necessary for maintaining livelihood and biological needs, such as hygiene, sleep, eating, and home maintenance (Oswald & Wahl, 2005; Prüss et al., 2002), whereas secondary daily routines refer to optional behaviors that are dependent upon motivation and preferences, such as exercising, leisure, social activities, and employment (Borodulin et al., 2016; Chen & Pang, 2012). Social zeitgeber model in psychiatry similarly suggests that social cues such as bedtime, contact with other persons, having a meal, going out, working, and so on can keep circadian rhythms synchronized with the 24-hour cycle when humans become increasingly detached from the natural daylight schedule (Walker et al., 2020). Disrupted social cues for daily routines (e.g., sleeping time, mealtime, time to go to office) may lead to irregular circadian rhythms and evoke somatic symptoms that relate to higher odds of mood disorders (Boland et al., 2019; Lai et al., 2021).

Desistance refers to cessation or decrease in the severity of criminal commission or other antisocial behaviors as a dynamic temporal process

(Ezell & Cohen, 2012). The risk-need-responsivity (RNR) model suggests three dynamic factors in offenders' rehabilitation, namely pro-criminal associates, substance abuse, and maladaptive leisure/recreation (Andrews et al., 2011). Pro-criminal associates refer to friends and acquaintances who model, encourage, and support criminal behaviors and thoughts. Constant interaction with these associates in daily life may increase the risk of recidivism (Sutherland et al., 1992). Substance abuse refers to regular alcohol or drug abuse that interferes with adaptive behaviors and relationships within the contexts of school, work, and family. Maladaptive leisure/recreation refers to activities that are lack of prosocial pursuits, absence of participation in prosocial activities, and poor use of leisure time (Andrews et al., 2000). Daily involvement of substance abuse and pro-criminal leisure activities has been found to predict recidivism among ex-prisoners (Andrews et al., 2011; Hakansson & Berglund, 2012; Stahler et al., 2013).

Drive to Thrive (DTT) theory and risk-need-responsivity (RNR) model provided solid theoretical frameworks to conceptualize resilience and desistance as outcomes of adaption. However, previous studies have not addressed the behavioral mechanisms of adaptation among prisoners, not to mention the understudied ex-prisoner populations (Liu et al., 2021). Only a handful of studies focus on daily functioning among elderly prisoners (Barry et al., 2020) or prisoners with physical or cognitive disabilities (Barry et al., 2017). Prison Activities of Daily Living (PADL) was developed to measure levels of difficulties in basic self-care ADL and instrumental ADL that are more complex and require more physical functioning (Katz, 1983; Williams et al., 2006). However, like measures of ADL, PADL does not assess behaviors that directly relate to stress adaptation. Therefore, it does not explain how overt behaviors in everyday life might either predispose ex-prisoners to or protect them against poorer mental health and reoffending in face of stressors.

### The present study

The purposes of the current study are three-fold: (1) to develop a novel self-report instrument, hereafter referred to as Post Release Living Inventory for Ex-prisoners (PORLI-ex), for measuring key daily routines that are relevant to mental health and desistance among ex-prisoners in the community; (2) to test measurement invariance of PORLI-ex; and (3) to test the convergent validity, discriminant validity, criterion-related validity, and incremental validity of the PORLI-ex. We hypothesize the following: (1) Different dimensions of daily routines will be identified in exploratory factor analysis. (2) Different dimensions of daily routines will be loaded on three second-order factors: consolidation, replacement, and addition based on previous theories and empirical evidence. (3) The newly developed instrument will demonstrate measurement invariance across age, gender, race, length of incarceration, and time since last release. (4) The instrument will demonstrate convergent validity, discriminant validity, criterion-related, and incremental validity. We assessed three independent samples with different instruments.

### Method

#### Participants and procedure

The current study was conducted using Amazon.com's Mechanical Turk (MTurk). Previous studies evidenced the validity, representativeness, and reliability of data derived from MTurk participants (Casler et al., 2013; Ramsey et al., 2016). The study was advertised on MTurk as "Post-release daily routines among ex-prisoners" and limited participants from the US only. The survey followed previous epidemiological studies (Bebbington et al., 2021; Kulkarni et al., 2010; Wang & Green, 2010) and adopted a self-report method to assess incarceration history, demographic information, and the draft items for PORLI-ex. To reduce fraud for special populations on Mturk, only participants who have reportedly convicted and incarcerated were considered eligible and proceeded to participate after giving their informed written consent online.

We restricted each MTurk Worker ID to participate in only one data collection to avoid multiple participations. The study got research ethics approval from The Education University of Hong Kong.

Study 1 was undertaken with the first sample ( $n=309$ ). Participants (114 females) ranged in age 21–64 years ( $M=35.95$  years,  $SD=11.17$ ) and were compensated for US\$1.20. Study 2 was undertaken with the second sample ( $n=394$ ). Participants (170 females) aged 35.91 years on average ( $SD=10.34$ , range = 19–89) completed the measures and got US \$3.00 for their participation. Study 3 was undertaken with the third sample. 574 participants (281 males, 274 females, 19 other) aged 35.11 years on average ( $SD=9.32$ , range = 17–82) completed the measures and were compensated for US\$3.00. Study 4 was undertaken with the third sample in conjunction with the second sample. Characteristics of the three samples were summarized in Supplementary material 1.

### Measures

Detailed descriptions of each self-report measure were summarized in Supplementary material 2.

### Analytic plan

Exploratory factor analysis (EFA) with Direct Oblimin rotation was conducted in **Study 1** on 53 draft items after the expert panel discussion. Factorability of the item correlation matrix was tested using the Kaiser–Meyer–Olkin (KMO) index and Bartlett’s test of sphericity (Tabachnick & Fidell, 2007). Communalities values indicated the association between item variance and the factors. The optimal number of factors was determined by a combination of latent root criteria (eigenvalues > 1.0) and scree plot. Inter-factor correlations, inter-item correlations within a factor, and cross-loading were examined to determine the appropriateness of including an item in the factor. **Study 2** tested the factor structure of the 45 items in nine routines as identified in EFA through the lens of Drive to Thrive (DTT) theory. Three core behaviors, namely consolidation, replacement, and addition, were suggested for sustaining daily routines (Hou et al., 2021). The nine dimensions identified in Study 1 can fit into each of the second-order factors by closely examining the life changes in the transition from incarceration to post-release in the community: Consolidation: Institutional Routines, Active Living, and Work Involvement; Replacement: Maladaptive Behaviors and Nonactivity; and Addition: Socializing with Ex-prisoner Friends, Online Leisure, Religious Engagement, and Seeking Professional Support. Detailed descriptions on the individual items were summarized in Supplementary material 3. **Study 3** assessed measurement invariance of PORLI-ex across age, gender, race, length of incarceration, and time since last release after the measurement model has been established in Study 2. Previous evidence suggested that these variables are potentially related with post-release adaptation in different ways. Age of prisoners was positively related to psychological health and inversely related to risk of reoffending (Piquero et al., 2015; Shinkfield & Graffam, 2010). Post-release adaptation also varied between genders and races, with women and those from ethnic minority groups exhibiting poorer emotional and social adjustment (Lockwood et al., 2015; Pettus-Davis et al., 2018). Longer incarceration was found to be positively associated with poorer mental health (Porter & DeMarco, 2019) and occupational outcomes (Ramakers et al., 2014). Post-release programs were found to increase the employment outcomes in the short term, but the effects diminished with time (Cale et al., 2019). Ex-prisoners’ earnings per week were also found to decline with time since release (Graffam & Shinkfield, 2012). In **Study 4**, convergent validity of the PORLI-ex was measured by zero-order correlations between total and subscales of PORLI-ex and theoretically related concepts. Scores on the two maladaptive routines “Maladaptive Behaviors” and “Nonactivity” were reverse coded when calculating the total score, with higher scores indicating more regular adaptive routines. Validated instruments of everyday life experiences and coping resources included Lawton instrumental

activities of daily living (IADL) scale (Lawton & Brody, 1969), Sustainability of Living Inventory (SOLI) (Hou et al., 2019), Meaning in Life Questionnaire (MLQ) (Steger et al., 2006), General Self-Efficacy Scale (GSE-6) (Rommel et al., 2013), Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet et al., 1988). It is hypothesized that PORLI-ex full scale and subscale scores were positively correlated with activities of daily living, regularity of daily routines, meaning in life, self-efficacy, and perceived social support, except that the correlations were opposite for Maladaptive Behaviors and Nonactivity subscale scores.

Discriminant validity was evaluated by assessing the correlations between the PORLI-ex and measurements of life histories of stress. According to DTT theory, regularity of daily routines is disrupted in chronic stress context (Hou, Hall, et al., 2018), whereas measures of lifetime trauma or significant stressors could be distal and minimally related to the current evaluation of daily routines (Hou et al., 2020). Attitudes toward social cost and personal cost of punishment could also be unrelated to current daily routines because cost of punishment is not salient after release (Morenoff & Harding, 2014). Validated measure of potential traumatic events (Life Events Checklist for DSM–5 [LEC-5]) (Weathers et al., 2013) and measurements of perceived social and personal cost of punishment (Mulvey et al., 2004; Schubert et al., 2004) were used. We expected that measurement of the regularity of routines was weakly correlated or uncorrelated with measures of life histories of major stressors and attitudes towards social and personal costs of crime.

Criterion-related validity was evaluated by assessing correlations between the PORLI-ex subscales and common self-reported outcomes that indicate psychological resilience and desistance. Mental health outcomes included anxiety symptoms measured by 7-item Generalized Anxiety Disorder scale (GAD-7) (Spitzer et al., 2006), depressive symptoms by Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001), and PTSD symptoms by the abbreviated PTSD Checklist—Civilian Version (PCL-C) (Lang & Stein, 2005). Desistance-related outcomes included delinquent behaviors by Self-Reported Offending (SRO) (Huizinga et al., 1991), risk of criminal offending by Hare Psychopathy Checklist Revised (PCL-R) (Hare, 2003), risk of violent reoffending at the first and second year as measured by OxRec (Fazel, Chang, et al., 2016), and severity of substance abuse measured by 20-item Drug Abuse Screening Test (DAST-20) (Yudko et al., 2007). We expected that PORLI-ex scores were inversely correlated with psychiatric symptoms and crime or drug-related outcomes.

Finally, incremental validity was tested by showing the predictive utility of PORLI-ex in psychological and criminal behavioral outcomes over and beyond the effects of other relevant variables. Hierarchical multiple regressions tested the associations of PORLI-ex scores with the outcome scores controlling for the effect of activities of daily living, regularity of daily routines, meaning in life, self-efficacy, and perceived social support. We expected that PORLI-ex scores were correlated with the outcomes independent of the effects of the related constructs.

## Results

### Study 1: item development and exploratory factor analysis

A total of 72 original items were drafted based on two theoretical frameworks, namely Drive to Thrive (DTT) theory and risk-need-responsivity (RNR) model, and rated and reviewed by expert panel discussions among criminologists, psychologists, social workers, and community workers, as well as synthesis of previous studies on adaptation to post-imprisonment (Supplementary material 4–6). Upon initial deletion, 53 items were analyzed: institutional routines (4 items), physical activities (3 items), online leisure activities (5 items), socializing with social partners (14 items), maladaptive behaviors (10 items), bad leisure (3 items), religious activities (3 items), and work involvement (6 items), and

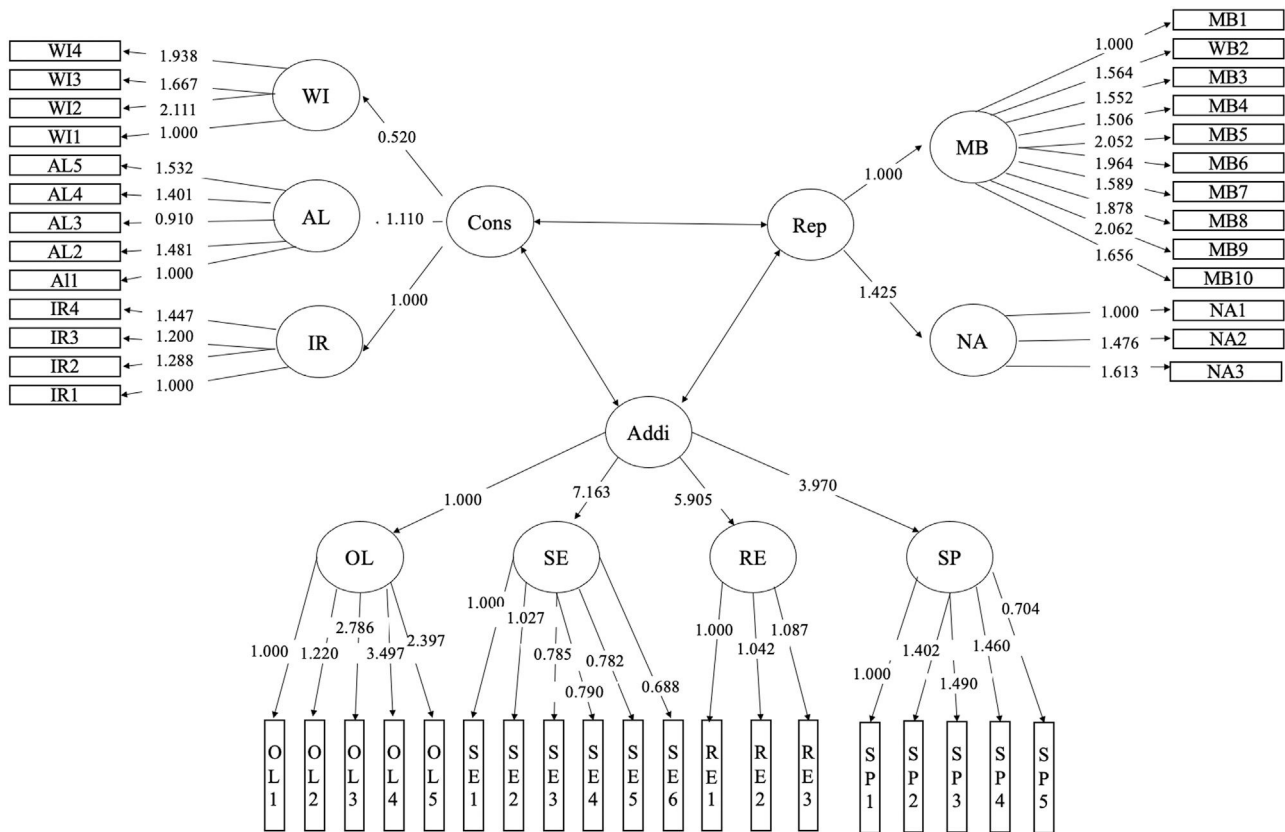


Fig. 1. Final model generated from the confirmatory factor analysis with unstandardized coefficients.

Notes. IR=Institutional Routines; AL=Active Living; WI=Work Involvement; MB=Maladaptive Behaviors; NA=Nonactivity SE=Socializing with Ex-prisoner Friends; OL=Online Leisure; RE=Religious Engagement; SP=Seeking Professional Support; Cons=Consolidation; Rep=Replacement; Addi=Addition

seeking social tangible support (5 items). Participants rated how regularly they did the activities in the past two weeks on an 11-point scale (0 = *Not at all regular*, 5 = *Moderately regular*, 10 = *Very much regular*), based on previously validated self-report instruments that assess daily activities (Hou et al., 2019; Monk et al., 2002).

Exploratory factor analysis (EFA) with Direct Oblimin rotation was conducted. The KMO index (.916) and Bartlett's test ( $\chi^2=12,339.873$ ,  $df=1,378$ ,  $p<.0001$ ) indicated that the sample size was adequate and the extracted factors accounted for substantial observed variance (Tabachnick & Fidell, 2007). Satisfactory percentage of item variance was predicted by the latent factors (communality values = .317–.866). The latent root criterion suggested an 11-factor model (62.530% of the total observed variance). Four items were not loaded on any factors, whereas another four items demonstrated similar cross-loadings. These eight items were excluded from subsequent analyses.

EFA with Direct Oblimin rotation was performed on the remaining 45 items. A 9-factor model was specified. Factor 1 (six items) was "Socializing with Ex-prisoner Friends" (31.135% of variance). Factor 2 (five items) was "Active Living" (9.467%). Factor 3 (five items) was "Online Leisure" (5.059%). Factor 4 (four items) was "Institutional Routines" (3.949%). Factor 5 (10 items) was "Maladaptive Behaviors" (3.773%). Factor 6 (three items) was "Religious Engagement" (2.999%). Factor 7 (five items) was "Seeking Professional Support" (2.295%). Factor 8 (four items) was "Work Involvement" (2.010%). Factor 9 (3 items) was "Nonactivity" (1.429%). Factor loadings and full scale are listed in Supplementary material 7-8.

Study 2: confirmatory factor analysis

Confirmatory factor analysis (CFA) using R package 'lavaan' (Rosseel, 2012) showed that three second-order latent constructs achieved acceptable goodness-of-fit,  $\chi^2(df, p\text{-value}) = 2491.988 (930, <0.001)$ ,

RMSEA = .065 (95% CI [0.062, 0.068]), SRMR = .08, CFI = .923, and TLI = .919, which outperformed the alternative model with one second-order construct,  $\chi^2(df, p\text{-value}) = 23455.031 (990, <0.001)$ , RMSEA = .077 (95% CI [0.075, 0.080]), SRMR = .094, CFI = .895, and TLI = .888 (Supplementary material 9). The three-construct model was considered as optimal (Fig. 1). Correlations between the subscales and their Cronbach's alphas are shown in Supplementary material 10. All subscales demonstrated good internal consistency ( $\geq .70$ ).

Study 3: measurement invariance

To determine model invariance, we used the size of change criteria of SRMR ( $\geq .030$ ), CFI ( $\geq .010$ ), and RMSEA ( $\geq .015$ ) because  $\chi^2$  tests are sensitive to sample size and may wrongly reject invariance. Models were compared between age groups (17–33 vs. median age of 34 or older), gender (women vs. men), racial groups (non-White or White), length of incarceration (<6 months vs.  $\geq 6$  months), and time since last release (<12 months vs.  $\geq 12$  months). Supplementary material 11 summarized the results for all five stratifications. Changes in SRMR, CFI, and RMSEA were examined with the equality constraints on loadings, intercepts, and means, which were all below the thresholds of indicating noninvariance. Model invariance was confirmed across age, gender, race, length of incarceration, and time since last release.

Study 4: scale validity

Convergent validity

Supplementary material 12 summarizes the results on convergent, discriminant, and criterion-related validity. Regularity of daily routines, meaning in life, self-efficacy, and perceived social support were positively correlated with PORLI-ex total scores (.28-.44), Institutional Routines (.22-.23), Active Living (.22-.33), and/or Work Involvement (.23-

.35), with perceived social support was also correlated with Online Leisure (.25). ADL scores were moderately inversely correlated with subscale scores on Maladaptive Behaviors (-.31), Nonactivity (-.35), and Socializing with Ex-prisoner Friends (-.34).

#### *Discriminant validity*

Total and subscales of PORLI-ex were weakly or uncorrelated with different measures of traumatic life events (happened, witnessed, or learned about) (-.18 to .11) and perceived social cost (-.11) and personal cost (.12 to .16) of punishment.

#### *Criterion-related validity*

All symptoms and crime or drug-related outcomes were moderately positively correlated with Maladaptive Behaviors (.29-.51), Nonactivity (.23-.46), or Socializing with Ex-prisoner Friends (.21-.32).

#### *Incremental validity*

We also tested the predictive utility of PORLI-ex in psychiatric symptoms and desistance, controlling for the effects of activities of daily living, regularity of daily routines, meaning in life, self-efficacy, and perceived social support. Supplementary material 13 summarizes the correlations between PORLI-ex's subscales and outcomes. The scores on Maladaptive Behaviors were positively associated with all symptoms, self-report/risk of reoffending, and severity of substance abuse, controlling for the effects of daily functioning and coping resources. The scores on Active Living were inversely whereas Nonactivity and Seeking Professional Support were positively associated with all symptoms, some measures of reoffending, and severity of substance abuse independent of daily functioning and coping resources. Work Involvement was inversely whereas Online Leisure was positively associated with symptoms independent of regular routines, meaning in life, and self-efficacy.

## **Discussion**

This study aims to develop a novel self-report instrument PORLI-ex for measuring key daily routines that are relevant to mental health and desistance among ex-prisoners in the community; test measurement invariance of POLIR-ex; and test the convergent validity, discriminant validity, criterion-related validity, and incremental validity of POLI-ex. Nine dimensions of daily routines were derived with insights from the expert panel. Using three non-repeated crowdsourced samples of ex-prisoners (N=1,277) in the US community, exploratory factor analysis firstly supported nine-factor structure of post-release daily routines. Confirmatory factor analysis further identified three high-order latent factors consistent with consolidation, replacement, and addition of daily routines (Hou et al., 2018; Hou, Liang, et al., 2021). Measurement invariance was further established by demonstrating comparable model fit across age groups, gender, ethnic groups, length of incarceration, and time since last release. Different dimensions of validity of the scales were established through expected correlations with similar, irrelevant, and outcome measures. This study systematically profiled both adaptive and maladaptive daily routines of ex-prisoners and investigated their predictive utility for psychological resilience and desistance from crime. Transition from prison to community as a significant life stressor is very likely accompanied by significant changes in daily routines (Durnescu & Istrate, 2020; Hancock et al., 2018; Kirk, 2012). A close look at day-to-day living patterns could offer an evidence base for identifying behavioral mechanisms for post-release mental health and reoffending.

The final model evidenced acceptable goodness-of-fit on nine dimensions, which further loaded on three second-order factors. This finding provided empirical evidence to support three core processes for sustaining daily routines suggested by the Sustaining Everyday Life Fabrics and Structure (SELFs) model (Hou et al., 2018). To facilitate reintegration into the society, ex-prisoners should first consolidate the existing routines that had been established during the imprisonment but disrupted upon release, for example, healthy lifestyle, keeping physically active,

and involving at work. After that, ex-prisoners should replace maladaptive behaviors and nonactivity through self-regulatory processes or support from professionals. Ex-prisoners then add new routines to complete their everyday life structure, especially those that did not exist in the prison settings and are additional to post-release life. These routines include online leisure using internet or mobile devices, socializing with ex-prisoner friends, religious engagement, and seeking professional support. Measurement invariance was supported between age group, gender, ethnic groups, length of incarceration, and time since last release, suggesting the instrument could be applied to evaluate adaptation across ex-prisoners with different demographic and imprisonment characteristics.

#### *Criminal lifestyles*

The findings on the regularity of Institutional Routines indicated that ex-prisoners still keep up with institutional routines after release from prison, suggesting the lasting effect of total institution (Goffman, 1961) and the importance of healthy lifestyle during imprisonment to benefit post-release adjustment. Maladaptive Behaviors and Socializing with Ex-prisoner Friends are two types of routines that reflected criminal lifestyles. Contrary to previous evidence on higher risk of reoffending through deprived resources opportunities to socialize with criminal associates (Kirk, 2009; Stahler et al., 2013; Sutherland et al., 1992), our study showed that the majority of ex-prisoners did not regularly take part in maladaptive behaviors and socializing with ex-prisoners and returning to the old lifestyle is not a general phenomenon for ex-prisoners. Two important factors highly related to the post-release adaptation are length of incarceration and time since last release.

#### *Psychological resilience*

We found that Active Living was inversely associated with depressive symptoms and positively associated with meaning in life and perceived social support, consistent with previous evidence on the protective role of exercise on mental health (O'Toole et al., 2018). The moderate positive correlations of Active Living with work involvement, institutional routines, and religious engagement further suggested that staying active could interact with other adaptive essential aspects of life, from engagement at work and sustainment of healthy routines established in prison to spiritual engagement, which could all contribute to lower risk of depression among ex-prisoners in the community (Fazel & Baillargeon, 2011; Kinner & Young, 2018; Wildeman & Wang, 2017).

Three risky lifestyles were also identified that diminished psychological resilience, namely Maladaptive Behaviors, Nonactivity, and Socializing with Ex-prisoner friends. Previous evidence supported the positive association of unhealthy and unstructured lifestyles with psychiatric symptoms (Bačak et al., 2021; Lien et al., 2009; Widinghoff et al., 2019). The current study added to this body of evidence by showing positive associations of maladaptive daily routines with anxiety symptoms, depressive symptoms, and/or PTSD symptoms among ex-prisoners. The significant positive correlations of Nonactivity with psychiatric symptoms were consistent with previous research findings demonstrating that physical inactivity is a risk factor for different mental disorders, including anxiety and depression (Hallgren et al., 2018; Huang et al., 2020). The positive association between Socializing with Ex-prisoners Friends and PTSD symptoms can be possibly due to the intention to obtain drugs from or take drugs with their ex-prisoners friends as a self-medication for alleviating their existing psychiatric conditions (Nishith et al., 2022).

#### *Lifestyles and desistance*

Our findings on post-incarceration daily routines also provided contextual information for understanding reoffending. Maladaptive Behaviors in PORLI-ex include high-risk deviant behaviors such as gang

activities, substance abuse, and gambling. Gang members are typically from low social-economic status, and social disorganization (SD) theory argued that macro-structural factors such as poverty and neighborhood instability could explain the frequency of crime in the neighborhood (Breetzke et al., 2021). A recent meta-analysis also showed the strong link between gang membership and offending (Pyrooz et al., 2016). Severity of gambling is also a significant predictor of increased recidivism (April & Weinstock, 2018).

Being physically inactive or engaging in non-productive activities also plays a debilitating role in the pathway to desistance. Excessive spare time could motivate ex-offenders to look for opportunities to commit crime (Felson & Boba, 2010; Skardhamar & Telle, 2012). The significant positive associations of socializing with ex-prisoners with all crime-related outcomes could reflect social learning of crime, for crime occurs through the interaction with others who had a favorable attitude towards crime (Sutherland et al., 1992). This finding is also consistent with the strong link between crime and drug as socializing with drug addicts may increase the chance of recreational substance abuse and thus drug-related crime (Yukhnenko et al., 2020).

#### Digitalizing mental health and rehabilitation services

Ex-prisoners were regarded as having low level of technologically sophistication and being one of the most impoverished groups in digital age (Jewkes & Reisdorf, 2016; McDougall et al., 2017). A recent study of post-release technology experience of ex-prisoners highlighted that prisoners experienced “digital disconnection” where their digital skills were not refreshed during the imprisonment and would face substantial barriers to technology upon release (Davis & Ostini, 2019). Nevertheless, our study found that ex-prisoners reported the highest rating on the regularities of Online Leisure compared with other routines. The fact that ex-prisoners are likely to have regular daily online activities, be it communication with friends, reading news, playing games, etc., points to the feasibility of digitalizing mental health and rehabilitation services for ex-prisoners (Langat et al., 2020). The positive correlation between online leisure routines and perceived social support in the present study also calls for establishing online supporting groups for ex-prisoners to improve their psychological resilience.

#### Limitations

There are several limitations of the current study. First, this study recruited ex-prisoners with 70% were Caucasians in the US community. Cautions are warranted in generalizing our findings to ex-prisoners in other countries with low incarceration rates. Second, we used a cross-sectional design to validate PORLI-ex. Although the current retrospective method of the regularity of daily routines was cost-effective and found to be valid and reliable across samples, we cannot rule out memory bias. Third, MTurk Workers with multiple accounts could have participated more than one time despite growing evidence of the excellent psychometrics of data from MTurk Workers. Fourth, given that female prisoners comprise only about 10-15% of the US prison population, the proportion of women in the present sample (36%) is high. It might nonetheless reflect that female prisoners’ growth rate has outpaced that of male prisoners (The Lancet, 2021). Fifth, we did not measure whether participants were released under parole supervision or their experience on parole. Previous study suggested that parole condition was related to higher risk of reincarceration (Winter et al., 2019). Those with better experience during the parole were more likely to report desistance from crime (Gwynne et al., 2020). Parole conditions should be considered in evaluating the scores on PORLI-ex in future studies. The utility of PORLI-ex on parole evaluation to predict adjustment should also be tested. Sixth, data collection was conducted amid the COVID-19 pandemic which could inevitably impact the daily routines of ex-prisoners like the general population. Interpretation of the current findings should

consider COVID-19 and associated infection control measures such as social distancing and lockdown (Lemenager et al., 2021; Sun et al., 2020).

#### Conclusions and implications

Notwithstanding the above limitations, PORLI-ex is among some of the first self-report instruments for comprehensively measuring daily routines and their potential roles in psychological resilience and desistance from crime among ex-prisoners. Nine dimensions of ex-prisoners’ daily routines were identified, and their differential value in mental health and reoffending were emphasized. Based on the data from PORLI-ex, simple yet cost-effective assessment and intervention protocols could be developed for enhancing both mental health and desistance among ex-prisoners. This study calls for more resources on fostering psychological strengths and resilience through regularizing basic daily life experiences on top of traditional interventions for risk management among the ex-prisoners. Such evidence-based psychosocial interventions or education programs will have specific benefits on newly released ex-prisoners’ immediate adaptation to the non-institutional daily life.

#### Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.ijchp.2022.100352](https://doi.org/10.1016/j.ijchp.2022.100352).

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