

Quantitative Syntheses of the Effects of Administrative Segregation on Inmates' Well-Being

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There is a widely held belief that the use of administrative segregation (AS) produces debilitating psychological effects; however, there are also those who assert that AS is an effective strategy for reducing prison antisocial behavior and prison violence. Given these conflicting opinions it is not surprising that the use of segregation in corrections has become a hotly debated and litigated issue. To clarify the competing perspectives, two independent meta-analytic reviews, in an unplanned systematic replication, were undertaken to determine what effect AS has on inmate's physical and mental health functioning, as well as behavioral outcomes (e.g., recidivism). Collectively, the findings from these two meta-analytic reviews indicated that the adverse effects resulting from AS on overlapping outcomes ranged from $d = 0.06 - 0.55$ (i.e., small to moderate) for the time periods observed by the included studies. Moderator analyses from both investigations further reveal considerably smaller effect sizes among studies with stronger research designs compared to those with weaker designs. These results do not support the popular contention that AS is responsible for producing lasting emotional damage, nor do they indicate that AS is an effective suppressor of unwanted antisocial or criminal behavior. Rather, these findings tentatively suggest that AS may not produce any more of an iatrogenic effect than routine incarceration. Coding for these meta-analyses also revealed serious methodological gaps in the current literature. Recommendations for future research that will provide a much better understanding of the effects of AS are offered.

Keywords: administrative segregation, solitary confinement, sensory deprivation, meta-analysis

The use of administrative segregation (AS)—also known as solitary confinement—to isolate inmates from harming others or, conversely, being harmed has grown at an alarming rate in North America (Fine & Wingrove, 2014; King, 1999; Makin,

2013; O'Keefe, 2008). Currently, it is estimated that approximately 5.5% of inmates in the United States are maintained in segregated housing (Stephan, 2008), and 18% of all prison and jail inmates have served some time in segregation (A. J. Beck, 2015). Similarly, within the Canadian federal system, which houses all offenders in the country with sentences of 2 years or more, approximately 4% of inmates are in AS (3% are involuntary and 1% voluntary; G. Hill, Correctional Services of Canada, personal communication, May 8, 2015). Clearly the use of AS is one common North American practice for intervening when inmate behavior is deemed a threat to the security of an institution.

There are different forms of segregation used in most North American correctional facilities. Disciplinary segregation typically refers to the use of segregated housing as punishment for a behavioral infraction(s). The duration of disciplinary segregation is usually time specific and contingent upon the nature of the offense committed (e.g., 7 days, 30 days, etc.). AS typically refers to a

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change in inmate classification and is most frequently used to reduce the risk of harm to the inmate or others. Indeterminate sentences are usually associated with AS placement, such that the inmate is unaware of his or her release date. For purposes of this review, AS refers to the use of segregated housing, regardless of the purpose or official classification (e.g., AS, disciplinary segregation, Special Housing Units).

The practice of AS generally includes 23-hour-a-day lockdown, but the physical conditions vary considerably, as do the amenities and the services made available to inmates (Butler, Griffin, & Johnson, 2013; Metcalf et al., 2013; National Institute of Corrections, 1997). However, inmates typically receive their meals in their cell, and are allowed out of their cell three times per week for a shower (approximately 15 min) and for daily exercise (approximately 1 hr per day of solitary recreation outside of their cells in a small enclosed recreational unit). Some correctional facilities allow televisions, radios, and reading materials. Inmates in segregated housing are provided basic health and mental health services, but have limited access to other professional services (e.g., rehabilitative services) and limited visitation consisting of no physical contact and typically held in observation booths with conversation occurring telephonically (see Browne, Cambier, & Agha, 2011; Cloud, Drucker, Browne, & Parsons, 2015).

We now present a brief history on AS from the time it became a contentious issue in the sensation and perception literature and subsequently influenced the field of penology, followed by a review of some of the key research findings and methodological issues that have led to such a heated debate over its reputed effects.

The Administrative Segregation Debate

Various forms of AS have been a central feature of prisons since the 18th century (Gendreau & Goggin, 2014; P. S. Smith, 2006), but it was not until about 60 years ago that the topic became a contentious issue in the penological and sensation and perception literature. In the 1950s, some dramatic results emanated from research, allegedly funded by the U.S. Central Intelligence Agency (CIA), on the effects of extreme conditions of confinement as a psychological tool for interrogation. The research was directed by a world renowned neuropsychologist, Donald Hebb, and a psychiatrist, Donald Cameron, known for his theories on depatterning the mind (Brown, 2007; Klein, 2007; McCoy, 2006). Attracting particular attention were sensory deprivation (SD) experiments led by Hebb, in which sensory input in the environment was restricted. In these studies, volunteer college students were used as test subjects to examine the effect that SD had on various physiological and psychological outcomes during periods of confinement that ranged from a few hours to 3 to 4 days. A typical finding was that participants' cognitive and perceptual abilities deteriorated markedly (e.g., Bexton, Heron, & Scott, 1954). Acceptance of these findings persisted into the late 1960s when they were challenged by researchers who demonstrated that uncontrolled experimenter and setting dynamics introduced response bias in the early SD studies (C. W. Jackson & Kelly, 1962; Orne, 1962; Orne & Scheibe, 1964; Zubek, 1969). The final word on the effects of SD was summarized by Suedfeld (1975), who concluded, from his review of studies involving more than 3,300 subjects of widely varying backgrounds, that "one rarely finds, particularly in more

recent studies, extreme emotionality, anger, and anxiety" (Suedfeld, 1975, p. 62; see also Suedfeld, 1980).

The question remains, however, as to whether the results from the SD experimental literature apply to prison settings, given the differences in settings and subjects. This subject was addressed by the medical branch of the then Canadian Penitentiary Service. In the 1960s, when the findings from the early SD studies were still popular, this government agency was concerned that their use of AS might produce harmful psychological results on inmates. As it turned out, the results from the random assignment studies conducted on volunteer AS inmates in Canadian federal and provincial prison settings for several days (e.g., Ecclestone, Gendreau, & Knox, 1974; Gendreau, Freedman, Wilde, & Scott, 1968, 1972; Gendreau, McLean, Parsons, Drake, & Ecclestone, 1970; Walters, Callahan, & Newman, 1963) produced strikingly similar effects as the findings from the SD literature (e.g., heightened arousal to sensory stimulation, resting state electroencephalogram (EEG), need for sensory stimulation, slightly lower stress levels, no signs of perceptual dysfunction, and personality disintegration; see Zubek, 1969). This was an important finding; prison AS was a facsimile of SD, thereby making the SD literature relevant to any discussion on the topic of AS (Gendreau et al., 1972; Gendreau & Thériault, 2011). Subsequently, Suedfeld, Ramirez, Deaton, and Baker-Brown (1982) examined 115 inmates who were in AS in three prisons in Canada and two in the United States for at least 90 days. Suedfeld et al. found some measure of psychological upset; however, his summary of the results was that the conditions of AS were not overwhelmingly aversive, stressful, or damaging to inmates. These observations by Suedfeld et al. were later replicated by Zinger, Wichmann, and Andrews (2001). This conclusion, however, was quickly challenged.

In 1983, Grassian described his psychiatric assessment of 14 AS inmates in a Massachusetts prison. Grassian (1983) reported these inmates suffered from massive free-floating anxiety, aggressive fantasies, and paranoia, among other behaviors. He opined that the cluster of symptoms associated with AS confinement formed a "clinically distinguishable syndrome" (p. 1450), which he termed the "SHU Syndrome" (with SHU referring to the Security Housing Unit structure of the California Department of Corrections and Rehabilitation). This study became the impetus for the belief that AS produces debilitating psychological effects. Kupers (2008) further stated that AS produced substantial psychopathological effects that resulted in "lasting emotional damage (p. 1006).

Since the Grassian (1983) publication, a number of investigators have claimed that inmates experienced a myriad of mental health concerns and symptoms, including appetite and sleep disturbance; anxiety, including panic; depression and hopelessness; irritability; anger and rage; lethargy; psychosis and cognitive rumination; social withdrawal; cognitive impairment; and suicidal ideation and self-injurious behaviors (see Andersen et al., 2000; Beven, 2005; Bonner, 2006; Brodsky & Scogin, 1988; Cloyes, Lovell, Allen, & Rhodes, 2006; F. Cohen, 2006, 2008, 2012; Glaze & Herberman, 2013; Grassian, 2006a, 2006b; Haney, 1993, 2003, 2009; Hayes & Rowan, 1988; Hresko, 2006; Kupers, 2008; Lovell, 2008; Metzner & Fellner, 2010; Miller & Young, 1997; P. S. Smith, 2008; Stephan, 2008). Offenders with mental illness are considered particularly vulnerable when placed in AS (Metzner & Fellner, 2010), as they may experience more mental health disturbance (i.e., greater symptomatology) than offenders with mental illness not

placed in AS (O'Keefe, 2007; for a differing view, see Grassian & Friedman, 1986). Lastly, inmates released directly from segregation to the community have shown poorer postrelease outcomes than inmates not released from segregation (Lovell, Johnson, & Cain, 2007), although it is noted these authors did not account for other commonly known situational and criminal risk factors.

Collectively, these reports led to the conclusion that AS results in significant inmate mental health impairment (Haney, 2009; Kupers, 2008; Lovell, 2008; P. S. Smith, 2006; Toch, 2003). Recently, Haney (2012) has stated unequivocally that the "empirical research on solitary confinement has consistently documented its problematic effects" (p. 11). Others, however, have pointed to the serious methodological shortcomings on much of the literature that contributed to these conclusions (e.g., selection bias, reliance on phenomenological methods and qualitative outcomes, failure to control for powerful response bias factors where inmates were encouraged to report pathological symptoms)—these shortcomings limit the credibility of their results (Gendreau & Labrecque, in press; Hanson, 2011; Suedfeld et al., 1982; Zinger et al., 2001).

Furthermore, as noted previously, not all studies have borne out the negative effects of placement in segregation. When examining very brief periods of segregation, almost no deleterious effects are found (see, e.g., Gendreau et al., 1972; Walters et al., 1963). As referenced previously, Suedfeld et al. (1982) and Zinger et al. (2001) examined nonvolunteer inmates who were sent to AS in six prison settings for periods up to 90 days. The respective authors found little mental health decompensation for segregated inmates compared with their peers in the general prison population.

Notably, another study that may be more typical of the use of segregation in large adult prisons in the United States also showed a general absence of adverse effects resulting from placement in AS (O'Keefe, Klebe, Stucker, Sturm, & Leggett, 2010). Participants in this study consisted of 247 men from AS, the general prison population, and a psychiatric care correctional facility. Researchers assessed inmates over a 1-year period on the following domains: psychosis; anxiety, depression, and hopelessness; somatization; social functioning; cognitive functioning; anger; and hypersensitivity. Contrary to the researchers' hypotheses, results indicated that AS was generally not associated with the onset of psychological symptoms or cognitive impairment for mentally ill and nonmentally ill inmates, nor did inmates with mental illness fair worse in AS than their nonmentally ill peers. Specifically, results from this study indicated that only 7% of the AS sample reported an increase in mental health symptomology, whereas 20% improved, and the rest remained stable (Metzner & O'Keefe, 2011).

Although this study was the most sophisticated study to date with markedly significant methodological improvement over previous works examining the effects of AS on inmate functioning (see Berger, Chaplin, & Trestman, 2013; Gendreau & Thériault, 2011), it was criticized on several fronts, including (a) that the researchers deliberately ignored indicators of psychiatric disturbance, (b) that the inclusion criteria resulted in a biased inmate selection process, (c) the questionable validity of the information from the self-report measures used in the study, and (d) the gender of the primary data gatherer (e.g., Grassian & Kupers, 2011). In response to criticisms, O'Keefe and colleagues (2010) commented the multimethod data collection, including, but not limited to, standardized and commonly used clinical self-report measures

(e.g., the Beck Depression Inventory; A. T. Beck, Ward, Mendelson, Mock & Erbaugh, 1961) for assessing psychological disturbance, and the relevance of the sample and comparison groups for generalizing to other AS units with adult male literate inmates.

The Need for a Research Synthesis

Given the conflicting findings in the literature on the use of segregation, further work was clearly warranted. Relevant to this point, many years prior, Toch (1984) called for a "science of imprisonment as well as a science of inmate reactions to imprisonment" (p. 514), a message that, 30 years later, continues to be ignored at the correctional policy level (Gendreau, 2015). Unfortunately, all the literature reviews on the effects of AS (e.g., P. S. Smith, 2006) to date have relied on narrative summaries, which have frequently been shown to be notoriously unreliable in other areas of psychological study (Beaman, 1991). Thus, further work to clarify current findings on the effects of AS on inmate well-being was clearly needed.

Unbeknownst to the present authors at the time, two independent meta-analytic reviews were being conducted. Although these meta-analyses were conducted almost simultaneously, the respective researchers were unaware of the other group's work until the results were finalized (Research Synthesis 1: primarily based at the University of Cincinnati—Gendreau, Smith & Labrecque, and Research Synthesis 2: primarily based at Texas Tech University—Morgan, Gray, MacLean, Van Horn, Bolanos, Batastini, & Mills). The statistical results of the two research groups were blind to each other's methods and calculations until the preparation of this manuscript. The comparison of these two meta-analyses was fortuitous, because there is a growing recognition in psychology in which a failure to replicate is of grave concern not only for primary studies (Pashler & Wagenmakers, 2012) but also meta-analyses themselves (Rosenthal, 1990). Moreover, when there is a great deal of sensitivity and controversy that affects legal issues about the humane care of inmates, replication becomes even more critical. Here, we present what is known in the literature as a systematic replication, such that general features and goals of research replications—in this case, meta-analyses—remained similar; however, there were differences in some important aspects (e.g., inclusion criteria, number of studies coded, coding procedures, and analytical procedures). It has been proposed that systematic replications offer more information than literal or operational replications for cross-validation and generalization (Schmidt, 2014).

Method

Research Synthesis 1 (Gendreau, Smith, & Labrecque)

Literature retrieval. In the current investigation, the process for locating relevant studies included searching for the key terms "administrative segregation," "solitary confinement," and "supermax" within the abstracts of articles in several online databases (e.g., Criminal Justice Abstracts, Criminal Justice Periodical Index, Google Scholar, National Criminal Justice Reference Service, PsycINFO, Social Sciences Index, Sociological Abstracts, and SocINDEX), followed by using an ancestry approach (e.g., the reference lists from each identified study were used to locate additional studies). In addition, indexes of all the issues of the

journals that frequently publish segregation related works (e.g., *Canadian Journal of Criminology*, *Crime & Delinquency*, *Criminal Justice and Behavior*, *Criminology*, *The Prison Journal*) were examined to find any additional studies not discovered through the first step. The annual conference programs for the American Psychological Association, the American Society of Criminology, and the Academy of Criminal Justice Sciences were also reviewed to uncover any related unpublished research. Finally, the ancestry method was used by contacting researchers in the area for leads as to other studies that were not uncovered by the previous methods. These procedures resulted in the identification of 150 documents.

Eligibility criteria. To be included in the meta-analysis, studies had to meet several eligibility criteria. First, the study must have been conducted on prisoners experiencing AS in a custodial setting (i.e., prison or jail). Studies relying on nonoffender samples, or that took place in nonprison laboratory settings, were excluded. Second, the study must have included a comparison group and examined some measure of outcome. Third, the study must have been written in the English language. Finally, the study had to have contained sufficient data to calculate an effect size (i.e., Pearson r or phi coefficient).

A total of 150 studies were reviewed for the purposes of this meta-analysis, including books, published articles, paper presentations, and reports from correctional agencies. Of the 150 studies located, only 14 (or 9.3%) were suitable for analysis according to our inclusion criteria. Note that in the list of references, references marked with one asterisk indicate studies included in the first meta-analysis, references marked with two asterisks were included in the second meta-analysis, and references marked with three asterisks were included in both meta-analyses.

Coding procedures. The coding manual created for this meta-analysis was used to systematically capture the characteristics of the identified studies, such as design quality, sample size, length of time in AS, and outcome type. The dependent variables were grouped into one of three distinct categories: (a) psychological indicators (i.e., anger, hostility, anxiety, depression, psychosis, paranoid ideation, intelligence, cognitive impairment, somatization, coping, negative attitude, hypersensitivity, global functioning); (b) medical/psychophysiological indicators (i.e., physical health and sensory arousal); and (c) behavioral indicators (i.e., postrelease recidivism and serious institutional misconduct). For the purposes of this investigation, stronger designs were defined as those that had comparison groups that were similar to the treatment group on at least five empirically relevant static and/or dynamic risk factors (e.g., age, criminal history, years in prison, institutional behavior, antisocial attitudes). In contrast, weaker designs were those in which either no information was provided on offender characteristics or the two groups were not similar on at least five of the relevant static and dynamic risk factors described above. Multiple publications based on the same sample or data set were treated as a single study for coding purposes.

In Research Synthesis 1 (RS1), two studies were randomly selected and coded by the second and third authors. In these two studies, 132 of the 134 items were coded similarly for an interrater reliability of 98.5%. The two items in question were resolved by a meeting of the two coders. The third author then coded the remaining 12 studies. When questions arose during the coding of these studies, all three authors reviewed the study in question in order to reach a decision on the coding item(s) of concern. There

were two meetings held with all three authors to resolve such issues.

Effect size calculation and interpretation. This meta-analysis used r as the effect size metric (ES) with 95% confidence intervals (CIs) to estimate the magnitude of the effect of AS on outcomes. A positive valence in the results indicates an iatrogenic effect (i.e., AS correlates with an increase in the dependent variable), whereas a negative valence in the results indicates a positive effect (i.e., AS correlates with a decrease in the dependent variable). In choosing the ESs for inclusion in the analyses, studies were allowed to contribute more than one ES as long as each represented an estimate for a separate sample of offenders. Whenever a study reported multiple outcome measures for a similar construct, all of the estimates within this domain were averaged within the study in order to produce only one effect size per unique sample for each type of outcome examined.

The effect sizes for each outcome were calculated using a random-effects model. This method is especially useful when the goal of the meta-analysis is to extend the results to the population of studies of which the current sample of studies is only a part, and it cannot be determined with any degree of accuracy that all of the studies are not functionally similar (see Bornstein, Hedges, Higgins, & Rothstein, 2009). Interpretation of the data focused on the CIs of the point estimates to assess the precision and replicability of a finding (see Cumming, 2012; Gendreau, Listwan, Kuhns, & Exum, 2014). The CI provides a robust probability (83%) of a future replication of a finding to plausibly fall within the CI limits (Cumming, 2012). A CI that contains zero does not mean there is no effect; it is just one of the plausible, though highly unlikely, effects within the CI (Schmidt & Hunter, 1997). Based on the rationale provided by Smithson (2003), CIs with a width greater than .10 were considered to be imprecise, thereby warranting further replication (Gendreau & Smith, 2007). The heterogeneity of ESs was determined by the I^2 statistic, which is an intuitive and simple index of the discrepancy of a group of studies results (Higgins & Thompson, 2002). The I^2 statistic is based on the Cochran's Q statistic, but also provides a point estimate of the magnitude of the discrepancy, rather than just a significance test, as is the case with the Q statistic. I^2 is calculated as $100\% \times (Q - df)/Q$. The interpretation of I^2 is the proportion of total variation in the estimates of treatment effect that is related to heterogeneity between studies, which is presented in percentage terms. Higgins and Thompson (2002) proposed that I^2 percentages of around 25%, 50%, and 75% indicate low, medium, and high heterogeneity among the ESs.

Research Synthesis 2 (Morgan, Gray, MacLean, Van Horn, Bolanos, Batastini, & Mills)

Literature retrieval. Two separate methods of article retrieval were utilized to find literature pertaining to AS and mental health outcomes. First, an electronic database search was conducted with the following search terms: "administrative segregation," "segregation," "secure housing," "supermax prison," "supermax facility," and "solitary confinement." The database search yielded 40,589 articles: 5,918 from PsycINFO, 33,035 from MEDLINE, and 1,636 from Criminal Justice Abstracts. Second, the reference sections of literature reviews and other meta-analyses were examined to identify additional journal articles and presen-

tations related to segregation and mental health outcomes. Trained research assistants reviewed the titles and abstracts of these documents to eliminate unrelated articles (e.g., articles related to corrections but not AS), those not available in English, book chapters that did not report the results of original research, and articles that did not evaluate mental health outcomes for inmates in AS resulted in 61 remaining documents.

A trained research assistant then reviewed the 61 remaining documents for inclusion in this research synthesis. The inclusion criteria for this review included: (a) the article/report/dissertation was available in English; (b) the study evaluates outcomes for inmates placed in segregation in a correctional facility (e.g., jail, prison) for research or correctional purposes; and (c) the studies must have included sufficient data or summary statistics that allowed for the calculation of effect sizes. It should be noted that if Criteria 1 and 2 were met, but the document did not provide sufficient data for calculating effect sizes, authors were contacted to request additional information. If the authors were unable to provide the necessary information for purposes of computing effect sizes, the document did not meet inclusion criteria and was excluded. This review process eliminated 42 articles, leaving 19 documents consisting of case-controlled studies that met the inclusion criteria for this research synthesis. Ten of these documents overlapped with RS1.

Coding procedures. A coding manual was developed by the lead author of the research synthesis. The following content areas were included in this code sheet:

1. Study, author, and institutional descriptors.
2. Sample descriptors (e.g., sample size of segregated group, presence and sample size of control group, sample demographics, psychiatric diagnosis, offender risk level, and assessment method).
3. Segregation descriptors (e.g., availability and frequency of mental health treatment, training of service provider, time out of cell).
4. Control group descriptors (i.e., general population or unknown).
5. Research design descriptors (e.g., scientific integrity of study,¹ research design, type of follow-up, type of failure).
6. Effect size descriptors (e.g., type and value of significance test, sample size, significance value, group means and standard deviations, effect sizes).

After the code sheet was developed, the research team reviewed the code sheet and provided revisions for clarifying item coding criteria. One document was then coded by all authors and a conference call was convened to review coder discrepancies, re-review scoring criteria, and correct coding errors.

To complete the coding process, each document was coded by three of the authors or a trained research assistant. Documents were randomly assigned to authors; however, the number of documents coded was generally representative of author order. One author then reviewed the three code sheets for each document and

identified scoring discrepancies. A two-thirds majority agreement criterion was utilized to resolve discrepancies, such that agreement of two of the three coders was required for items to be considered accurately scored. Items that did not result in a two-thirds majority agreement were resolved by the three coders reviewing the item and coding via in-person or conference call meeting. In Research Synthesis 2 (RS2), 93% of items met the two-thirds agreement criteria such that only 66 of 950 items had to be resolved by a meeting of the three coders.

Effect Size Calculation and Interpretation

Given that the collection of studies coded for this article assessed a diverse range of physical, mental health, and behavioral outcomes, it would be inappropriate to combine all studies into a single analysis. Instead, the primary statistical procedures consisted of a series of univariate meta-analyses, with a separate meta-analysis reported for each outcome of interest. The outcomes were grouped into 15 general categories: general mental health, mental health functioning, anxiety, mood/emotion, psychosis, anger, hypersensitivity, self-harm, social interaction, victimization, physical health, cognitive, behavioral functioning, recidivism, and antisocial indicators. Note that some studies contributed ESs for more than one of these general outcome categories.

To determine the magnitude of the difference between segregated and nonsegregated offenders for each outcome of interest, the standardized mean difference (i.e., Cohen's d) and its variance was coded from information available within the studies. However, given the upward bias associated with Cohen's d values derived from sample sizes that are less than 20, all d values and their respective variances were converted to Hedges' g using the correction factor J (Borenstein et al., 2009). All effect sizes were coded such that positive values indicated poorer outcomes for segregated offenders.

For each outcome, a weighted mean ES was calculated, in which each weight is the inverse of the estimated variance of the ES, using the random-effects model (see Borenstein et al., 2009; Lipsey & Wilson, 2001). Given that several studies reported multiple effects for the same construct, robust variance estimation (RVE) was employed (see Hedges, Tipton, & Johnson, 2010; Tipton, 2015). RVE is equipped to handle dependent effect sizes without knowledge of their covariance structure, thus allowing for the inclusion of all effect sizes and eliminating the need for averaging effects. All analyses were conducted using the "robmeta" (Fisher & Tipton, n.d.) package developed for R statistical software (<http://www.r-project.org/>). Due to the small number of studies ($m < 40$ studies) within each analysis, the small sample corrections developed by Tipton (2015) were applied. An important aspect of this type of analysis is the Satterthwaite degrees of freedom. When the Satterthwaite degrees of freedom are less than 4, the probability of a Type I error is much higher than $\alpha = .05$. Therefore, given the risk of falsely rejecting the null hypothesis, all

¹ To examine scientific integrity in RS2, we used the Maryland Scale of Scientific Rigor (MSSR). The MSSR is a metric that was developed to evaluate the scientific rigor of empirical investigations in order to assist in the evaluation of causation among variables (Sherman et al., 1997). The metric and coding used in this meta-analysis is available from the first author.

univariate meta-analyses with degrees of freedom less than 4 were reported as being nonsignificant.

For all analyses, the ρ value was set at 0.8. To determine whether the effect size, standard error, and τ^2 values were robust to fluctuations in the ρ value, sensitivity analyses were conducted across varying values of ρ (i.e., 0.0, 0.2, 0.4, 0.6, 0.8, and 1.0; not reported). Among the 15 meta-analyses conducted, seven analyses exhibited either no change in the estimates across all values of ρ or, once rounded to the second decimal, the estimates across the various values of ρ were identical. For the remaining eight analyses, however, the ρ value was set to 1.0 to account for the degree of fluctuation in the effect size, standard error, and τ^2 values, thus ensuring conservative estimates. Lastly, heterogeneity was examined by way of τ^2 (i.e., between-study heterogeneity) and I^2 values. Reporting of the results was modeled after publications and reports by Tipton and colleagues (Fisher & Tipton, n.d.; Tanner-Smith & Tipton, 2014; Tipton, 2015).

As outlined by J. Cohen (1992), ES values of 0.20, 0.50, and 0.80 were considered to be indicative of small, medium, and large associations.

Results

Research Synthesis 1

Description of sample. From the 14 studies included in RS1, a total of 65 separate effect sizes were tabulated, which included a total of 50 involving psychological indices, six involving medical/psychophysiological indices, and nine involving behavioral indices.

The preponderance of studies examined were journal articles published within the last 14 years. The authors were primarily academics from the disciplines of psychology and criminology. Approximately three quarters of the studies included in this meta-analysis were conducted in the United States. The majority of the offenders drawn from these studies involved adult male inmates ($\geq 80\%$), although a small proportion had mixed gender (i.e., male and female) samples. Table 1 lists the effect size estimates for the psychological outcomes and includes the rating of design strength, time spent in AS, and the unweighted ES (r).

Presented here are the results by outcome domain, which includes the number and magnitude of the ES (k , r), the 95% CI, I^2 , and the sample size (n) for each category. The ES is weighted by sample size. The I^2 results are presented by their classification as to low, medium, and high dispersion of ESs.

Effect for psychological outcomes. Psychological measures were the most frequently investigated in the AS literature. Six studies with eight samples examined 13 psychological indicators. The data for the ESs and their 95% CIs are presented in Table 1 and graphed in Figure 1.

As seen from Table 1 and Figure 1, the ES values ranged from $-.06$ to $.17$. The CIs for both outcome types also overlapped with one another.² Nine of the outcome point estimates consisted of an $r < .10$. All 13 of the CIs were rated as imprecise in width ($r > .10$). The between-subjects variability for the ES groups was rated low on the I^2 index for the following: anger, depression, intelligence, paranoid ideation, somatization, coping, and negative attitude. Medium dispersion of ESs was found for anxiety, hyper-

Table 1
Meta-Analysis of the Effects of Administrative Segregation by Outcome Type and Domain

Outcome	Average ES and 95% CI		I^2	n	k
	r	95% CI			
Psychological					
Anger	-.06	-.17 to .06	0%	315	3
Hostility	.17	-.12 to .43	74%	244	5
Anxiety	.17	.05 to .28	36%	474	6
Depression	.08	-.02 to .18	13%	474	6
Psychosis	.05	-.14 to .24	39%	219	4
Paranoid ideation	.09	-.04 to .23	0%	219	4
Intelligence	.03	-.10 to .15	23%	315	3
Cognitive impairment	.01	-.25 to .27	79%	314	4
Somatization	.04	-.11 to .18	8%	219	4
Coping	.08	-.07 to .22	0%	179	2
Negative attitude	-.05	-.20 to .10	0%	179	2
Hypersensitivity	.17	-.03 to .35	40%	219	4
Global functioning	.15	-.10 to .38	73%	280	3
Medical/Psychophysiological					
Physical health	.10	-.01 to .21	0%	314	4
Sensory arousal	.38	.07 to .63	0%	40	2
Behavioral					
Postrelease recidivism	.06	.02 to .10	25%	4,636	7
Institutional misconduct	.01	-.03 to .06	— ^a	1,830	1

Note. ES = effect size; CI = confidence interval.

^a I^2 not calculated because $k = 1$.

sensitivity, and psychosis, and large dispersion was reported for the cognitive impairment, global functioning, and hostility.

Effect for medical/psychophysiological outcomes. There were five studies with six unique samples that examined the effect of AS on measures of medical/psychophysiological outcomes ($n = 344$). The data for ESs and their 95% CIs are also presented in Table 1 and in Figure 2. The CIs for both outcomes overlap.

There were three studies with four samples that examined the effect of AS on measures of physical health (i.e., heart rate/blood pressure, plasma cortisol levels; $n = 314$). The ES was $r = .10$, 95% CI $[-.01, .21]$. There were two studies that produced two effect sizes that examined the effect of AS on measures of sensory arousal ($n = 40$). The dependent variables were EEG levels and visual evoked potentials. The ES was $r = .38$, 95% CI $[.07, .63]$. The CIs for both outcomes overlapped. The between-subjects variability for each outcome was rated low by the I^2 index. The widths of the two CIs $[.22, .56]$ indicated that the ES estimate was imprecise.

Effect for behavioral outcomes. There were six studies with nine unique samples that examined the effect of AS on measures of behavioral outcomes ($n = 6,540$). The data for ESs and their 95% CIs are presented in Table 1 and Figure 3. The CIs for both outcomes overlap.

There were five studies with seven unique samples that examined the effect of AS on measures of postrelease recidivism ($n = 4,636$), and one study that produced two effect sizes examining the effect of AS on measures of institutional misconduct ($n = 1,904$).

² For readers wishing to compare the use of CIs with traditional significance testing conclusions, see Cumming and Finch (2005) and Campbell, French, and Gendreau (2009) for an example in the forensic area.

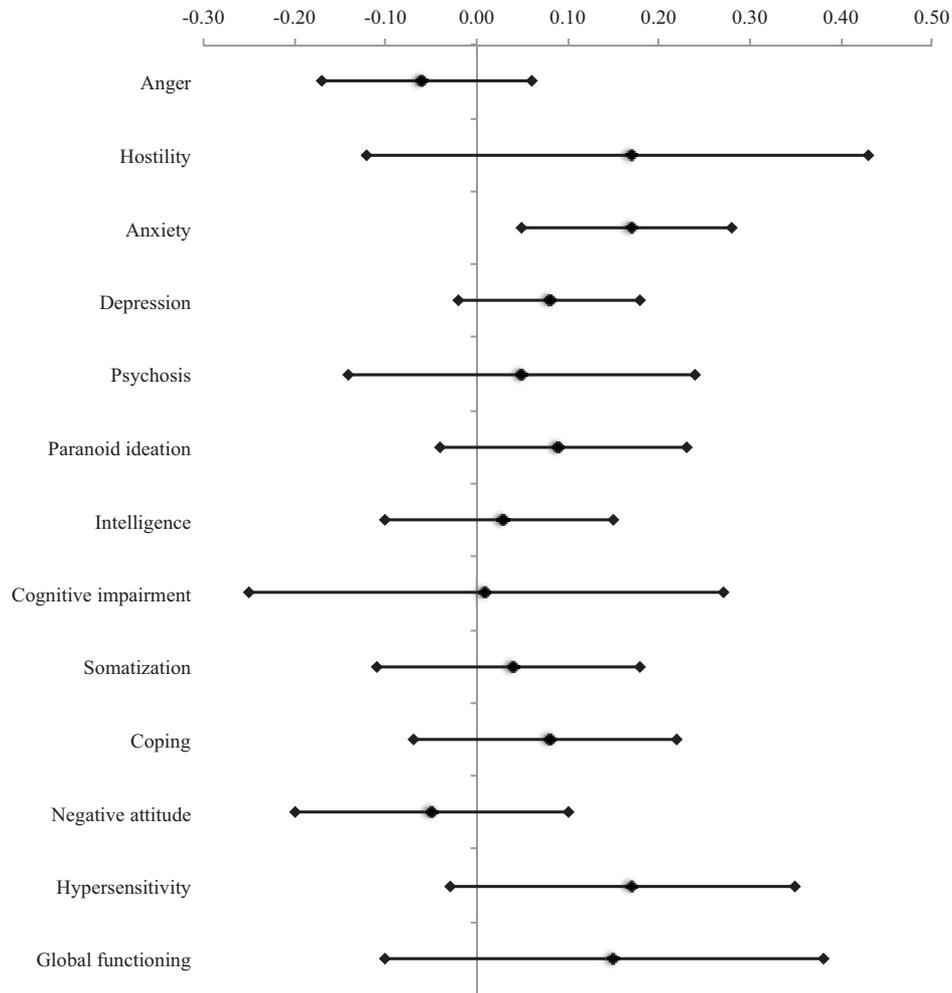


Figure 1. Forest plot of random effect sizes and 95% confidence intervals for psychological measures.

For postrelease recidivism, the ES was .06, 95% CI [.02, .10], pointing to an increase in recidivism for the inmates exposed to the AS condition. The relationship of AS ($n = 1,904$, $k = 2$) on misconducts suggests a suppression effect ($r = -.08$, 95% CI [-0.20, .05]). The between-subjects variability (I^2) was estimated to be low and high, respectively, for both outcomes. The width of the CI for recidivism was precise ($<.10$), but not for misconducts (CI width = .25). Table 2 provides a summary of the effect sizes for all outcome types.

Moderator analysis. This study also attempted to code for factors that would possibly moderate the effect of AS on the dependent variables. With the exception of one moderator, very little information was available in this regard. The 14 studies included samples that were comprised of 80% or more of adult males. The samples were all mixed for the eight studies that reported information on offender race. Only four studies included information on offender risk for recidivism; all of them used static predictors (e.g., age, gender, race, and previous criminal record) to

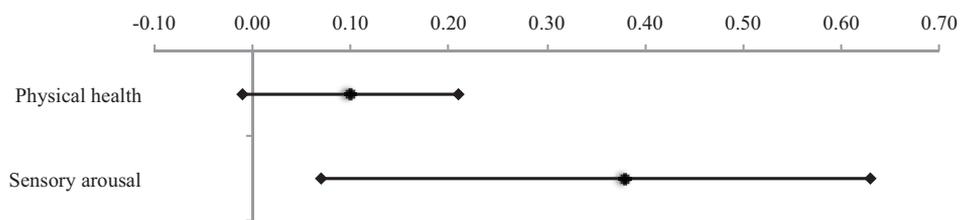


Figure 2. Forest plot of random effect sizes and 95% confidence intervals for medical/psychophysiological measures.

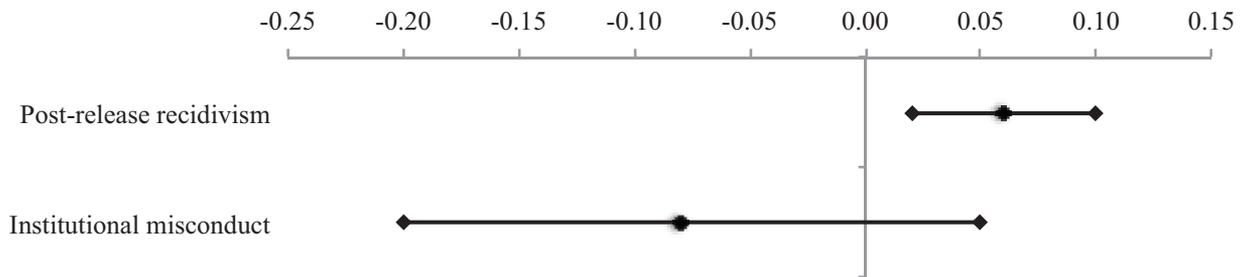


Figure 3. Forest plot of random effect sizes and 95% confidence intervals for behavioral measures.

make comparisons between groups, and none of the studies separated the effects by risk level. Therefore, it was not possible to assess whether AS has a differential impact on outcomes based on any of these offender-level characteristics. Data was virtually nonexistent on situational variables (i.e., reasons for being sent to AS, physical conditions of AS, staff–inmate relations, health care and treatment services, access to outside contacts such as family, parole). It was, however, possible to code studies by design strength. Studies categorized as stronger designs ($k = 41$) produced an ES of $r = .03$, 95% CI [.00, .05]. The corresponding data for weaker designs ($k = 24$) was an ES of $r = .21$, 95% CI [.12, .29].

Research Synthesis 2

The 19 studies included in this meta-analytic review produced 144 total effect sizes (see Tables 3 and 4).

Description of sample. Of the 19 documents included in this research synthesis, 14 were peer-reviewed journal articles, one was a technical report, one was a published dissertation, one was a government report, one was a conference presentation, and one was a study that was published as a peer-reviewed journal article and as a government report. The documents were produced between 1963 and 2014. The majority of correctional facilities included in this review were a prison setting ($n = 18$), with the remaining study occurring in a jail. Twenty-one percent of the correctional facilities were designated as supermaximum (lock-down) facilities, whereas 29% were maximum security facilities, 14% were medium security facilities, and 36% were facilities of mixed security levels (five facilities were unknown). Correctional facilities were located predominantly in North America (i.e., 42% United States, 42% Canada), with three studies (16%) occurring in Europe.

Participants from the 19 studies consisted of more than 9,823 inmates in AS and 131,169 inmates in non-AS control groups primarily from general prison populations ($n = 131,074$). The average age of participants was 29.3 years ($SD = 4.1$; $m = 8$) for inmates in AS, and 31.4 for inmates in control groups ($SD = 3.8$; $m = 8$). Inmates were generally sent from the general population ($m = 10$); however, in two studies, inmates were placed in AS in a jail setting upon arrest or while awaiting trial. Inmate location prior to AS placement was unknown for seven studies. Meaningful data regarding race, ethnicity, index offense, sentence length, offender risk of reoffending, and other relevant criminal justice sample descriptors (e.g., history of prior incarceration, disciplinary

behavior) of participants were unattainable due to inconsistent or unreported data.

In total, 15 univariate meta-analyses were conducted, with the total number of effect sizes per analysis ranging from 4 to 81 (see Table 3). Among the meta-analyses, just over half (i.e., 53% or 8/15) had Satterthwaite degrees of freedom greater than 4. This was likely caused by the small number of studies and independent samples included within several of the analyses. Consequently, the ES values of the univariate meta-analyses with degrees of freedom less than 4 have been reported for descriptive purposes and should be interpreted with caution. Likewise, due to the low number of studies identified for several of the analyses, the majority of the findings described below are considered preliminary at this time.

Behavioral functioning. A significant, albeit modest, effect of segregation status was found when overall behavioral functioning was examined (ES = 0.43, 95% CI [0.22, 0.65], $p = .001$). When broken down by type of behavior, a slightly smaller, yet significant, effect was found between recidivism and segregation status (ES = 0.33, 95% CI [0.10, 0.57], $p = .014$). With respect to self-harm and victimization, only a small number of studies ($m = 2$ and 1, respectively) were identified, resulting in the Satterthwaite degrees of freedom falling below 4. As such, the level of significance could not be ascertained for these analyses. However, notwithstanding the low degrees of freedom, the analyses revealed that the effects of segregation status on self-harm was moderate in magnitude (ES = 0.78), whereas the effects of segregation status on victimization fell just below the threshold for a moderate effect (ES = 0.49). Level of heterogeneity for the four analyses ranged from low to high ($\tau^2 = 0.00$ to 0.28, $I^2 = 0.0\%$ to 98.93%).

Physical health. A modest effect was found when the association between segregation status and physical health was examined (ES = 0.36, 95% CI [-0.04, 0.75]). Although this analysis was nonsignificant, it appeared to be approaching significance ($p = .068$). Heterogeneity among the effect sizes was considered moderate ($\tau^2 = 0.14$, $I^2 = 62.00\%$).

Cognitive functioning. Given that there was a small number of studies ($m = 2$) from which the effect sizes of the association between cognitive functioning and segregation status could be coded, the results pertaining to cognitive functioning are considered preliminary. Results of the analysis revealed a modest, nonsignificant association between segregation status and cognitive functioning (ES = 0.19). Heterogeneity among the effect sizes was considered low ($\tau^2 = 0.03$, $I^2 = 35.29\%$).

Table 2
Descriptive Statistics and Effect Sizes for Studies Included in the Meta-Analysis by Outcome Type

Study and outcomes	Design quality	Time in AS	Sample size	<i>r</i>
Psychological outcomes				
Anger				
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.00
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.08
Zinger et al. (2001)	Stronger	60 days	136	-.08
Hostility				
Miller & Young (1997; AS)	Weaker	n/a	20	.65
Miller & Young (1997; DS)	Weaker	n/a	20	.09
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	-.07
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.12
Suedfeld et al. (1982)	Weaker	<i>M</i> = 34 days	25	.40
Anxiety				
Andersen et al. (2003)	Weaker	≥3 months	119	.27
Miller & Young (1997; AS)	Weaker	n/a	20	.23
Miller & Young (1997; DS)	Weaker	n/a	20	.34
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.02
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.00
Zinger et al. (2001)	Stronger	60 days	136	.26
Depression				
Andersen et al. (2003)	Weaker	≥3 months	119	.24
Miller & Young (1997; AS)	Weaker	n/a	20	.01
Miller & Young (1997; DS)	Weaker	n/a	20	.27
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.02
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.00
Zinger et al. (2001)	Stronger	60 days	136	.00
Psychosis				
Miller & Young (1997; AS)	Weaker	n/a	20	.15
Miller & Young (1997; DS)	Weaker	n/a	20	.46
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	-.07
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.02
Paranoid ideation				
Miller & Young (1997; AS)	Weaker	n/a	20	.15
Miller & Young (1997; DS)	Weaker	n/a	20	.26
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.06
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.09
Intelligence				
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.15
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.09
Zinger et al. (2001)	Stronger	60 days	136	.02
Cognitive impairment				
Andersen et al. (2003)	Weaker	≥3 months	119	.32
Ecclestone et al. (1974)	Stronger	10 days	16	-.38
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	-.09
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.02
Somatization				
Miller & Young (1997; AS)	Weaker	n/a	20	.25
Miller & Young (1997; DS)	Weaker	n/a	20	.30
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.04
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	-.09
Coping				
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.07
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.08
Negative attitude				
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	93	-.12
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	84	.02
Hypersensitivity				
Miller & Young (1997; AS)	Weaker	n/a	20	.31
Miller & Young (1997; DS)	Weaker	n/a	20	.51
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.13
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.01
Global functioning				
Andersen et al. (2003)	Weaker	≥3 months	119	.21
Suedfeld et al. (1982)	Weaker	<i>M</i> = 34 days	25	.40
Zinger et al. (2001)	Stronger	60 days	136	-.06

(table continues)

Table 2 (continued)

Study and outcomes	Design quality	Time in AS	Sample size	<i>r</i>
Medical/psychophysiological outcomes				
Physical health				
Andersen et al. (2003)	Weaker	≥3 months	119	.09
Ecclestone et al. (1974)	Stronger	10 days	16	.44
O'Keefe et al. (2010; NMI)	Stronger	<i>M</i> = 373 days	94	.05
O'Keefe et al. (2010; MI)	Stronger	<i>M</i> = 361 days	85	.11
Sensory arousal				
Gendreau et al. (1968)	Stronger	7 days	20	.33
Gendreau et al. (1972)	Stronger	7 days	20	.43
Behavioral outcomes				
Postrelease recidivism				
Butler, Steiner, Makarios, & Travis (2013)	Stronger	≥90 days	104	.10
Lovell & Johnson (2004; NMI)	Stronger	≥12 weeks	380	.09
Lovell & Johnson (2004; MI)	Stronger	≥12 weeks	104	-.04
Lovell et al. (2007; direct release)	Stronger	≥12 weeks	110	.19
Lovell et al. (2007; later release)	Stronger	≥12 weeks	252	.02
Mears & Bales (2009)	Stronger	≥91 days	2,482	.02
Motiuk & Blanchette (2001)	Weaker	n/a	931	.10
Institutional misconduct				
Briggs et al. (2003; inmate)	Weaker	n/a	1,143	-.14
Briggs et al. (2003; staff)	Weaker	n/a	761	-.01

Note. NMI = no mental illness; MI = mental illness; AS = administrative segregation; DS = disciplinary segregation; n/a = not available.

Mental health functioning. Results revealed a significant effect of segregation status on mental health functioning, the magnitude of which fell just below the threshold for a medium effect size ($ES = 0.47$, 95% CI [0.18, 0.76], $p = .007$), with the level of heterogeneity falling within the moderate range ($\tau^2 = 0.13$, $I^2 = 61.07\%$). Subanalyses indicated that when general mental health and segregation status was examined, the association was moderate in magnitude ($ES = 0.61$, 95% CI [0.14, 1.08], $p = .022$). However, with the exception of anxiety ($ES = 0.39$, 95% CI [0.08, 0.70], $p = .024$), analyses for the remainder of the mental health outcomes yielded nonsignificant results, with only one

medium effect size (mood/emotion [$ES = 0.54$]; anger/aggression [$ES = 0.28$]; psychosis [$ES = 0.38$]; and hypersensitivity/hyperactivity [$ES = 0.10$]). Heterogeneity among the subanalyses ranged from low to high ($\tau^2 = 0.02$ to 0.70 , $I^2 = 18.48\%$ to 91.92%).

Antisocial indicators. Not surprisingly, a significant association was found between segregation status and antisocial indicators; however, the magnitude of the association was small ($ES = 0.31$, 95% CI [0.13, 0.50], $p = .004$), with a high degree of heterogeneity among the effect sizes ($\tau^2 = 0.05$, $I^2 = 83.68\%$).

Table 3
Mean Weighted Effect Size Values for Segregated Versus Nonsegregated Offenders by Outcome

Outcome	<i>m</i> (<i>s</i>)	Effect size information			Random-effects model with RVE				τ^2	I^2
		<i>k</i>	<i>M</i> (<i>Mdn</i>)	Range	ES (<i>SE</i>)	95% CI _{ES}	<i>t</i> value (<i>df</i>)	<i>p</i>		
Behavioral functioning	9 (12)	32	2.7 (2.0)	1–5	.43 (.10)	[.22, .65]	4.44 (11.00)	.001	.28	98.93
Recidivism	6 (7)	14	2.0 (2.0)	1–5	.33 (.10)	[.10, .57]	3.47 (5.80)	.014	.04	88.30
Self-harm	2 (3)	4	1.3 (1.0)	1–2	.78 (.15)	[.15, 1.42]	5.33 (1.99)	<i>ns</i>	.12	94.57
Victimization	1 (2)	6	3.0 (3.0)	3–3	.49 (.01)	[.35, .63]	44.4 (1.00)	<i>ns</i>	.00	0.00
Physical health	7 (8)	13	1.6 (2.0)	1–2	.36 (.16)	[-.04, .75]	2.20 (6.29)	.068	.14	62.00
Cognitive functioning	2 (3)	16	5.3 (6.0)	4–6	.19 (.08)	[-.16, .54]	2.30 (1.99)	<i>ns</i>	.03	35.29
Mental health functioning	7 (8)	81	10.1 (5.5)	1–28	.47 (.12)	[.18, .76]	3.86 (6.56)	.007	.13	61.07
General mental health	5 (6)	25	4.2 (3.5)	1–8	.61 (.18)	[.14, 1.08]	3.36 (4.79)	.022	.17	61.49
Mood/emotion	4 (5)	5	2.0 (2.0)	1–4	.54 (.32)	[-.34, 1.42]	1.70 (3.99)	<i>ns</i>	.70	91.92
Anxiety	5 (6)	11	1.8 (2.0)	1–3	.39 (.12)	[.08, .70]	3.34 (4.47)	.024	.04	36.12
Anger/aggression	3 (4)	11	2.8 (3.0)	1–4	.28 (.14)	[-.16, .73]	2.10 (2.85)	<i>ns</i>	.07	48.11
Psychosis	2 (3)	10	3.3 (4.0)	2–4	.38 (.06)	[.10, .66]	6.63 (1.75)	<i>ns</i>	.02	18.48
Hypersensitivity/hyperactivity	1 (2)	8	4.0 (4.0)	4–4	.10 (.08)	[-.96, 1.17]	1.24 (1.00)	<i>ns</i>	.04	42.96
Antisocial indicators	9 (11)	29	2.6 (2.0)	1–6	.31 (.08)	[.13, .50]	3.84 (8.66)	.004	.05	83.68
Social interaction	2 (4)	10	2.5 (2.5)	1–4	.02 (.10)	[-.37, .41]	.19 (2.09)	<i>ns</i>	.01	42.45

Note. RVE = robust variance estimation; *m* = number of studies; *s* = number of independent samples; *k* = number of effect sizes; *M* = mean number of effect sizes per study; *Mdn* = median number of effect sizes per study; ES = mean weighted effect size (Hedge's *g*); SE = standard error of ES; 95% CI_{ES} = 95% confidence interval of ES; *df* = Satterthwaite degrees of freedom; *p* = significance value; τ^2 = tau-square value; I^2 = percentage of variability across effect sizes.

Table 4
Effect Size (ES) Statistics by Study and Outcome

Study and outcome	N	ES	Weight
Anger/aggression			
Miller & Young (1997): DS and AD combined			
Hostility	30	.68	4.66
O'Keefe et al. (2010): (a) Nonmentally Ill			
BPRS Hostility-Suspiciousness (Time 1)	60	-.20	2.06
BPRS Hostility-Suspiciousness (Time 5)	60	-.34	2.06
Hostility-Anger Control (Time 1)	93	.37	2.06
Hostility-Anger Control (Time 5)	93	.44	2.06
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Hostility-Suspiciousness (Time 1)	74	.30	2.06
BPRS Hostility-Suspiciousness (Time 5)	74	.03	2.06
Hostility-Anger Control (Time 1)	83	.13	2.06
Hostility-Anger Control (Time 5)	83	-.06	2.06
Zinger et al. (2001)			
Aggression Questionnaire (Time 1)	60	.65	3.67
Aggression Questionnaire (Time 3)	60	.32	3.67
Antisocial indicators			
Butler, Steiner, et al. (2013)			
Felony Re-arrest	104	.26	6.01
Re-arrest	104	.19	6.01
Lovell et al. (2007)			
Felony Recidivism	362	.16	17.09
Mears & Bales (2009)			
Any Recidivism	2,482	.03	4.15
Drug Recidivism	2,482	-.02	4.15
Other Recidivism	2,482	-.05	4.15
Property Recidivism	2,482	.02	4.15
Violent Recidivism	2,482	.12	4.15
Miller & Young (1997): DS and AD combined			
Hostility	30	.68	5.14
Motiuk & Blanchette (2001)			
Re-admission (Any)	931	.43	9.37
Re-admission (New offense)	931	.30	9.37
O'Keefe et al. (2010): (a) Nonmentally Ill			
BPRS Hostility-Suspiciousness (Time 1)	60	-.20	1.59
BPRS Hostility-Suspiciousness (Time 5)	60	-.34	1.59
Hostility-Anger Control (Time 1)	93	.37	1.59
Hostility-Anger Control (Time 5)	93	.44	1.59
PBRS Anti-Authority (Time 1)	73	.28	1.59
PBRS Anti-Authority (Time 5)	73	-.84	1.59
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Hostility-Suspiciousness (Time 1)	74	.30	1.52
BPRS Hostility-Suspiciousness (Time 5)	74	.03	1.52
Hostility-Anger Control (Time 1)	83	.13	1.52
Hostility-Anger Control (Time 5)	83	-.06	1.52
PBRS Anti-Authority (Time 1)	66	.26	1.52
PBRS Anti-Authority (Time 5)	66	-.40	1.52
P. Smith (2006)			
Re-incarceration	5,469	.31	10.89
Revocation	5,469	.33	10.89
Thompson & Rubinfeld (2013): (a) Non-Aboriginal			
Supervision Revoked	549	.77	18.01
Thompson & Rubinfeld (2013): (b) Aboriginal			
Supervision Revoked	314	.50	16.23
Zinger et al. (2001)			
Aggression Questionnaire (Time 1)	60	.65	4.31
Aggression Questionnaire (Time 3)	60	.32	4.31
Anxiety			
Andersen et al. (2000)			
Hamilton Anxiety Scale	127	.09	14.95
Miller & Young (1997): DS and AD combined			
Anxiety	30	.67	1.79
Obsessive-Compulsive	30	1.12	1.79
Phobic Anxiety	30	.16	1.79

(table continues)

Table 4 (continued)

Study and outcome	<i>N</i>	ES	Weight
O'Keefe et al. (2010): (a) Non-Mentally Ill			
Anxiety (Time 1)	93	.53	6.21
Anxiety (Time 5)	93	.58	6.21
O'Keefe et al. (2010): (b) Mentally Ill			
Anxiety (Time 1)	83	.18	5.67
Anxiety (Time 5)	83	.15	5.67
Walters et al. (1963)			
Anxiety	39	.57	7.26
Zinger et al. (2001)			
State-Trait Anxiety Inventory (Time 1)	60	.36	4.64
State-Trait Anxiety Inventory (Time 3)	60	.91	4.64
Behavior			
Butler, Steiner, et al. (2013)			
Felony Re-arrest	104	.26	1.58
Re-arrest	104	.19	1.58
Coid et al. (2003): (a) Men			
Victimization	2,368	.45	.66
Prison victim-forced sexual attention	2,368	.47	.66
Prison victim-unwanted sexual attention	2,368	.58	.66
Self-harm	2,368	.56	.66
Visitation	2,368	-.12	.66
Coid et al. (2003): (b) Women			
Victimization	770	.57	.65
Prison victim-forced sexual attention	770	.32	.65
Prison victim-unwanted sexual attention	770	.56	.65
Self-harm	771	.72	.65
Visitation	768	.06	.65
Kaba et al. (2014)			
Self-Harm	244,689	1.06	1.79
Potentially Fatal Self-Harm	244,689	1.01	1.79
Lovell et al. (2007)			
Felony Recidivism	362	.16	3.42
Mears & Bales (2009)			
Any Recidivism	2,482	.03	.71
Drug Recidivism	2,482	-.02	.71
Other Recidivism	2,482	-.05	.71
Property Recidivism	2,482	.02	.71
Violent Recidivism	2,482	.12	.71
Motiuk & Blanchette (2001)			
Re-admission (Any)	931	.43	1.74
Re-admission (New offense)	931	.30	1.74
O'Keefe et al. (2010): (a) Non-Mentally Ill			
Withdrawal (Time 1)	93	.22	1.55
Withdrawal (Time 5)	93	.30	1.55
O'Keefe et al. (2010): (b) Mentally Ill			
Withdrawal (Time 1)	83	.08	1.50
Withdrawal (Time 5)	83	.27	1.50
P. Smith (2006)			
Re-incarceration	5,469	.31	1.78
Revocation	5,469	.33	1.78
Thompson & Rubinfeld (2013): (a) Non-Aboriginal			
Discretionary Release	1,325	1.22	1.73
Supervision Revoked	549	.77	1.73
Thompson & Rubinfeld (2013): (b) Aboriginal			
Discretionary Release	403	.94	1.68
Supervision Revoked	314	.50	1.68
Cognitive functioning			
O'Keefe et al. (2010): (a) Non-Mentally Ill			
PBRS Dull-Confused (Time 1)	69	.06	2.05
PBRS Dull-Confused (Time 5)	69	-.46	2.05
SLUMS (Time 1)	93	.38	2.05
SLUMS (Time 5)	93	.19	2.05
Trails A/B (Time 1)	93	.22	2.05
Trails A/B (Time 5)	93	-.09	2.05

Table 4 (continued)

Study and outcome	<i>N</i>	ES	Weight
O'Keefe et al. (2010): (b) Mentally Ill			
PBRs Dull-Confused (Time 1)	65	.57	1.82
PBRs Dull-Confused (Time 5)	65	.35	1.82
SLUMS (Time 1)	83	.11	1.82
SLUMS (Time 5)	83	.38	1.82
Trails A/B (Time 1)	83	-.21	1.82
Trails A/B (Time 5)	83	.06	1.82
Zinger et al. (2001)			
WAIS Digit Span (Time 1)	60	.33	2.54
WAIS Digit Span (Time 3)	60	.23	2.54
WAIS Digit Symbol (Time 1)	60	.38	2.54
WAIS Digit Symbol (Time 3)	60	.36	2.54
General mental health functioning			
Cloyes et al. (2006)			
BPRS Total	19	1.14	2.54
Miller & Young (1997): DS and AD combined			
Interpersonal Sensitivity	30	.88	3.14
Miller (1994)			
General Severity Index	30	1.11	1.04
Positive Symptom Distress Index	30	.80	1.04
Positive Symptom Total	30	.88	1.04
O'Keefe et al. (2010): (a) Non-Mentally Ill			
BPRS Anxious-Depressed (Time 1)	60	.35	.55
BPRS Anxious-Depressed (Time 5)	60	.50	.55
BPRS Total (Time 1)	60	.27	.55
BPRS Total (Time 5)	60	.23	.55
PBRs Anxious-Depressed (Time 1)	71	.12	.55
PBRs Anxious-Depressed (Time 5)	71	-.36	.55
PBRs Total (Time 1)	71	.21	.55
PBRs Total (Time 5)	71	-.77	.55
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Anxious-Depressed (Time 1)	74	.26	.53
BPRS Anxious-Depressed (Time 5)	74	.03	.53
BPRS Total (Time 1)	74	.43	.53
BPRS Total (Time 5)	74	.23	.53
PBRs Anxious-Depressed (Time 1)	65	.60	.53
PBRs Anxious-Depressed (Time 5)	65	-.17	.53
PBRs Total (Time 1)	65	.53	.53
PBRs Total (Time 5)	65	-.21	.53
Zinger et al. (2001)			
Brief Symptom Inventory (Time 1)	60	.89	1.05
Brief Symptom Inventory (Time 3)	60	.57	1.05
Holden Psychological Screening Inventory (Time 1)	60	.84	1.05
Holden Psychological Screening Inventory (Time 3)	60	.94	1.05
Hypersensitivity/hyperactivity			
O'Keefe et al. (2010): (a) Non-Mentally Ill			
BPRS Activity (Time 1)	60	-.03	2.78
BPRS Activity (Time 5)	60	-.15	2.78
Hypersensitivity (Time 1)	93	.37	2.78
Hypersensitivity (Time 5)	93	.56	2.78
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Activity (Time 1)	83	-.01	2.78
BPRS Activity (Time 5)	83	-.03	2.78
Hypersensitivity (Time 1)	74	.03	2.78
Hypersensitivity (Time 5)	74	.08	2.78
Mental health functioning			
Andersen et al. (2000)			
Hamilton Anxiety Scale	127	.09	3.22
Hamilton Depression Scale	127	.01	3.22
Cloyes et al. (2006)			
BPRS Total	19	1.14	2.82
Miller & Young (1997): DS and AD combined			
Anxiety	30	.67	.46
Depression	30	.28	.46
Hostility	30	.68	.46

(table continues)

Table 4 (continued)

Study and outcome	<i>N</i>	ES	Weight
Interpersonal Sensitivity	30	.88	.46
Obsessive-compulsive	30	1.12	.46
Paranoid Ideation	30	.41	.46
Phobic Anxiety	30	.16	.46
Psychoticism	30	.61	.46
Miller (1994)			
General Severity Index	30	1.11	1.90
Positive Symptom Distress Index	30	.80	1.90
Positive Symptom Total	30	.88	1.90
O'Keefe et al. (2010): (a) Non-Mentally Ill			
Anxiety (Time 1)	93	.53	.20
Anxiety (Time 5)	93	.58	.20
BPRS Activity (Time 1)	60	-.03	.20
BPRS Activity (Time 5)	60	-.15	.20
BPRS Anxious-Depressed (Time 1)	60	.35	.20
BPRS Anxious-Depressed (Time 5)	60	.50	.20
BPRS Hostility-Suspiciousness (Time 1)	60	-.20	.20
BPRS Hostility-Suspiciousness (Time 5)	60	-.34	.20
BPRS Thought Disorder (Time 1)	60	.26	.20
BPRS Thought Disorder (Time 5)	60	-.20	.20
BPRS Total (Time 1)	60	.27	.20
BPRS Total (Time 5)	60	.23	.20
BPRS Withdrawal (Time 1)	60	.27	.20
BPRS Withdrawal (Time 5)	60	.26	.20
Depression-Hopelessness (Time 1)	93	.74	.20
Depression-Hopelessness (Time 5)	93	2.80	.20
Hostility-Anger Control (Time 1)	93	.37	.20
Hostility-Anger Control (Time 5)	93	.44	.20
Hypersensitivity (Time 1)	93	.37	.20
Hypersensitivity (Time 5)	93	.56	.20
PBRS Anxious-Depressed (Time 1)	60	.12	.20
PBRS Anxious-Depressed (Time 5)	60	-.36	.20
PBRS Total (Time 1)	71	.21	.20
PBRS Total (Time 5)	71	-.77	.20
Psychosis (Time 1)	93	.44	.20
Psychosis (Time 5)	93	.65	.20
O'Keefe et al. (2010): (b) Mentally Ill			
Anxiety (Time 1)	83	.18	.21
Anxiety (Time 5)	83	.15	.21
BPRS Activity (Time 1)	74	-.01	.21
BPRS Activity (Time 5)	74	-.03	.21
BPRS Anxious-Depressed (Time 1)	74	.26	.21
BPRS Anxious-Depressed (Time 5)	74	.03	.21
BPRS Hostility-Suspiciousness (Time 1)	74	.30	.21
BPRS Hostility-Suspiciousness (Time 5)	74	.03	.21
BPRS Thought Disorder (Time 1)	60	.44	.21
BPRS Thought Disorder (Time 5)	60	.58	.21
BPRS Total (Time 1)	74	.43	.21
BPRS Total (Time 5)	74	.23	.21
BPRS Withdrawal (Time 1)	74	.36	.21
BPRS Withdrawal (Time 5)	74	.16	.21
Depression-Hopelessness (Time 1)	83	.24	.21
Depression-Hopelessness (Time 5)	83	.26	.21
Hostility-Anger Control (Time 1)	83	.13	.21
Hostility-Anger Control (Time 5)	83	-.06	.21
Hypersensitivity (Time 1)	83	.03	.21
Hypersensitivity (Time 5)	83	.17	.21
PBRS Anxious-Depressed (Time 1)	74	.60	.21
PBRS Anxious-Depressed (Time 5)	74	-.17	.21
PBRS Total (Time 1)	65	.53	.21
PBRS Total (Time 5)	65	-.21	.21
Psychosis (Time 1)	83	.17	.21
Psychosis (Time 5)	83	.43	.21
Walters et al. (1963)			
Anxiety	39	.57	4.42

Table 4 (continued)

Study and outcome	<i>N</i>	ES	Weight
Zinger et al. (2001)			
Aggression Questionnaire (Time 1)	60	.65	.43
Aggression Questionnaire (Time 3)	60	.32	.43
Beck Depression Inventory (Time 1)	60	.52	.43
Beck Depression Inventory (Time 3)	60	.51	.43
Beck Hopelessness Scale (Time 1)	60	.22	.43
Beck Hopelessness Scale (Time 3)	60	.34	.43
Brief Symptom Inventory (Time 1)	60	.89	.43
Brief Symptom Inventory (Time 3)	60	.57	.43
Holden Psychological Screening Inventory (Time 1)	60	.84	.43
Holden Psychological Screening Inventory (Time 3)	60	.94	.43
State-Trait Anxiety Inventory (Time 1)	60	.36	.43
State-Trait Anxiety Inventory (Time 3)	60	.91	.43
Mood/emotion			
Andersen et al. (2000)			
Hamilton Depression Scale	127	.01	1.38
Miller & Young (1997): DS and AD combined			
Depression	30	.28	1.19
O'Keefe et al. (2010): (a) Non-Mentally Ill			
Depression-Hopelessness (Time 1)	93	.74	.66
Depression-Hopelessness (Time 5)	93	2.80	.66
O'Keefe et al. (2010): (b) Mentally Ill			
Depression-Hopelessness (Time 1)	83	.24	.67
Depression-Hopelessness (Time 5)	83	.26	.67
Zinger et al. (2001)			
Beck Depression Inventory (Time 1)	60	.52	.33
Beck Depression Inventory (Time 3)	60	.51	.33
Beck Hopelessness Scale (Time 1)	60	.22	.33
Beck Hopelessness Scale (Time 3)	60	.34	.33
Physical health			
Andersen et al. (2000)			
General Health Questionnaire	127	.29	5.75
Ecclestone et al. (1974)			
Plasma Cortisol (AM)	16	-.91	1.28
Plasma Cortisol (PM)	16	-.90	1.28
Gendreau et al. (1968)			
Auditory Input	20	.43	1.47
Visual Input	20	.96	1.47
Gendreau et al. (1972)			
EEG	20	2.71	1.17
Visual Evoked Potentials	20	.88	1.17
Miller & Young (1997): DS and AD combined			
Somatization	30	.55	3.46
O'Keefe et al. (2010): (a) Non-Mentally Ill			
Somatization (Time 1)	93	.26	2.68
Somatization (Time 5)	93	.42	2.68
O'Keefe et al. (2010): (b) Mentally Ill			
Somatization (Time 1)	83	.20	2.56
Somatization (Time 5)	83	.17	2.56
P. S. Smith (2008)			
Dyspeptic Problems	1,320	.26	3.98
Psychosis			
Miller & Young (1997): DS and AD combined			
Paranoid Ideation	30	.41	3.16
Psychoticism	30	.61	3.16
O'Keefe et al. (2010): (a) Non-Mentally Ill			
BPRS Thought Disorder (Time 1)	60	.26	3.66
BPRS Thought Disorder (Time 5)	60	-.20	3.66
Psychosis (Time 1)	93	.44	3.66
Psychosis (Time 5)	93	.65	3.66
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Thought Disorder (Time 1)	83	.44	3.61
BPRS Thought Disorder (Time 5)	83	.58	3.61
Psychosis (Time 1)	74	.17	3.61
Psychosis (Time 5)	74	.43	3.61

(table continues)

Table 4 (continued)

Study and outcome	<i>N</i>	ES	Weight
Recidivism			
Butler, Steiner, et al. (2013)			
Felony Re-arrest	104	.26	6.13
Re-arrest	104	.19	6.13
Lovell et al. (2007)			
Felony Recidivism	362	.16	17.59
Mears & Bales (2009)			
Any Recidivism	2,482	.03	4.30
Drug Recidivism	2,482	-.02	4.30
Other Recidivism	2,482	-.05	4.30
Property Recidivism	2,482	.02	4.30
Violent Recidivism	2,482	.12	4.30
Motiuk & Blanchette (2001)			
Re-admission (Any)	931	.43	9.68
Re-admission (New offense)	931	.30	9.68
P. Smith (2006)			
Re-incarceration	5,469	.31	11.30
Revocation	5,469	.33	11.30
Thompson & Rubinfeld (2013): (a) Non-Aboriginal			
Supervision Revoked	549	.77	18.57
Thompson & Rubinfeld (2013): (b) Aboriginal			
Supervision Revoked	314	.50	16.69
Self-harm			
Coid et al. (2003): (a) Men			
Non-suicidal Self-harm	2,369	.56	7.70
Coid et al. (2003): (b) Women			
Non-suicidal Self-harm	771	.72	7.18
Kaba et al. (2014)			
Potentially Fatal Self-harm	244,699	1.01	4.16
Self-harm	244,699	1.06	4.16
Social interaction			
Coid et al. (2003): (a) Men			
Visitation	2,368	-.12	59.11
Coid et al. (2003): (b) Women			
Visitation	768	.06	39.20
O'Keefe et al. (2010): (a) Non-Mentally Ill			
BPRS Withdrawal (Time 1)	60	.27	3.65
BPRS Withdrawal (Time 5)	60	.16	3.65
Withdrawal-Alienation (Time 1)	93	.22	3.65
Withdrawal-Alienation (Time 5)	93	.30	3.65
O'Keefe et al. (2010): (b) Mentally Ill			
BPRS Withdrawal (Time 1)	74	.36	3.61
BPRS Withdrawal (Time 5)	74	.16	3.61
Withdrawal-Alienation (Time 1)	83	.08	3.61
Withdrawal-Alienation (Time 5)	83	.27	3.61
Victimization			
Coid et al. (2003): (a) Men			
Victimization	2,369	.45	9.70
Prison victim-forced sexual attention	2,369	.47	9.70
Prison victim-unwanted sexual attention	2,369	.58	9.70
Coid et al. (2003): (b) Women			
Victimization	770	.57	8.23
Prison victim-forced sexual attention	770	.32	8.23
Prison victim-unwanted sexual attention	770	.56	8.23

Note. *N* = sample size; ES = effect size; Weight = effect size weight derived from robust variance estimation; DS = disciplinary segregation; AD = administrative detention; BPRS = Brief Psychiatric Rating Scale; SLUMS = Saint Louis University Memory Scale; WAIS = Wechsler Adult Intelligence Scale.

Social interaction. A lack of association was found between segregation status and social interaction (ES = 0.02). Although the heterogeneity among the effect sizes for the analysis was low ($\tau^2 = 0.01$, $I^2 = 42.45\%$), so, too, were the Satterthwaite degrees of freedom ($df = 2.09$).

Moderator analysis and metaregression. Due to missing information, only six moderator variables were analyzed (publica-

tion bias [non-peer-reviewed = 0, peer reviewed = 1]; country of origin [other = 0, United States = 1]; type of facility [nonsegregation oriented = 0, segregation oriented = 1]; scientific integrity [indicates no scientific integrity = 0, indicates scientific integrity = 1]; year of publication/completion; and author affiliation [external = 0, internal = 1]). All six moderator variables were simultaneously entered into a multivariate random-effects metare-

gression with RVE. Again, analyses were conducted with the p value set at 0.8, with the sensitivity analysis yielding very little variation at the second decimal for estimates of the regression coefficients, standard errors, and the between-study variance estimates. Moreover, all Satterthwaite degrees of freedom exceeded 4, thus reducing the risk of a Type I error.

Among the six moderator variables, there was a significant moderating effect of country of origin, with effect sizes originating from the United States ($k = 99$) being significantly larger compared with effect sizes originating from other countries ($k = 45$, $b = 0.36$, $SE = 0.10$, $t = 3.47$, $df = 4.62$, $p = .020$, 95% CI [0.09, 0.63]). Interestingly, effect size magnitude was significantly lower among segregation specific facilities (e.g., supermax facilities; $k = 86$) versus facilities that included segregated and nonsegregated inmates ($k = 58$, $b = -0.43$, $SE = 0.16$, $t = -2.77$, $df = 5.36$, $p = .036$, 95% CI [-0.82, -0.04]), and among studies with scientific integrity ($k = 11$) versus studies with no scientific integrity ($k = 133$, $b = -0.39$, $SE = 0.14$, $t = -2.91$, $df = 6.35$, $p = .025$, 95% CI [-0.72, -0.07]). The remaining moderator variables (i.e., publication bias, year of publication/completion, and author affiliation) were not significantly associated with effect size magnitude.

Summary

Table 5 presents effect size comparisons for the two research syntheses and highlights that, considered collectively, analyses produced comparable results for nine outcomes of interest that overlapped between the two reviews.

Discussion

The use of AS is a hotly contested issue in North America such that even the White House and Parliament of Canada is commenting on its potential harms (see Fine & White, 2015; Obama, 2016); however, results of studies to date have been mixed. Thus, a meta-analytic review was warranted to bring some clarity to the effects resulting from the use of AS in corrections. Results of two independent meta-analyses with somewhat different methodologies and studies (although 10 studies overlapped in RS1 and RS2) demonstrated considerable agreement as evidenced by the overlapping CIs on nine important outcomes (see Table 5). This means both studies are sampling from the same population parameters

(Borenstein, 1994; Cumming, 2012; Schmidt, 1992). The results for these outcomes produced effect sizes ranging from $d = 0.06$ to 0.55. Although attaching descriptive labels to effect sizes is problematic (Reviewer 1, personal communication [via manuscript review], March 25, 2016) it is relevant to note that these results are in the small to moderate range, with no analyses resulting in a large ES, which is clearly contradictory to much that has been written about the demonstrable effects of AS (see, e.g., Haney, 2008, 2009). These results are even more compelling when one considers that primary studies with the strongest designs produced much smaller effects in these meta-analyses. These results are surprising, and possibly even confusing, for many, as they do not fit with people's intuitive analysis of what happens when you isolate offenders in AS. Furthermore, these results are in marked contrast to the "fiery opinions" (Reviewer 3, personal communication [via manuscript review], October 9, 2015) commonly presented in the scientific and advocacy literature in which AS has been likened to torture, with debilitating consequences (M. Jackson, 1983; Kupers, 2008). Notably, the "dosage" of AS in a number of studies in these meta-analyses was for periods (e.g., 60 days or more) considered very harmful.

A disconcerting aspect of the AS debate is that discussions of AS have largely ignored other effects of the criminal justice system. This runs the risk of a lack of social perspective taking on the matter. For example, is the magnitude of the effect resulting from confinement in segregated housing greater than adverse effects resulting from general incarceration (i.e., nonsegregated imprisonment)? This does not appear to be the case when segregated inmates are compared with nonsegregated inmates in our respective analyses (see O'Keefe et al., 2010, as just one example from our analyses). Furthermore, meta-analysis of the adverse effects resulting from the use of incarceration produces results (see Bonta & Gendreau, 1990; Gendreau & Labrecque, in press; Gendreau & Smith, 2012; Jonson, 2010; P. Smith, Goggin, & Gendreau, 2002) comparable with or greater (i.e., more severe) than those obtained in our respective reviews of the AS literature. In other words, the quantifiable effects resulting from segregation are comparable with the quantifiable effects resulting from incarceration, as a general matter, and with various nonsegregated prison conditions.

Two exceptions were found: ES for mood disturbance and self-injurious behavior in RS1 and RS2. Regarding the first ex-

Table 5
Effect Size (d) Comparison of Research Synthesis 1 and Research Synthesis 2

Research Synthesis 1				Research Synthesis 2			
Construct	d	95% CI	k	Construct	d	95% CI	k^a
Anger	-.11	[-.34, .11]	3	Anger/aggression	.28	[-.16, .73]	11
Hostility	.28	[-.26, .82]	5	Anger/aggression	.28	[-.16, .73]	11
Anxiety	.34	[.09, .58]	6	Anxiety	.39	[.08, .70]	11
Depression	.15	[-.05, .35]	6	Mood/emotion	.55	[-.34, 1.43]	5
Psychosis	.07	[-.29, .44]	4	Psychosis	.38	[.10, .66]	10
Intelligence	.06	[-.20, .31]	3	Cognitive Functioning	.19	[-.17, .54]	16
Hypersensitivity	.31	[-.07, .69]	4	Hypersensitivity/hyperactivity	.10	[-.96, 1.17]	8
Physical health	.20	[-.03, .42]	4	Physical health	.37	[-.04, .77]	13
Recidivism	.12	[.03, .21]	7	Recidivism	.33	[.10, .57]	14

Note. d = Cohen's d ; CI = confidence interval; k = number of effect sizes.

^a Includes dependent effect sizes.

ception, RS1 and RS2 obtained markedly different effect sizes for depression ($d = 0.15$; RS1) and mood/emotion ($d = 0.54$; RS2). Importantly, however, the indices of mood disturbance (i.e., see Table 5) were very similar regarding the overlap of their CIs, suggesting the real possibility of sampling error inflating results (see Schmidt & Hunter, 2015). Further, the difference in effect sizes for depression and mood/emotion were obtained despite the fact that both research syntheses included the same four studies in computing their effect sizes, such that this difference can be largely attributed to the different coding procedures for the O'Keefe et al. (2010) and Miller and Young (1997) articles. O'Keefe and colleagues used a longitudinal design, and RS1 coded the change in score on an outcome between the first and last time period such that it was a change score analysis; RS2, on the other hand, coded the first and last time points, resulting in one large outlier effect size (2.80) for non-mentally-ill inmates at the last time point of assessment. Although we also used a discrepant coding procedure for Miller and Young, whereby RS2 combined disciplinary and AS groups, and RS1 did not, this discrepancy did not contribute to the differential findings. The coding discrepancy for the O'Keefe et al. study, however, contributed significantly to the different findings on mood outcome between the two research syntheses. Removal of this outlier in RS2 results in a much reduced weighted mean $ES = 0.33$. Thus, considered collectively, these results suggest that inmates experience mild to moderate mood disturbance while in AS.

Regarding the effect of AS on inmate self-injurious behavior, RS2 found a moderate effect. At first glance, this result appears to suggest that the use of AS places inmates at risk for self-harm; however, upon further scrutiny, this may not necessarily be the case. First, instances of self-harm increase significantly in higher security facilities (and AS is the highest level of security classification). That is, the prevalence of inmate serious self-injury is statistically significantly higher in maximum-security facilities than prevalence rates in minimum, medium, or mixed security level facilities (H. P. Smith & Kaminski, 2011). Even more notable are findings that inmates who self-injure themselves had significantly more disciplinary infractions than inmates who did not (H. P. Smith & Kaminski, 2010); thus, they are more likely to be placed in AS (see Liebling, 1995), especially long-term AS (Lanes, 2011), than inmates who do not self-injure. It is also possible, given that some inmates voluntarily seek AS placement, that self-injury may occur as a purposeful means of remaining in AS. Consequently, rather than AS placing inmates at risk for self-injurious behavior, it seems equally plausible that inmates at risk for self-harm are more likely to be placed in AS. Regardless of the directionality, it does appear to be a truism that AS does not suppress the risk of self-injurious behavior, and this issue certainly warrants further study.

Penological Implications

Beyond examining the effects of AS on inmate physical and mental health functioning, as well as behavioral outcomes (e.g., recidivism), the results of this study also provide penological implications. Opinions vary as to whether AS is an effective punishment strategy that increases safety and promotes order throughout the prison system, or whether it might contribute to an increase in institutional misconduct making prisons less safe over

time (see Mears, 2013; Pizarro, Zgoba, & Haugebrook, 2014). Collectively, these two meta-analyses indicate a small increase in postrelease recidivism ($ES = .12$ and $.33$ in RS1 and RS2, respectively) and antisocial indicators ($ES = 0.31$ in RS2); however, the estimate for institutional misconducts ($r = -.01$) suggests a small decrease in inmate violence because of AS.

These results are not intended to, nor do they, minimize the adverse psychological effects experienced by inmates in AS as demonstrated in both RS1 and RS2; however, as noted above, the magnitude of the adverse effects for AS placement tended to be small to moderate, and no greater than the magnitude of effects for incarceration, generally speaking.

The finding that AS results in small increases in recidivism warrants further consideration. Much has been made in the literature that AS increases criminal behavior. The primary studies in our respective research syntheses could not be disaggregated to sort out this question. Recently, Pizarro et al. (2014) posed the question, why should AS be thought to have any unique features to promote criminogenic behavior (i.e., recidivism)? One possibility is the small increase in anger and aggressive tendencies (see RS2), given that anger is considered by some to be associated with criminal risk (Quinsey, Harris, Rice, & Cormier, 1998); however, level of criminal risk is a key construct in this matter. Prisons are criminogenic, but primarily for low-risk offenders (it should be noted that AS is not likely to house many low-risk offenders, as it is customarily used as a practice for the "worst of the worst" with regard to criminal behavior within correctional settings). This tends to occur because low-risk offenders are more vulnerable, such that they are more prone to incorporate the powerful antisocial values of their higher risk prison peers into their behavioral repertoire. This effect becomes stronger as the duration of confinement increases (Gendreau & Smith, 2012). It is possible that AS isolates inmates from the social learning dynamics that promote criminality for this subgroup of offenders (see Bukstel & Kilmann, 1980). Lastly, the rationale that AS produces criminal behavior because it creates mental health problems fails to recognize that symptoms of alienation, anxiety, depression, and schizoid thinking are among the weakest predictors of recidivism (Andrews & Bonta, 2010; Gendreau, Little, & Goggin, 1996).

In summary, these meta-analyses do not endorse the view that AS is an effective punisher. This point is particularly salient when we consider the strength of the research design, as both meta-analyses indicated that weaker designs contributed to notably higher ESs (i.e., less impairment is noted in studies that incorporated stronger research designs). Nevertheless, our work is not complete. One advantage of a meta-analysis is that it takes stock of the literature by identifying research issues that must be resolved before a trustworthy science of the effects of AS can be drawn (Hunt, 1997; Toch, 1984).

Future Directions for Research

Replication is central to establishing a science of prison effects because it generates precise estimates of the ES. Based on the recommendations by Smithson (2003), our benchmark to satisfy the criterion of precision was a $CI < .10$ (Gendreau & Smith, 2007). Because a number of ESs in RS1 and RS2 did not meet this standard, more primary studies must be added to the database for future systematic meta-analyses. Second, meta-analyses them-

selves must undergo “systematic” replications in which central features of the original meta-analyses are maintained, but some aspects are changed (e.g., additional studies, measures, method of meta-analysis; French & Gendreau, 2006; Schmidt & Hunter, 1999; Rosenthal, 1995; Schmidt, 2014). Although we had consistent coder agreement across both meta-analyses, it is possible that interrater reliability is problematic. Consequently, future meta-analyses should include chance-corrected agreement scores (e.g., kappa coefficients) rather than relying on global percent agreement, as was done in these two reviews.

Notably, all of the studies included in these meta-analyses consisted of 1 year or less of AS placement. It is important that future studies examine extended periods of AS, as dosage (time) is increasingly of concern in penological practice, given that even small effects over significant periods of time can have a cumulative effect. Such has been the focus in recent litigation of AS practices (see *Madrid et al. v. Gomez et al.*, 1995; *Ashker et al. v. Governor et al.*, 2015; *Silverstein v. The Federal Bureau of Prisons*, 2011). Environmental factors (e.g., overcrowding, prison culture, staff-inmate relations) also warrant increased consideration. Specifically, it is imperative that replication of the current meta-analyses include data from prisons that have, using Haney’s (2008) terms, a culture of harm. Our interpretation of this expression is a chronic situation in which correctional staff in AS denigrate, harass, and treat inmates capriciously, and induce uncertainty as to how long they will remain in AS, while providing little in the way of treatment and related services. It has been predicted that under these circumstances, acute psychological pathology will be the result (Gendreau & Bonta, 1984; Gendreau & Labrecque, in press; Gendreau & Thériault, 2011; Vantour, 1975). Thus, the real culprit may be a breakdown in the correctional officer–inmate relationship, rather than placement in a segregated physical environment (Gendreau & Labrecque, in press; Gendreau & Thériault, 2011). M. Jackson (1983) remarked that when the same inmates were transferred from AS in one Canadian prison that had miserable physical AS conditions to another in which the facilities had quite acceptable conditions, complaints still were forthcoming.³ The same conclusion was reached by Haney (2008) when he declared that it is “naive view . . . suggesting that modest tinkering with its [AS] basic design can produce a meaningful beneficial or palliative response” (p. 982).

A number of research design issues also merit serious consideration in future studies examining effects resulting from AS placement. Previous mental health functioning (i.e., prior to AS placement) must be examined, as it is quite possible that effects observed in AS are preexisting conditions observed in other aspects of confinement or preincarceration. As previously discussed, staff–inmate relations in AS must be measured (e.g., measure of working alliance, videotape samples of behavior) to partial out effects of the human element from the AS physical setting itself. Second, it must be confirmed empirically that the AS setting under study actually restricts sensory input and/or induces perceptual monotony by taking physical measurements of the level of auditory, kinesthetic, and visual stimulation available to inmates (Gendreau & Labrecque, in press). Zinger (2013) has pointed out that many cell accommodations are in fact mislabeled. Some cell conditions may be claimed by prison authorities to not be AS when they actually restrict stimulation, whereas others are identified as AS but do not restrict stimulation. For example, segregated hous-

ing units that allow double bunking, such as Security Housing Units in the California Department of Corrections and Rehabilitation, may actually equate to sensory overstimulation found in the general population.

None of the studies included in these meta-analyses took efforts to examine or minimize response bias (e.g., overreporting or underreporting of problems/concerns, social desirable responding), with the exception of the Zinger et al. (2001) study, which examined social desirability but did not control for this variable due to its relationship with risk. Future research should utilize methods designed to reduce response bias when questioning inmates in AS (Orne & Scheibe, 1964). Lastly, we must move beyond relying on single point estimates (and significance testing) in favor of examining clinical change. Assessing clinically meaningful changes involves obtaining a difference score between a participant’s pre- and postscores, divided by the standard error of the difference. Cutoff scores are then established for placing an individual in various categories of deterioration, improvement, or no change. For the interested reader, a special edition of *Behavior Research and Therapy* in 1999 (Volume 37, Issue 12) provides an update on the various methods used and the statistical calculations needed for researchers (Hageman & Arrindell, 1999a, 1999b).⁴ It is essential that pre- and postbaseline AS measures of inmates’ time in prison are available to calculate change, which unfortunately has not been the case in studies published to date.

Summary

In closing, we would be remiss if we did not address our perspectives on the penological practice of AS. First and foremost, we anticipate and encourage replication of our findings. Second, and most importantly, although these meta-analyses indicate that AS has rather modest effects on inmate well-being, the results are not justification for its continued use at current levels or for the extreme length of time (e.g., several years) inmates often spend there (Bauer, 2012; Mears & Bales, 2010; Naday, Freilich, & Mellow, 2008). Furthermore, we do not advocate for long-term placement in AS. We submit that the use of long-term AS is a passive correctional intervention that reinforces short-term thinking and primitive solutions (Gendreau, 2012; F. Porporino, personal communication, June 30, 2012) when there are administrative policies, clinical prediction protocols, and treatment programs that can limit its use while maintaining institutional safety and promoting improved behavior (French & Gendreau, 2006; Gendreau & Labrecque, in press; Gendreau et al., 2014). Finally, although the results of these meta-analytic reviews suggested small to moderate effects resulting from the use of AS, and that these effects are consistent with effects from general use of incarceration, it is nevertheless incumbent upon correctional and mental health professionals to monitor and intervene in instances where inmates are at risk. The restricted nature of AS, however, limits

³ A specially commissioned review of dissociation in Canada stated that “most segregated inmates complained about the manner in which they were segregated than the physical conditions in which they lived . . . the physical milieu is not as crucial to the inmate as the psychological” (Vantour, 1975).

⁴ Before the arrival of statistical methods, the Delphi method (i.e., a structured communication technique that relies on a panel of experts; see Dalkey & Helmer, 1963) and client self-report were used, which can still be useful in defining change categories.

access to comprehensive mental health programming for these inmates. Currently, services typically consist of psychotropic medications, brief check-ins at the inmate's cell front, or infrequent meetings in private with a clinician (Metzner & Fellner, 2010). Further complicating the lack of available mental health resources, there is a paucity of treatment programs specifically developed or tailored to meet the treatment needs of segregated inmates, while allowing for treatment delivery within the structured confines of AS. *Escaping the Cage: A Mental Health Treatment Program for Inmates Detained in Restrictive Housing* (Batastini, Morgan, Kroner, & Mills, 2015) is the only intervention we are aware of that uniquely targets the psychological and behavioral problems of AS inmates, while also accommodating the security constraints common in these units. Further research on this and other treatment options is greatly needed.

It is our recommendation that best practices be developed for the use of AS in penological practice. For example, although data do not yet exist to support a specific recommendation, it seems reasonable to suggest that when indeterminate AS sentences are used, a best-practices model would likely rely on specified targets of behavior that must be met for release consideration. Consistent with recent court findings, a model of best practices would eliminate the use of AS for inmates with mental illness (e.g., *Madrid v. Gomez*) except in extreme circumstances (where the safety of the individual or others is contingent upon short-term AS placement). We submit that this is also true for juvenile offenders who may not have developed the resources for coping with the conditions in segregated housing units. Best practices may also include the implementation of therapeutic step-down programs to facilitate easier transfer in spite of the "overall conclusion . . . that symptoms generally recede and people generally get better when they get out of solitary confinement" (P. S. Smith, 2006, p. 26). Results of these independent meta-analytic reviews found small to moderate increases in recidivism when AS inmates are compared with their non-AS peers; thus, we recommend that inmates in AS be transitioned out of AS several months before their release to the community. Though there is not yet enough empirical data on which to base this recommendation, we opine that inmates be transitioned out of AS at least 6 months prior to community reentry.

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