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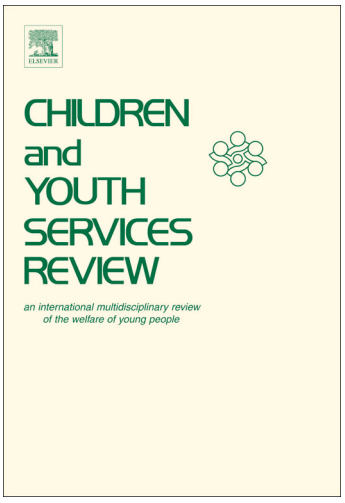

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Acute and Chronic Stress among workers in Residential Treatment Centers for Youth: Effects on Restraint and Seclusion

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Abstract

Workers in residential treatment centers for youth are often victims of violence, including verbally and physically aggressive behavior. Restraint and seclusion (R&S) are the last-resort methods used by residential workers to deal with the aggressive behavior of youths. However, their use has been found to contribute to building negative interactions between residential workers and youths, which can escalate to violence. To better understand the factors contributing to the use of R&S, the objective of this study was to investigate the effects of acute and chronic stress of workers as measured by psychological and physiological markers on the use of R&S in residential treatment for youth from an exploratory perspective. The data used for this study were collected from 70 workers in residential treatment centers for youths in Montreal, Canada, using questionnaires for chronic stress and salivary cortisol as measure of acute stress. Results revealed non-significant correlations and a lack of pattern in the longitudinal analyses between R&S and acute or chronic stress measures. Bayesian analyses were computed to assess the evidential value of the non-significant results. These results suggest that workers' stress may not be a significant factor associated with the use of R&S in residential treatment centers for youth.

Keywords: restraint and seclusion, residential treatment centers for youth, stress, residential workers.

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Acute and Chronic Stress among workers in Residential Treatment Centers for Youth: Effects on Restraint and Seclusion

1. Introduction

Every year in Québec (Canada), approximately 3000 children supported by the youth protection services are placed in residential treatment centers (RTC). Children are placed in these centers when their maladjustment problems have delayed their development, or when their behavior presents a danger either to themselves or others (i.e., aggression, fugue, drug or alcohol abuse, crime, etc.). In either case, the goal of placement is the social reintegration of the youth through their rehabilitation. These centers help youths overcome their difficulties, and the primary responsibility for their rehabilitation falls on residential workers (Sharon & Hennessy, 2015). Daily, they must attend to youths with serious behavioral disorders (Dale et al., 2006). Because of the traumas that these youths have experienced throughout their development, they often respond to the interventions of residential workers with oppositional behaviors and aggression (Geoffrion & Ouellet, 2013; Grogan-Kaylor et al., 2006). As a result, residential workers are often victims of violence that includes aggressive behavior, both verbal and physical (Geoffrion & Ouellet, 2013; Littlechild, 2002). In this context, it is necessary to find ways to manage youth violence while assuring the safety of all parties (Connor et al., 2003; Smith et al., 2016). The use of restraint and seclusion (R&S) by residential workers (Day, 2002; Roy et al., 2019) is part of these methods. Restraint can be defined as an external control or supportive technique that involves the use of physical, mechanical, or chemical means that are however forbidden with youth in residential treatment centers in Quebec, Canada (Government of Québec, 2017; Mullen, 2000). Seclusion involves isolation in a locked or unlocked room (Day, 2002).

When residential workers consider that youth represents a danger to themselves or others, they can use R&S as a last resort to control their aggressive behaviors (Day, 2002; Davidson et al., 2005). Yet, these interventions have been found to become the default response to violence in some centers (Day et al., 2010). Furthermore, they have been found to contribute to building negative interactions between residential workers and youths, fueling an escalation of violence (Fraser et al., 2016). Moreover, R&S has been found to have negative psychological and physical effects on youths, such as anxiety, and negatively reinforced misbehavior (Day, 2002). R&S use has undesirable outcomes also on residential workers, increasing their anxiety levels (Day, 2002). Therefore, reducing the use of R&S with youth has been a major concern for researchers and clinicians because these methods can put youth at risk of re-traumatization, injury, or even death (e.g., Bryson et al., 2017). Regarding those potential consequences, it becomes important to more thoroughly identify the factors associated with R&S in residential treatment centers for youths to take action to reduce their use.

Research on R&S has found that several factors related to the management practices in residential treatment centers for youths are associated with youth aggressive behaviors. A systematic literature review reported four different categories of factors influencing R&S use in these settings: characteristics of the youths, characteristics of the staff, environmental characteristics, and implemented programs (Roy et al., 2019). The present research focused on residential workers' characteristics. Some characteristics of the residential worker have been found to be negatively associated with R&S. More experienced residential workers (Farragher, 2002), older residential workers (Lee-Lipkins, 2014), and residential workers satisfied with their clinical supervision (Minjarez-Estenson, 2016) have been reported to use fewer R&S. Moreover, residential workers believed that understanding the client's needs and developing a solid working relationship based on honesty and trust with the youth reduces the use of restraint (Thomann, 2009). In contrast, several residential worker's characteristics have been found to be associated

with the increased use of R&S, such as perceived exposure to indirect aggression and perceived child agitation. Furthermore, on a more personal level, a higher level of education, a favorable attitude toward corporal punishment, and the inconsistent nature of the relationships with youth were associated with increased R&S use (Lee-Lipkins, 2014). The systematic review by Roy and colleagues (2019) revealed that no study had investigated the effect of a residential worker's stress on the use of R&S. Indeed, in their recommendations for future studies, the authors of this systematic review invite researchers to investigate the possible association between stress level of residential workers and R&S use. They refer to Leblanc and colleagues (2012), who found that child protection workers are more likely to manage a stressful situation with coercive interventions. Consequently, residential workers may be inclined to use coercive responses to violence as they work in highly stressful context; they are frequently exposed to oppositional behaviors, highly emotional situations, verbal harassment, and suffering youth, and the use of S&R can add additional stress to residential workers (France-Choquette, 2018; Freeman et al., 2018; Geoffrion, Morselli, & Guay 2016; Littlechild, 2002; Rosmond et al., 2005). Thus, it is important to study the stress of residential workers as a factor that may influence the use of R&S in residential treatment centers for youth.

1.1. Stress, violence, and R&S

Regarding this study, increased stress may have a significant effect on the functioning of the residential worker. As such, a residential worker threatened by youths' aggressive behaviors may experience an increase in work demands, which may, in the long term, engender a loss of resources. This could affect residential workers' capacity to regulate themselves and their relationships with aggressive youth. Consequently, they may be less available to use a pacifying intervention that is more demanding and will more likely use R&S as a quicker strategy to manage aggressive behaviors.

To understand the stress process of residential workers, it is important to highlight that stress can be acute and chronic. Referring to the DSM-5, "Acute Stress Reaction refers to the development of transient emotional, cognitive, and behavioral symptoms in response to an exceptional stressor such as an overwhelming traumatic experience involving serious threat to the security or physical integrity of the individual or of a loved person(s) (e.g., natural catastrophe, accident, battle, criminal assault, rape), or an unusually sudden and threatening change in the social position and/or network of the individual, such as the loss of one's family in a natural disaster" (American Psychiatric Association, 2013). On the other hand, chronic stress is defined in the APA dictionary as "the physiological or psychological response to a prolonged internal or external stressful event (i.e., a stressor). The stressor need not remain physically present to have its effects; recollections of it can substitute for its presence and sustain chronic stress" (American Psychology Association, 2015). Thus, acute stress differs from the concept of chronic stress that is based on the intensity, frequency, and duration of stressors (Gannon & Pardie, 1989). Experiencing chronic stress contributes to the development of psychological and emotional difficulties, such as psychosomatic disorders, anxiety, depression, and burnout, which affect functioning at work and in the personal sphere (Maslach, 2003). This study will assess acute and chronic stress to gain a thorough understanding of residential workers' functioning at work.

To understand the stress of residential workers, two different types of stress (acute and chronic) should be assessed subjectively and direct measures. For the subjective stress, perceived stress can be evaluated using questionnaires (Petrowski et al., 2018) and through personal appraisals of chronic stress. To measure stress with partial empirical data, biological measures can be adopted. Indeed, stress response involves activation of the Hypothalamic–Pituitary–Adrenal (HPA) system with a large increase in the adrenal secretion of cortisol within minutes of exposure to the stressor (Allen et al., 2014; Foley & Kirschbaum, 2010). Acute stress may be reflected in changes in the normal level and diurnal trajectory of cortisol secretion. Normally, cortisol follows a diurnal rhythm necessary for proper functioning but is dysregulated when an individual is exposed to acute stress. Two different measures of the cortisol levels are used to measure the acute stress, the Cortisol Awakening Response (CAR) that is very sensitive to awakening (Schulz et al., 1998) and area under the curve (AUC) which represent the total concentrations of cortisol produced throughout the day (Hoyt et al., 2016). Normally, salivary cortisol increases rapidly upon awakening and reaches the peak level approximately after 30 to 45 minutes, representing the CAR, followed by a gradual decline to the lowest levels in the evening and the first hours of sleep, this total production representing the AUC (Lupien et al., 2018). A meta-analysis found that CAR magnitude is positively associated with stress but negatively associated with fatigue, burnout, and exhaustion (Chida & Steptoe, 2009).

Concerning the AUC and the acute stress, although the associations between stress and AUC cortisol are inconsistent, it is generally believed that both very large and very small AUCs (representing hyperactivity and hypoactivity, respectively) signify poor psychological and physiological functioning (Saxbe, 2008). The repeated activation of the HPA-axis during stressful events can produce a pathophysiological strain on the individual (Lupien et al., 2018). This means that repeated acute stress may result in chronic stress.

Stress usually occurs when there are too many job demands or not enough job resources over which an individual has little control (Demerouti et al., 2001). Various reactions to stress, which are strategies that the individual uses to cope with stress (Juster et al., 2011), can affect the individual psycho-physiologically. In our case, stress can cause a decrease in capacity of attention and low dedication to the organization as well as a deficient relaxation (Sonnentag & Frese, 2003). Repeated exposure to violence, as experienced by residential workers in residential treatment for youth, can help maintain a state of stress (Geoffrion & Ouellet, 2013), When an individual is unable to return to their pre-stress level, their stress response remains activated (France-Choquette, 2018). Thus, this prolonged activation contributes to the development of chronic stress, which can lead to mismatched physiological consequences (Juster et al., 2011). According to Leblanc and colleagues (2012), confrontational situations that lead to stress responses can alter residential workers' judgments and can be associated with increased perceptions of risk, which can affect the use of R&S.

1.2. Aims of the study

The overarching objective of this study was to investigate whether and how the stress of residential workers affects the use of R&S in residential treatment for youth using subjective and direct measure acute and chronic stress measures. As acute stress is an immediate reaction to a

stressor, the first objective of this study was to verify the relationship between acute stress and R&S on a transversal point of view using salivary cortisol as a measure of acute stress with CAR and AUC. As chronic stress is a reaction to long-term exposure to acute stress, the second objective was to examine the relations between chronic stress and the use of R&S in a longitudinal manner using a questionnaire to measure chronic stress.

2. Methods

2.1. Participants

The data used for this study came from a larger research project "Towards an ISO-Stress label: optimizing stress management for clients and staff of the Montreal youth centre to increase the quality of services and the well-being of employees", directed by the second author, and that assessed the effectiveness of a stress-management program for residential workers RTC. This study utilized a sample of 70 residential workers in residential treatment centers for youths in Montreal, Canada. The data were collected from 2015 to 2018. The groups of workers were residential workers for children between 6 and 12 years old in residential treatment in 7 different units. Each unit has 9 to 12 youths under its supervision.

2.2. Measures

Following the literature, cortisol was used as a stress marker for the acute stress of residential workers (Dickerson & Kemeny, 2004), and a questionnaire measuring perceived chronic stress was used to assess chronic stress if one of those two different kinds of stress affect the R&S uses.

2.2.1. Cortisol

Salivary cortisol was measured to assess biological reactivity to acute stress (Kirschbaum & Hellhammer, 1989). Cortisol was measured in saliva samples, which is a reliable method to assess the unbound cortisol in plasma (Aardal & Holm, 1995; Kirschbaum & Hellhammer, 1994). For proper collection, the participants were provided with saliva tubes (Sarsted tubes Part No. 62.558.201). In the saliva tube, participants provided 2 ml of pure saliva. Saliva samples were stored in freezers at -20˚C at the Centre for Studies on Human Stress (CSHS) until determination using a high sensitivity enzyme immune assay kits (Salimetrics State College, PA, Catalogue No. 1-3102). Frozen samples were brought to room temperature to be centrifuged for 15 minutes at 15,000g (3000 rpm). The laboratory of the Center for Studies on Human Stress analyzed the collected saliva samples by radioimmunoassay using a case of DSL (Diagnosis System Laboratories Inc., Texas, the USA) . The range of detection for this assay was between 0.012 and 3µg/dL. For each sample, there were duplicate assay values. These values were averaged together. The cortisol data allowed us to measure the level of acute stress of the residential workers at a biological level. As mentioned, saliva collection was used to assess the acute stress with two different calculations: CAR and AUC.

As the cortisol samples are always collected on two consecutive days, to compare the use of R&S during the same period, R&S were calculated for the week during which the cortisol and the questionnaire were assessed (the questionnaires were completed the first day of the cortisol sample collection) as well as the week before and the week after the collection of cortisol samples. For example, if the cortisol samples were taken on February 16 and 17, R&S were calculated during that specific week (February 14 to 20), one week before (February 7 to 13), and one week after (February 21 to 27). This method allowed us to verify the relation between R&S and acute stress before, during, and after the cortisol collection.

2.2.2. Questionnaire

Chronic stress was assessed by the Trier Inventory for the Assessment of Chronic Stress (TICS), which comprises six subscales, namely work overload, work discontent, social stress, lack of social recognition, worries, and intrusive memories (Schulz & Schlotz, 1999). The questionnaire asks subjects whether they have had a certain stress experience or have found themselves in a particular stress situation in the past months. Residential workers were instructed to indicate the frequency with which they experienced the described stressful situations, measured by 30 items, during the past months. The TICS measures overall chronic stress on a five-point Likert scale ranging from 0 to 4 (never–very often). A validation study found that the TICS questionnaire has reliability estimates (Cronbach's α and adjusted split-half reliability) ranging globally from .84 to .92. Item-scale correlations ranged from .50 to .85. Measures of fit showed values of .052 for RMSEA (Cl = 0.50–.054) and .067 for SRMR for the absolute model fit, and values of .846 (TLI) and .855 (CFI) for the relative model-fit. Factor loadings ranged from .55 to .91 (Petrowski et al., 2018).

2.2.3. Restraints and seclusions

The research team compiled the number of R&S performed by each participant using the data provided by the Youth Centers directly. Section 118.1 of the Act on health services and social services (L.R.Q., c S-4.2, art. 118.1) requires residential workers to collect daily use of all R&S in a computer database, specifying the name of the residential worker and the children.

2.2.4. Potential confounding variables

A section of the questionnaire was used to collect different socio-demographic information, such as sex and working environment. Normally, participants who do not meet some criteria pertaining to sex hormones, medications, or cigarette/alcohol use are excluded from the sample to avoid potential confounding effects. In this study, there was not enough information about participants to compile that information.

2.3. Procedure

The data were collected in three waves during 2016 and 2017. The participants completed the TICS at four different time-points (T0-T1-T2-T3). Eight weeks separated each testing interval, except for T1 and T2 that were separate by 5 weeks. A saliva sample was collected at each of the three first test intervals (T0-T1-T2), the same period as the questionnaire. We asked participants to complete the questionnaires the same week, and ideally the first day of the cortisol sampling for T0-T1-T2 during the day shift.

The salivary cortisol was collected following a protocol tested in several studies (Lupien et al., 2013; Plusquellec et al., 2015). This protocol requires four different measures of cortisol during the day, (1) Upon awakening, (2) 30 minutes after awakening, (3) 4:00 PM, and (4) before going to bed, on two consecutive days. The protocol is based on the circadian rhythm of the cortisol and its variation throughout the day. In previous studies, these sampling times are reliable markers of the diurnal cycle of cortisol secretion (Lupien et al., 1998). The two cortisol samples taken for two consecutive days were averaged to account for intra- and interindividual variability (Lupien et al., 2001) to minimize the potentially confounding influence of extraneous factors that can distort the representation of a single measurement.

2.4. Treatment of data and statistical analyses

The relation between acute stress, as measured with salivary cortisol, and R&S, using cortisol as a measure of acute stress, was assessed by correlational analyses conducted in SPSS version 24. From an explanatory angle, we looked at correlations between R&S and CAR and AUC at different time frame. We thus explore whether cortisol measures could predict the use of R&S the following week, whether the use of R&S could predict cortisol measures the following week, or whether they were correlated when taken the same week. Subsequently, the use of R&S correlated with the CAR and AUC of the participant one week before the cortisol measure, the week of the cortisol measure, and one week after the cortisol measure. Preliminary analyses were conducted, and the CAR and AUC measures were transformed with a logarithm to follow a normal distribution.

The longitudinal assessment of the associations between acute stress measured with salivary cortisol, chronic stress determined by the TICS, and the use of R&S was investigated using structural equation modeling. With structural equation modeling, it is possible to examine the transversal and longitudinal effects in addition to observing the temporal stability of the same variable. Cross-lagged analyses (Selig & Little, 2012) were performed using the MPlus software (Version 7, Muthén & Muthén, 2012). A blank response in a questionnaire was coded as a missing value. Missing data were estimated by MPlus using the maximum likelihood strategy. To verify whether the R&S use was associated with acute or chronic stress, an examination of the effects of the multiplicative interaction terms between those variables and the slopes of the linear splines, both in terms of the cross-sectional and longitudinal effects, was performed. Two cross-lagged structural equation models (see Figures 2 and 3) were conducted to analyze the links between acute, chronic stress, and the use of R&S from a longitudinal perspective using four time-points (T0-T1-T2-T3) (Selig & Little, 2012). The first model included the chronic stress and the acute stress using the CAR (Figure 2) and the second one used the AUC for acute stress (Figure 3), as it is not clear in the literature, which one is a better indicator of stress. To verify the fit of the model, the indices were compared to the criteria of Hu and Bentler (1999). For the R&S, all the R&S were

added one week before, one week after, and the week of the cortisol sampling and questionnaire administration across the four times-points. This procedure of collecting the R&S data for a full week aimed to maximize the analyses by including a greater number of R&S (see Figure 1 at T0 as an example).

Bayes factors were calculated to verify evidential values of the results, ie. the likelihood that the data support the alternative as opposed to the null hypothesis (Table 1). The Bayes factor can calculate the ratio of the likelihood of one hypothesis compared to the likelihood of another hypothesis on a continuous scale from 0 to positive infinity, with a higher number indicating greater evidential value for the given hypothesis (Jeffreys, 1961).

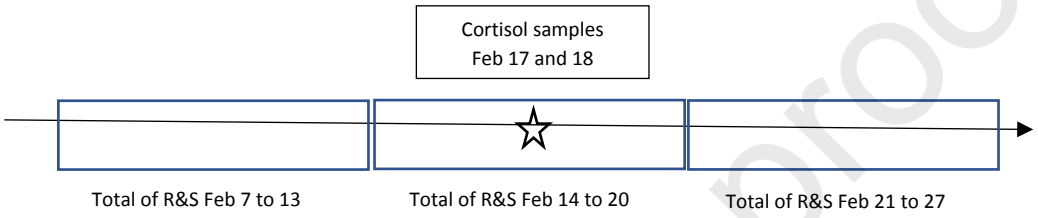

Figure 1. Example of the R&S calculated for T0.

3. Results

3.1. Descriptive preliminary analyses

Of the 70 participants, 11 (16%) were male, and 59 (84%) were female. All worked with children between 6 and 12 years old in a residential treatment center for youth. From 2015 to 2018, the participants used 1669 R&S, with an average of one R&S use per week per participant. Concerning the chronic stress of the participants, the average scores on the TICS instrument for the four different periods were respectively 1.27 (standard deviation SD=0.41), 0.88 (SD=0.68), 1.25 (SD=0.51), and 1.05. (SD= 0.47). The average CAR of residential workers varied from 42.73 (SD= 93.72) and 139.67 nmol/L (SD=398.53) for three periods time. Finally, the average AUC was 2.52 for T0 (SD=1.41), 2.45 (SD=1.16) for T1, and 2.32 nmol/L (SD=1.08) for T2. In this study, residential workers appeared to experience lower chronic stress with a low standard deviation compared to university students (Petrowski et al., 2018).

3.2. Main analyses

The results of the correlation analyses between salivary cortisol AUC, CAR, and R&S measures are presented in Table 1. Each period contains both the saliva and questionnaire data since they were taken the same day. The letter "W" refers to the term "week."

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Table 1

Correlations Between CAR, AUC, and R&S Measures

Time 0 (n=70)						
R&S measures		CAR T0	AUC T0	W. before T0	W. of T0	W. after T0
W. before T0:	Pearson's r	0.034	0.019	1		
	BF_{10}	0.206	0.180			
W. of T0:	Pearson's r	-.245	-.273	0.330**	1	
	BF_{10}	0.581	1.029	6.771		
W. after T0:	Pearson's r	.293	.203	0.214	.026	1
	BF_{10}	0.939	0.460	0.698	0.153	
Time 1 (n=70)						
R&S measures		CAR T1	AUC T1	W. before T1	W. of T1	W. after T1
W. before T1:	Pearson's r	-.055	-.182	1		
	BF_{10}	0.244	0.353			
W. of T1:	Pearson's r	.301	-.186	.205	1	
	BF_{10}	0.746	0.360	0.617		
W. after T1:	Pearson's r	.023	.176	-.003	.210	1
	BF_{10}	0.236	0.343	0.149	0.666	
Time 2 (n=70)						
R&S measures		CAR T	AUC T2	W. before T2	W. of T2	W. after T2
W. before T2:	Pearson's r	-.335	-.022	1		
	BF_{10}	0.616	0.232			
W. of T2:	Pearson's r	b	b	.341**	1	
	BF_{10}			8.924		
W. after T2:	Pearson's r	-.335	.307	.018	.184	1
	BF_{10}	0.616	0.804	0.151	0.465	

* The letter "W" refers to the term "week."

*Correlation significant at the 0.05 level (2-tailed) and ** at the level 0.01 level (2-tailed). BF_{10} means Bayes factors.

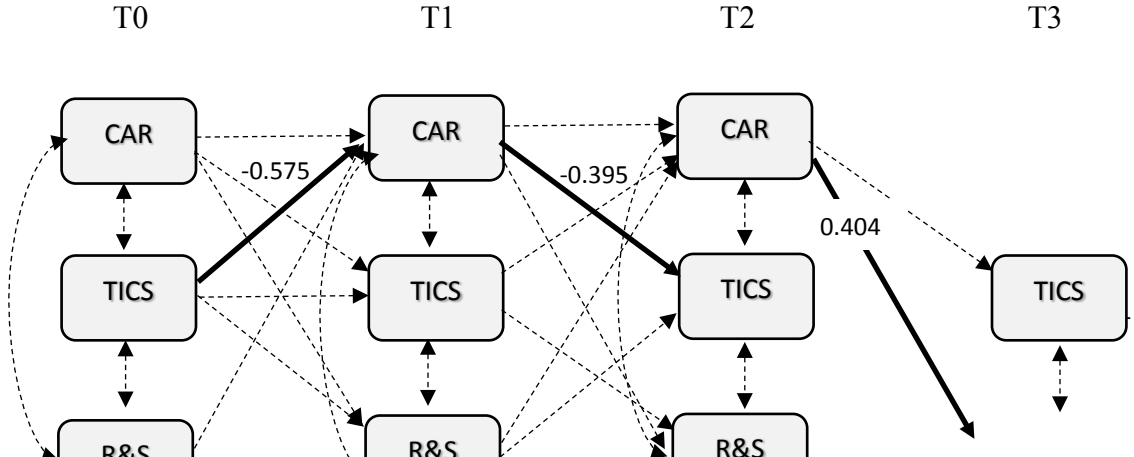
Only two significant correlations were found: the correlations between R&S before and R&S at time 0 (r= 0.33 and p = 0.005) as well as between the R&S before and at the time 2 (r= 0.341and p = 0.004). More precisely, no correlation was found between CAR or AUC and R&S, indicating no association between the use of R&S and acute stress (Table 1).

In this research, the Bayes factors for the non-significant correlations ranged from 0.151 to 1.029, and for the significant correlations ranging from 6.771 to 8.924 (Table 1). The results showed that overall, only two analyses provided moderate support for the null hypothesis (Bayes factors between 3 and 10). For the other 23 analyses, 15 provided anecdotal evidence in favor of alternative hypotheses, and 8 provided moderate evidence for the alternative hypotheses. Overall, 40% of all analyzed results provided moderate evidence and 60% anecdotal evidence. In other words, the results showing anecdotal evidence of the likelihood of the data to support the alternative hypotheses are not strong.

3.2.1. The relationships between chronic stress and the use of R&S

The first model, including all variables (with CAR) at all four time periods, was tested, and standardized results (STDYX) were used (Figure 2). Structural equation modelling revealed, based on different indices, that the fit of the final model had questionable fit (N = 70, *x2/df* = 42.117/21 = 2.001, p = 0.000, *RMSEA* = 0.120 [90% CI = 0.066 - 0.172], *CFI* = 0.807, *TLI* = 0.522). When compared to the Hu and Bentler's (1999) criteria, model fit indices were not optimal. However, it should be noted that these scales, although useful, have certain limits. Indeed, Hu and Bentler never mentioned that the thresholds they suggested should be considered as golden rules, absolute thresholds, or rigid criteria appropriate in all cases. To optimize the model fit indices, a model with only CAR and R&S across four time-points was also tested (acute stress and no chronic stress). The indices were better (N = 70, *x2/df* = 9.658/8 = 1.21, p = 0.2898, *RMSEA* = 0.054 [90% *CI* = 0.000 - 0.157], *CFI* = 0.964, *TLI* = 0.909). The cross-lagged model was used to understand better the longitudinal effect of acute and chronic stress on R&S. The optimization of a model was not the objective. For that reason, the model with all the variables was retained.

The second model that included acute stress with AUC, chronic stress, and R&S at all four time points was tested, and standardized results (STDYX) were used (Figure 3). Regarding the fit of the final model, the different indices indicated a questionable fit (N = 70, *x2/df* = 38.951/21 = 2.001, p = 0.000, *RMSEA* = 0.111 [90% *CI* = 0.053 - 0.164], *CFI* = 0.843, *TLI* = 0.612). To optimize the model fit indices, the model with only acute stress (no chronic stress) was tested using AUC and R&S at four time points. The indices improved a little (N = 70, x2/df = 13.320/8 = 1.665, p = 0.1013, *RMSEA* = 0.097 [90% CI = 0.000 - 0.187], *CFI* = 0.909, *TLI* = 0.773. For the same reason as the previous model, the model that included all variables was retained.



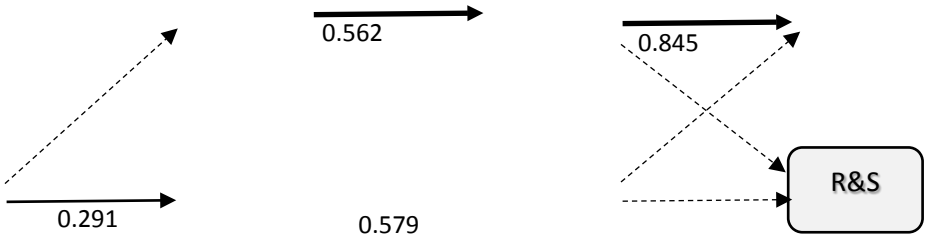


Figure 2. Cross-lagged model analysis with awakening cortisol response. Non-continuous arrows represent non-significant relationships, and full bold arrows represent significant relationships (0.05 significance level).

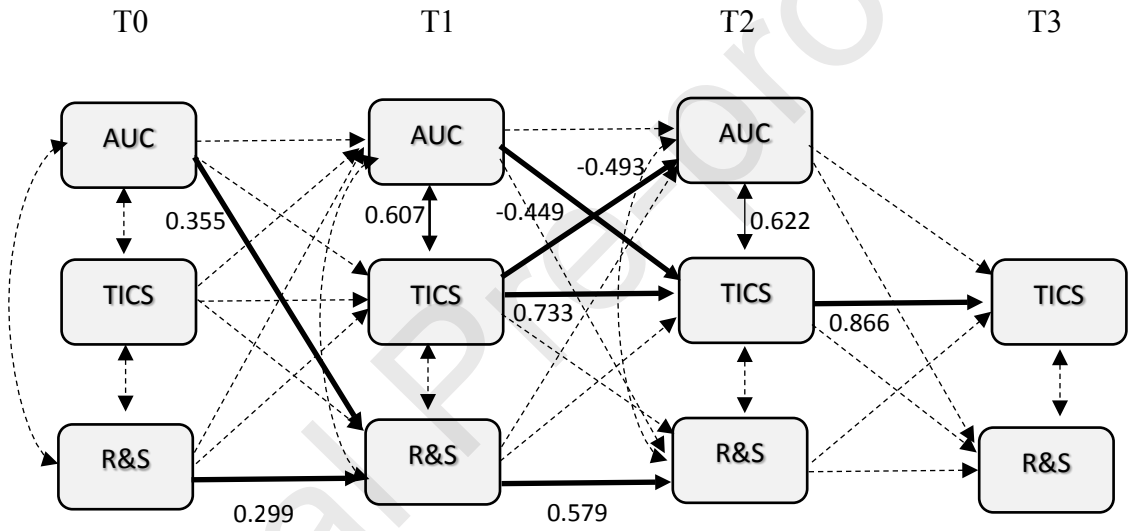


Figure 3. Cross-lagged model analysis with the area under the curve (diurnal cortisol). Non-continuous arrows represent non-significant relationships, and full bold arrows represent significant relationships (0.05 significance level).

Figure 2 shows a cross-lagged structural equation model and coefficients between items across four time points (T0-T1-T2-T3), TICS and CAR as the cortisol measure. R&S at times 0, 1, and 2 had a direct and positive effect on the same variable at the subsequent points (0.579 for T0 to T1 and 0.291 for T1 to T2, respectively, at 0.001 significance level). A participant with higher acute stress (CAR) at time 2 used significantly more R&S at time 3 (0.404 at 0.05 significance level). No indirect relationship was observed.

Figure 3 depicts a cross-lagged structural equation model and coefficients between items using AUC instead of CAR as cortisol measure. From the longitudinal perspective, R&S at time points 0, 1, and 2 had direct positive effects on the same variable at subsequent time points (0.299 for T0 to T1 and 0.291 for T1 to T2 at 0.001 significance level). The results, therefore, showed that participants who used R&S were more likely to use it subsequently. Moreover, a higher level

of AUC at time 0 had a direct positive effect on the use of R&S at time 1 (0.355 at 0.001 significance level). No indirect effect was observed.

In those two models, some relationships were observed between TICS and CAR or AUC (see Figure 2 and 3). The Bayes factors were also verified for the cross-lagged models. To obtain the Bayes factors for those models, the model had to be tested with all relations set to zero (H_0: constrained model, H_1: original model). The Bayes factor of 2,08883 indicated strong support in favor of H_0, suggesting that the absence of a significant correlation between R&S and cortisol is not due to low statistical power. Even if the corelations indicated anecdotal evidence regarding the Bayes factors, the Bayes factor for the cross-lagged model indicated a strong support in favor of H_0, implying no relationship between R&S and cortisol.

4. Discussion

Our goal was to examine the relationship between residential workers' stress and their use of R&S. First, to understand residential workers' stress, as it was presented by Hobfoll (1989), research should attempt to study partial empirical data as well as the individuals' perceived stress. Accordingly, this study measured chronic stress using a validated questionnaire assessing the perceived stress of the residential worker and acute stress using cortisol levels as direct measures. For the correlational analyses, the non-significant results suggest that the use of R&S may not be associated with acute stress and vice versa. Similarly, the structural equation modeling with two different models showed no statistically significant direct recurrent effect between R&S, acute, or chronic stress.

Intuitively, one would predict that stress should affect how one performs at the job, such as resorting to R&S measures. Nevertheless, the results of the present study does not support this hypothesis. Salivary cortisol levels were unrelated to the use of R&S in the same period of time, a result that can be explained through adaptational and coping processes. The personality of the workers might determine how HPA regulation is affected by the stressor and thus affect the use of R&S (Sladek et al., 2016). Lazarus defined coping as all the processes that individuals interpose between them and events perceived as threatening, to control, tolerate, or decrease the effects of these events on their psychological and physical well-being. The individuals can then use a strategy of behavioral or cognitive adaptation (coping) to decrease the negative effects of stress (Lazarus & Folkman, 1984). It is possible that people choosing the profession of a residential worker, although expecting a high level of demands, still have to develop coping strategies to adapt to a daily stressful job. Lazarus' (1998) research demonstrated the importance of the influence of individual attitudes, beliefs, expectations, and motivations on the perceptions of the environment. This approach suggests a more subjective understanding of human behavior by looking at individual differences in purposes and values as sources of variation of behaviors. How an individual's coping strategies, values, beliefs, and attitudes influence individual reactions in the context of R&S should be explored in a more systematic way (Lazarus, 1993).

As such, coping strategies may have influenced the results of this research, which could explain why even when residential workers are under chronic stress, they are not driven by it, and it does not affect their use of R&S. Even if residential workers describe violence at work as 'part-

of-the-job' (Lamothe et al., 2018), aggressive behavior requiring the use of R&S may not be affected by the residential worker's stress. The stress of residential workers may be diluted in their daily job and may not show when they are confronted with aggressive behavior or the use of R&S. In the same idea, the peak of stress resulting from exposure to violence may not be captured by saliva measures of cortisol or a questionnaire over a week as the peak may be diluted in the normal stress of the week. We can assume that the population in this research was not very stressed, regardless of the nature of their work, or they did not feel it. The AUC of residential workers in this study was very low, indicating a low variation of cortisol during the day in comparison to healthy female in general population (Stalder et al., 2010). Since laboratory analysis may vary between countries, it is difficult to compare the AUC between population as there is not any norms in cortisol values at this time. Additionally, in comparison with the normal population (between –31.0. and 56.57nmol/L with a mean of 7.89), their CAR was higher (Kramer et al., 2019). Since studies on cortisol and stress report inconsistent results, it is difficult to compare the biological stress of residential workers with other populations. Consistent with our results, a previous study focusing on residential workers (Lamothe et al., 2018) suggested that this population experiences stress but deliberately minimizes it. In other words, their perception of stress, as measured by the questionnaire used in this study, may reflect their minimized stress levels. Even if violence increased stress, coping, as mentioned earlier, could be a key factor in reducing the effects of stressors. This is consistent with a study by Maina and colleagues (2008) that did not find any association between cortisol and self-report mental stressors assessed with job strain model.

Overall, the results of this study suggest that one way to predict the R&S use of an residential worker is to look at the previous use of R&S for the same residential worker. As our results indicated, residential workers' stress seems to be unrelated to their R&C uses.

The results of this study may have implications for R&S reduction in residential treatment centers for youth. First, this study should be replicated to confirm the null hypothesis with a larger sample size. If there is still no association between stress and R&S use, other avenues must be explored besides reducing the stress if the goal is to reduce R&S use. It may be more appropriate to teach residential workers coping strategies, such as reframing threatening situations into challenges. This leads us to suggest that other variables should be studied to explain the use of R&S in further research, such as violence experienced by residential workers or the work environment. Furthermore, the results showing that using R&S predicts future use of R&S need to be further confirmed. Perhaps the role of stress in this population should be better understood.

This being said, this research is ultimately focused on reducing the use of R&S, but it is important to underline that R&S events are not always failures of best practice; they are therefore likely to be related to worker stress. While R&S are high-risk interventions, they may be appropriate under certain circumstances, i.e., when the risk of another response (like no action) is greater than that posed by R&S. Furthermore, future studies could examine if some events (e.g. youth suicidal attempt) generate good stress for workers to react properly.

5. Limitations

This research has some limitations. First, regarding the correlations, the Bayes factors for the non-significant correlations suggest 60% of anecdotal evidence. These results indicating anecdotal evidence should be analyzed with caution and not be used for generalization. Other research should investigate these relations to confirm our conclusion. On the other hand, the Bayes factor for the cross-lagged model indicated a strong support in favor of H_0, implying no relationship between R&S and cortisol.

Given its relative novelty, using salivary cortisol (CAR or AUC) as an indicator of stress is presently controversial. Some studies suggest that AUC and CAR are good measures of stress (e.g. Pruessner et al., 1999). While some experts lead us with some barriers to use cortisol correctly in researches, other studies show that cortisol saliva should not be used to interpret the CAR as a marker of general basal or stress-reactive cortisol secretion (Stalder et al., 2011). Studies suggest that CAR should not be taken individually to calculate stress but should serve as one of the elements to calculate the adrenocortical activity, which provides important information on the (re)activity of the HPA axis to have a more specific measure of biological stress (Stalder et al., 2016). This more specific calculation could not be done with our data.

Furthermore, even in healthy humans, the cortisol awakening response is sensitive to light exposure, such as morning awakening in darkness or dim light, which reduces the dynamic of the CAR relative to awakening in light (Figueiro & Rea, 2012). This was not considered in this study. Moreover, the necessity to collect samples in close accordance with the specified sampling times is critical for the accuracy of the analyses. The cortisol also changes in response to drinking or eating (caffeinated drinks, sugared drinks, food), even to some other behaviors (smoking) or physical activity. It is difficult to know whether the participants followed instructions to eliminate these factors even if we asked them to fill in logbook. Furthermore, the time of saliva sampling is very important because cortisol seems to fluctuate in the first hour after waking. In research in which the participants collect their saliva at home, it is difficult to control the time of its collection. Moreover, unfortunately, no data were collected with the participants in this research to use as confounding variables in the analyses (e.g. light exposure, drinking, eating). Considering that the use of R&S did not correlate with biological stress in this study, even without taking confounding variables into account, it can be assumed that they would not have any effect in our case because our results show that subjective stress measure with questionnaires has the same results.

Going even further, the relatively high intraindividual stability of the free cortisol awakening response justifies the hypothesis that it can, in part, be regarded as a personality trait, which, in turn, may be influenced by genetic factors (Stalder et al., 2016). Regarding literature, most studies assessing CAR have been performed with individuals who were already suffering from stress, thereby making it difficult to determine whether the dysregulated CAR pattern was present before the stress exposure or whether it reflected the consequence of stress exposure (Marin et al., 2019). Finally, our two cross-lagged models did not show an optimal fit to the data; therefore, the results should be interpreted carefully. As this research is explanatory in examining the relationship between stress and recourse to R &S, it is important not to overgeneralize these results. The findings in this research should be replicated in a larger population, professions, and settings.

6. Conclusions

This study examined whether and how acute or chronic stress was associated with the use of R&S as well as the inverse relationship (i.e., whether recourse to R&S affects stress levels). The results suggest no correlations between acute or chronic stress and the use of R&S and no pattern between those variables in longitudinal analyses, concluding that there may be no effect between the use of R&S and acute or chronic stress of the residential worker.

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Conflict of interest

No conflict on interest.

Credit author statement

Caroline A. Mathieu : Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Writing - Original Draft, Writing - Review & Editing, Visualization, Project administration

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Highlights

- Reducing restraint and seclusion in residential treatment centers for youth.
- Questionnaires and salivary cortisol as measure of stress.
- The stress does not seem to impact the use of restraint and seclusion.