

PREDICTING INVOLVEMENT IN COERCIVE INTERVENTIONS  
FROM INDIVIDUAL AND CONTEXTUAL RISK  
FACTORS AND TREATMENT CONTEXT

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## ABSTRACT

Although coercive physical interventions such as restraint and seclusion have been linked to serious injuries and death in children and adolescents, little is known about the risk factors for youths' involvement in these interventions, particularly in the context of long-term residential treatment. This study examined admission and intake records for 99 youths in an intensive residential treatment facility to identify risk factors that could predict involvement in coercive physical interventions, to identify patterns of coercive intervention involvement while in treatment, and to explore the role of staff training in the use of these interventions. Results indicated that younger age and higher ratings of impulsivity predicted both any involvement and the total involvement in coercive interventions. While aggression was positively correlated with any involvement in coercive interventions, it did not predict total number of interventions required. Higher ratings of callous and unemotional traits and longer length of stay also predicted the total number of interventions a youth was involved in. Five trajectories of involvement across the first eight months of treatment were also identified, including a minimally involved group, a low-slightly increasing group, a moderate-increasing group, a moderate decreasing group, and a high-decreasing group. Finally, results indicated that staff members appeared more likely to utilize coercive physical interventions immediately after training, with steadily declining utilization until the next training session. Also discussed are the relevance of these results to residential treatment and the next steps for research on coercive

physical interventions, given that these youths frequently interact with multiple interconnected microsystems, each of which exerts influence on youths' responses to treatment.

## DEDICATION

This dissertation is dedicated to my family, who supported me throughout what felt like an eternity in school; to my former campers, who reminded me that the line between normal and abnormal is sometimes blurry and always a product of family and environment; and to my former clients in the IRT program at BPCC, who showed me what I was meant to do.

## LIST OF ABBREVIATIONS AND SYMBOLS

ADHD	Attention-Deficit/Hyperactivity Disorder
AIC	Akaike Information Criteria
ANOVA	Analysis of Variance
BIC	Bayesian Information Criteria
BMI	Body Mass Index
CD	Conduct Disorder
CU	Callous/Unemotional
$d'$	Difference in mean values between groups
$df$	Degrees of freedom
DHR	Department of Human Resources
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> Edition
ESIR	Emergency Safety Intervention Report
$F$	Fisher's F ration: A ratio of two variances
$f$	Cohen's effect size index
GLM	Generalized Linear Model
GMM	Growth Mixture Modeling
HIPAA	Health Insurance Portability and Accountability Act
IQ	Intelligence Quotient
IRB	Institutional Review Board

IRT	Intensive Residential Treatment
LMR	Low-Mendall-Rubin Adjusted Likelihood Ratio Test
LOS	Length of Stay
LRT	Likelihood Ratio Test
<i>M</i>	Mean:
<i>n</i>	Number of items, subjects, or values
ODD	Oppositional Defiant Disorder
OLS	Ordinary Least Squares
OR	Odds Ratio
<i>p</i>	Probability associated with the occurrence under the null hypothesis of a value as extreme or more extreme than the observed value
PCL:YV	Psychopathy Checklist: Youth Version
PCL-R	Psychopathy Checklist-Revised
PMAB	Prevention and Management of Aggressive Behavior
<i>r</i>	Pearson product-moment correlation
$R^2$	Coefficient of Determination
SAMA	Satori Alternatives to Managing Aggression
<i>SD</i>	Standard Deviation
<i>t</i>	Computed value of <i>t</i> test
$\beta$	Beta coefficient
$\chi^2$	Chi-square statistical test
#	Number of...
<	Less than

= Equal to

> Greater than

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## **Introduction**

Between 1988 and 1998, 142 clients in psychiatric or group home care died during involuntary restraint and seclusion (E. M. Weiss, 1998). At least 37 more adolescents died between 1998 and 2003 (Nunno, Holden, & Tollar, 2006). These deaths have prompted re-examination of the role of restraint and seclusion in psychiatric care. Legislative and regulatory efforts, coupled with the introduction of treatment programs and protocols that emphasize alternative interventions have resulted in a better understanding of factors influencing the use of these interventions (Busch & Shore, 2000; Fisher, 1994; LeBel, 2008; LeBel et al., 2004). Despite the improving knowledge surrounding restraint/seclusion in inpatient facilities, less is known about the factors that make particular clients more likely to be restrained during treatment. The purpose of the present study is to explore both the patterns of coercive intervention involvement and the psychological and contextual factors that may predict involvement in these types of coercive interventions. From previous research and theory, a model is developed to predict the use of coercive interventions in a long term residential treatment program. These interventions are at times necessary for the safety of both clients and staff, but with additional knowledge, more individually tailored treatment programs may be able to be implemented so that the use of these interventions is minimized and limited to those situations where the necessity outweighs the risks.

This study begins with a review of the use and rationale for coercive interventions such as restraint and seclusion, and the role of aggression in precipitating the use of these

interventions. Next, previous studies that have reviewed coercive interventions in inpatient treatment contexts are discussed. These prior findings are coupled with aspects of the aggression literature to build a proposed predictive model. Finally, the role of training and organizational dynamics is explored. Taken together, this will provide the foundation for hypotheses regarding the current study, which will look at predictors of coercive interventions in a long-term residential treatment facility for children and adolescents.

### **Definition of Coercive Interventions**

The term “coercive physical interventions” is used to describe the set of interventions which are designed to address an immediate safety issue, are physical in nature, are implemented by staff members without client consent, and are maintained until the safety issue is resolved. Broadly speaking, coercive interventions cover both restraint and seclusion. Exact definitions of restraint and seclusion vary slightly from facility to facility (Larson, Sheitman, Kraus, Mayo, & Leidy, 2008) but generally, seclusion refers to the involuntary confinement of a patient to a room where from which they are not permitted to leave – typically through the use of a locked door or physically blocking the exit. As described by the facility where this project was conducted, seclusion is “the placement of an individual alone in any room from which the resident is physically prevented from leaving.” By contrast, restraint “is the direct application of physical force to an individual, without the individual’s permission, to restrict his or her freedom of movement.” The term restraint encompasses three separate methods of restricting a child’s movement: a) mechanical, b) physical, and c) chemical restraint. All are intended to restrain a child’s movement to prevent harm (Busch & Shore, 2000; Leidy, Haugaard, Nunno, & Kwartner, 2006). Mechanical restraint refers to the use of mechanical devices such bed or chair restraints. Physical restraint restricts the child’s movement by use of staff holding the child in a prescribed

manner. Chemical restraint refers to the use of sedative medication to restrict a patient's mobility or range of motion, but may not necessarily refer to the use of pro re nata (prn) medication given to help reduce a child's agitation (Donat, 2005). This is medication which is not scheduled; instead, it is administered when a nurse or other qualified medical personnel determines it is necessary. The terms "coercive interventions" or "coercive physical interventions" are used interchangeably and refer to any use of seclusion or restraint.

### **History and Development of Coercive Interventions**

Proponents of physical restraint have suggested it may be therapeutic and derived from a psychodynamic orientation and/or attachment theory (see D. M. Day, 2002). It was seen as a method to promote a bond between caregiver and child through physical contact. Indeed, its therapeutic use is contra-indicated but still controversially utilized in some treatments of Reactive Attachment Disorder (Haugaard & Hazan, 2004). In contrast, the development of seclusion comes from the concepts of punishment and "time-out," a behavioral approach that enforces a consequence of loss of attention in response to negative behaviors. Although some argue that seclusion is not in and of itself a punishment, seclusion does appear more punitive than "time-out" and is typically done in a specialized, locked room (Cotton, 1989). Cotton argues that seclusion is properly seen as a method of helping children learn control in order to restore their own boundaries. Despite the purported therapeutic rationale(s) for their use, in practice, these interventions, even when necessary, appear to bear little resemblance to something that could be termed therapeutic. Day's (2002) review of the literature regarding the therapeutic benefit of restraint found no systematic study that showed an improvement in the level of attachment. There was also limited support for the therapeutic utility of seclusion, with one study finding seclusion as an effective means of reducing aggression (Persi & Pasquali,

1999) and several others finding no change in aggression (Atkins & Ricciuti, 1992; Hickerson & Garrison, 1991).

### **Current Use of Coercive Interventions**

Although restraint and seclusion have been seen in the past as therapeutic interventions, there is now a near-universal consensus that they are justified only to prevent harm to a client or others when less restrictive methods have not worked or are not practical (D. M. Day, 2002). They are most commonly used in response to aggression toward staff or peers (Sourander, Aurela, & Piha, 1996), though there is some evidence that assaults against staff may be more likely to result in restraint/seclusion than assaults against peers (Garrison, 1984; Gullick, McDermott, Stone, & Gibbon, 2005). When Fisher (1994) reviewed the literature on restraint and seclusion from 1972 to the 1994, he concluded that they can be used safely and effectively to reduce agitation, and that inpatient programs cannot operate without at least the possibility of using restraint and seclusion. He also noted the role that staff training, perception, and administrative focus play in the use of coercive interventions. Finally, his review illustrated the increasing recognition that these interventions have a lasting impact, both physically and psychologically, on all participants—both patients and staff. More recent reviews have concurred with Fisher's conclusions, while also noting that the use of these interventions varies independently of clinical and client characteristics and is affected by inconsistent decision making by staff (Busch & Shore, 2000). Those authors noted there is no evidence regarding which coercive intervention should be used based on the situation and client characteristics, and that no rigorous studies had looked at the efficacy of emergency medications in adults or children, despite their increasing use in managing aggression.

The American Academy of Child and Adolescent Psychiatry's most recent practice parameter regarding managing aggressive behavior in child and adolescent inpatient settings emphasizes the importance of the intake and evaluation process in minimizing coercive interventions (Masters & Bellonci, 2001). At a minimum, they note that this evaluation (a) should include a review of aggressive behavior and its antecedents, including prior restraint and seclusion events, (b) should determine any cognitive limitations or neurological deficits, and (c) should uncover any medical factors that may require modification of coercive intervention procedures. They also note that repeated, high quality training of staff in implementing these interventions is essential, and that this training should include the actual intervention techniques as well as shift-by-shift communication, documentation, and emergency preparedness procedures.

### **Aggression**

Given the restrictions regarding coercive interventions, particularly that they are limited to times when the client's safety is at risk, aggressive behavior toward others is the overwhelming precipitant to their use. There is extensive research on the risk factors for childhood aggression. For example, there is evidence that poor or disorganized attachment is associated with aggressive behavior (Valois, MacDonald, Bretous, Fischer, & Drane, 2002). Poor parenting, exposure to violence or maltreatment, and negative or inconsistent parenting are also associated with aggressive behavior. Contextual factors such as low socio economic status (SES), frequent changes in residence, and single parent families are linked to aggressive behavior. Socially, there is evidence that an antisocial peer group can reinforce aggressive behavior (see e.g., Lochman & Wells, 2002b). Other, more individual risk factors for aggression include having a psychiatric disorder and below average intellectual functioning (Rappaport &

Thomas, 2004). Some caution in interpreting these findings is warranted with regard to the specific setting of residential treatment due to the extraordinarily high number of risk factors present for many of those children. It is possible that different aspects of risk moderate the relationship to aggression in these extremely high aggression samples.

While aggression is commonly thought of as an act intended to injure another, in more severe samples, there is growing research regarding self-directed aggression (Boxer, 2010). Looking at a history of both self- and other-directed aggression as a risk factor for aggression in treatment, Boxer found that those youths who engaged in both self- and other-directed aggression engaged in more aggressive acts while in treatment than did those youths who had no history of aggression or those who had only engaged in one form of aggression. Boxer also examined those youths who had no history of aggression yet engaged in aggression during treatment (“emerging”) and those who had a history of aggression but did not engage in aggression during treatment (“desisting”). Those youths who desisted had significantly more risk factors, including psychopathology, maltreatment, and prior treatment history. While those desisting are likely responding positively to the treatment environment, those with “emerging aggression” may be further evidence for the role of a negative peer group in promoting and sustaining aggression. Self-directed aggression was more likely to emerge during treatment than other-directed aggression, and both were more frequent than those who desisted in treatment. The concept of emergent aggression is particularly concerning, as it suggests that even those youths who appear unlikely to require coercive physical interventions based on their history may in fact require them while in treatment. In essence, they may be learning aggressive behaviors from a negative peer group. Still, more research is needed on the differences in self- and other-directed aggression and how that corresponds to the use of coercive interventions.

## **Psychopathic Traits**

For youths coming into residential care, in addition to the contextual, pre-morbid risk factors for aggression such as family dysfunction or a deviant peer group, it is also important to understand the role that personality or behavior traits play in aggression. One area that has received attention is the construct of psychopathy. Psychopathy is a set of interpersonal, affective and behavioral characteristics (Salekin, Leistico, Neumann, DiCicco, & Duros, 2004; Salekin & Lynam, 2010) encompassing ego-centricity, manipulation, lack of empathy, and impulsiveness. Measures of psychopathy such as the Psychopathy Checklist: Youth Version, the Psychopathy Checklist: Revised, and the Antisocial Process Screening Device generally show between 2 and 4 factors within the broader construct of psychopathy (Cooke & Michie, 2001; Harpur, Hare, & Hakstian, 1989; Vitacco, Rogers, & Neumann, 2003). In the well-validated 3-factor model, one factor represents an arrogant, deceitful interpersonal style, factor 2 measures deficient affective experience, and factor 3 is characterized by impulsive, irresponsible behavior (Cooke & Michie, 2001). Thus, the 3 factor model encompasses narcissism, callous-unemotional (CU) traits, and impulsivity. Impulsivity has been shown to be significantly related to aggression in general in middle school children, while CU traits and narcissism were related to some particular forms of aggression, such as physical and proactive aggression (Kerig & Stellwagen, 2010). The relation between psychopathic traits and aggression has also been seen in clinical samples, such as children with Conduct Disorder (Dolan & Rennie, 2007). Most analogous to the current study, for adolescents in inpatient settings, psychopathy scores have been shown to predict later aggression while in treatment (Stafford & Cornell, 2003) as well as involvement in seclusion and restraint (Stellwagen & Kerig, 2010a). Psychopathy was predictive above and beyond variables such as diagnosis or the results of a broad clinical inventory.

Psychopathic traits such as CU, impulsivity, or narcissism appear to have a significant relation to aggressive behavior beyond that explained by other related variables such as diagnosis. Given the role of aggression in coercive interventions, this represents an important area for further study.

### **Previous Studies Examining the Prediction of Coercive Interventions**

Despite the growing literature regarding reducing coercive interventions, there remains limited understanding of what factors make it more likely that a child in out-of-home residential care will require such an intervention. Much of the work that has been done has been conducted in short or medium-term inpatient facilities. While important, this neglects those children who may be non-responders to treatment and thus require more intensive, long-term services. Although there is no clear delineation between short, medium, and long-term facilities, this study generally considers a stay of more than six months as long-term. Short and medium term facilities have typical treatment durations ranging from a few days (e.g. emergency hospitalization) to a few months. Note that within any facility, some clients may stay significantly longer than average due to factors such as their psychiatric condition or a lack of suitable discharge plans. Similarly, clients in a long-term facility may be discharged early due to a need for more acute care.

***Short Term Facilities.*** A Finnish study examined the use of seclusion, therapeutic holding, mechanical restraint, and time-out for nearly all hospitalized children in Finland in 2000 (Sourander, Ellila, Valimaki, & Piha, 2002). The prevalence of each technique, that is the percentage of clients involved in at least one episode during treatment, was 8.5% for seclusion, 28% for time out, 26% for holding, and 4% for mechanical restraint. Although an average length of stay was not reported, they did find that all four interventions were more likely in children

who stayed more than 90 days compared to those who stayed less than 90 days. All coercive interventions were more prevalent for adolescents compared to children and for those who engaged in aggressive acts. Differences between boys and girls were found only for time-out and holding, with boys being more likely to have required intervention. Perhaps most interestingly, in multivariate analyses there were notable differences between the interventions depending on the diagnosis of the patient. Time-out was associated with suicidal acts; holding was associated with attachment disorder and autism spectrum diagnoses; seclusion was associated with psychosis; and mechanical restraint was associated with psychosis and suicidal acts. Family structure and in-home versus out-of-home placement did not significantly predict any coercive intervention in multivariate analyses, although overall functioning level did predict more coercive interventions while in treatment. No ethnicity information was reported.

Another study examining the use of seclusion in a short-stay inpatient unit found that those children who were secluded had significantly higher levels of externalizing and internalizing difficulties compared to children who were not secluded or were in outpatient treatment only (Gullick, et al., 2005). Boys were more likely to be secluded than girls, and children who were secluded also had more life stressors and lower overall functioning than outpatient clients. When the specific seclusion events were considered, the primary precursors were, in descending frequency, risk to others, risk to self, verbal abuse/threats, and property destruction. Gullick et al. did not report ethnicity information; furthermore, while the authors did not separate restraints from seclusions, they noted that 95% of seclusion episodes also required restraint, and 5% of episodes involved the administration of medication, including thioridazine and clonazepam.

**Medium Term Facilities.** The most comprehensive study to date was conducted in a medium term residential facility with an average stay of 97 days (Boxer, 2007). In that study, approximately 35% of patients were restrained or secluded during treatment. This is consistent with findings from other studies that suggest a large number of restraints are caused by a small number of children (see e.g., Leidy, et al., 2006). Three patients required more than 100 coercive interventions; no other patient required more than 70. Involvement in any coercive intervention during treatment was predicted by the total level of aggression, body-mass index, exposure to domestic violence, peer victimization, previous hospitalization, and previous residential treatment. The total number of coercive interventions and restraints a client required were predicted by level of aggression, body-mass index (BMI), and prior residential treatment. Total seclusions were predicted only by aggression. Both seclusion and restraint were more common when aggression was directed at others than when it was self-directed. While psychological diagnostic status was looked at, it did not independently predict involvement in or number of incidents, nor did context variables such as race, IQ, abuse, and previous types of aggression. Using all of the variables investigated, retrospectively, approximately 66% of the participants were correctly predicted as being involved in a coercive intervention and approximately 90% were correctly predicted as not being involved in a coercive intervention, for an overall classification accuracy of 79%.

That classification accuracy is roughly comparable to a more recent study of a medium term facility conducted in Canada (Stewart, Theall-Honey, Armieri, & Cullion, 2010). Stewart et al. also reported that more than 50% of the participants experienced at least one coercive intervention during treatment, and consistent with other studies, boys were more likely than girls to be involved in coercive interventions. They also found higher rates for younger children, for

those who had exhibited more self-harmful behaviors prior to treatment, and for those with lower overall functioning. A history of abuse did not predict involvement in coercive interventions, and information regarding ethnicity was not reported.

***Long Term Facilities.*** A study investigating female adolescents in longer term care – average length of stay of 11 months – found a prevalence of 38% for restraint involvement while in care (Leidy, et al., 2006). The authors found that longer length of stay and younger age predicted more involvement in restraint. While white females averaged more restraints than African American females, this was due to a small number of white females who accounted for 30% of all restraints. African Americans were most likely to be involved in at least one restraint, followed by Caucasian and then Hispanic females. Somewhat surprisingly, girls who had been placed due to abuse/neglect or voluntarily had more restraints than those placed as a result of juvenile delinquency or “person in need of supervision” determinations, providing some evidence for the importance of any history of abuse. Those girls with a diagnosis at intake were more likely to be frequently restrained (>8 restraints during treatment) than those without a diagnosis; however, diagnosis of an internalizing versus externalizing disorder did not predict involvement. Unlike many studies, the authors also explored day and time patterns to restraints, finding an increasing number through early evening, peaking between 8 and 9 pm, as well as a declining number during the school week before increasing over the weekend to a peak on Mondays. As might be expected, restraints decreased as treatment neared completion except for the final 10% of stay, where a moderate increase was noted. While speculative, this may be due to increasing anxiety about returning home or to a less stable environment than that of treatment; or alternatively to an increase prior to hospitalization.

Table 1 below summarizes the variables and findings considered by the five most recent and comprehensive studies looking at the use of coercive interventions with children and/or adolescents in out of home care:

Table 1

*Previous Studies*

	Gullick	Stewart	Boxer	Sourander	Leidy
Length of Stay	Short	Medium	Medium	Varied	Long
Ages included	CA	CA	A	CA	A
Separated Restraint and Seclusion	Seclusion only	Yes	Yes	Yes	Restraints only
Gender Differences	No effect	Yes	Marginal	Yes	Girls only
Diagnosis	Internalizing/ Externalizing	No effect	No effect	Some differences	No effect
Family Context	No effect	Not explored	No effect	No effect	Not explored
Abuse History	Not explored	Marginal	No effect	Not explored	Not explored
Age effects (as age increases)	Not explored	Decreasing	No effect	Decreasing	Decreasing
Medication	Reported only	Included as intervention	Not explored	Not explored	Not explored

*Note.* \*CA indicates study included children and adolescents, A indicates study included only children older than 10. Short stay: less than 2 weeks; medium stay: between 2 weeks and 120 days; long: > 120 days

All of the studies were consistent in the primary precipitant for coercive interventions being aggression. There was also consistent support for the presence of a group of youths who required a disproportionate number of coercive interventions as well as a group who required none.

There are many precipitants for aggression in inpatient settings, including significant life stressors, the presence of a peer group that promotes aggression, and the absence of an alternative (Bell, 1997). As discussed above, youths also bring with them to treatment traits that have relevance to engaging in aggressive behavior. More recent literature has explored the

importance of callous-unemotional (CU) traits in predicting the use of coercive interventions. In a medium-term psychiatric hospital, restraint rates were predicted by CU traits, while other factors such as age, gender, and diagnosis of Oppositional Defiant Disorder (ODD) or Conduct Disorder (CD) were not predictive (Stellwagen & Kerig, 2010a). For seclusion, only the presence of CU traits and younger age were predictive of incident rate. A separate study found that the presence of CU traits was predictive of longer length of stay for both a children's unit and an adolescent unit (Stellwagen & Kerig, 2010b). As with Stellwagen & Kerig (2010a), other factors such as overall functioning, age, and CD or ODD were not predictive.

### **Coercive Intervention Patterns**

Given the mixed results of finding pre-treatment predictors, some work has been done on identifying early on those youths falling into various patterns with regard to coercive interventions. While many studies classify participants as either “involved” or “not involved” in a coercive intervention, and/or consider the extent of involvement, less attention has been focused on identifying patterns of involvement. This becomes particularly relevant in light of the evidence for a group of youths who are highly involved in coercive physical interventions, as well as a group that are not involved in any coercive physical interventions. One study attempting to identify groups of youths requiring a low (<1 on average per month), moderate (1-2 per month), or high (>2) number of coercive interventions found that group membership was highly unstable until about 60 days in treatment, at which point more reliable groups were identified (dosReis et al., 2010). Looking at various risk factors within these later classified groups, they identified internalizing disorders, antipsychotic medication, and mood stabilizer medication as more prominent in the high use group than the low use groups. At 60 days, youths in the high use group were roughly 15 times more likely to require a subsequent coercive

intervention than youths who had not yet required one. The instability in group membership early in treatment suggests that there may be other relevant groups. This conclusion is reinforced when considering that the low, moderate, and high use groups were created by averaging total restraints as opposed to a procedure that used a temporally flexible definition of group membership. Given other work showing coercive intervention use generally declines with time in treatment (Leidy, et al., 2006), for example, in addition to low-coercive intervention and high-coercive intervention groups, there may be a decreasing-coercive intervention group.

### **Toward A New Model**

While the research on prediction of coercive interventions is growing, there are number of gaps in the literature. Most apparent is the primary focus on short term, acute care settings, resulting in a much more limited understanding of longer-term care environments. Given the prior research suggesting that length of stay is strongly correlated with coercive interventions, neglecting longer term facilities is particularly unfortunate. Long term care facilities likely incorporate a more significant number of youths who are treatment-resistant and who may differ in presentation and history from those who require only short-term or acute care.

Second, when considering any particular risk factor and its predictive value, the results typically vary significantly across studies. There are several possible explanations for this phenomenon. One is that these differences in risk factors represent underlying population differences as measured by various samples. For example, as mentioned earlier, if youths in longer-term care are substantially different from those in acute care, their risk predictors may differ as well. Another explanation is the high number of risk factors for each individual in the sample compared to a more normative or community sample. As a result, there is likely to be more significant comorbidity of risk factors and identifying any one factor's unique contribution

may exclude a substantial amount of variance that is present but shared with other factors, depending on the types of statistical models used.

The proposed study moves beyond these limitations by focusing on a long-term intensive residential care facility and by winnowing down the possible predictors to those that have received some support in the literature within a set of theoretically related risk clusters. Two other advances from prior work are the inclusion of a measure of CU, impulsive, and narcissistic traits and incorporating a broader perspective regarding outcome groups than the typical “involved” or “not-involved” classifications. It may be that specific risk factors are more capable of explaining patterns in coercive intervention usage than they are in predicting the use of coercive interventions at any point in treatment. For example, a child with a history of sexual abuse may react differently to a coercive intervention early in treatment than a child with history of sexual abuse. Such an event may be more salient to the abused youth, resulting in more negative behaviors and more coercive interventions. By contrast, a non-abused youth may experience a similar coercive intervention very differently, and engage in less negative behavior so as to avoid future coercive interventions.

### **The Impact of Training and Organizational Philosophy**

One final area that deserves attention is that of training and organizational philosophy. Coercive interventions are a result of an interaction between clients and staff, who in turn are influenced by a variety of environmental and organizational factors (Larue, Dumais, Ahern, Bernheim, & Mailhot, 2009). Training staff in the implementation of coercive interventions is an essential component of a successful policy (Fisher, 1994). This is particularly clear when considering the risk of substantial injury involved. Between 1998 and 2003, at least 25 youths died from asphyxiation alone during a restraint, with the majority resulting from the position or

compression during a physical restraint, clear areas where training can be critical (Nunno, et al., 2006). Effective training focuses both on individual facilities and the larger context within a region or state.

At the individual facility level, there is substantial evidence that organizational philosophy is a significant predictor of restraint/seclusion use (Delaney, 2006). Reducing the use of coercive interventions is best accomplished by changing the organizational philosophy to recognize reduction as a primary goal, involving patients and staff in the mission, and using data-driven methods to analyze progress. One facility that implemented a reduction program including a 15 hour training program and regular coaching of staff found a significant reduction in restraints for 3 months and a reduction in seclusion for one of the 3 months following training (Crosland, Cigales, et al., 2008). Others have shown similar effects (e.g., Forster, Cavness, & Phelps, 1999).

One difficulty noted in surveying the literature on reducing coercive interventions is the lack of consistent differentiation between restraint and seclusion, making it difficult to determine if a reduction in restraint rates represents an overall decline or the substitution of a method such as seclusion. For example, introducing a padded seclusion room into an adolescent state psychiatric hospital resulted in a more than 90% decline in mechanical restraint episodes but no change in total events or seclusion time (Larson, et al., 2008).

One literature review found that in all but one study, training decreased use of coercive interventions and injuries resulting from those interventions (Busch & Shore, 2000). A statewide initiative in Massachusetts (LeBel, et al., 2004) incorporated a focus on restraint/seclusion procedures during licensing visits twice a year, a statewide best practices conferences, roundtable discussions between providers, and state-wide grand rounds. Despite the fact that the facilities

involved used a variety of different internal programs to reduce restraint and seclusion, statewide, the incidence of coercive interventions decreased by 73% for child facilities, 59% for child/adolescent facilities, and 47% for adolescent facilities. Importantly, despite predicting an increase in medication as an alternative to restraint/seclusion, medication use dropped by 50% as well. Administrative decisions can also have an impact on coercive intervention use. Donat (2002) noted that in a public psychiatric hospital, there was a significant correlation between the patient to staff ratio and total time spent in coercive interventions. This correlation accounted for 25% of the monthly variance in restraint/seclusion episodes. Even with the significant paperwork now required when conducting coercive interventions, there is also evidence to suggest that in a substantial minority of cases, required protocols are not followed and/or documented (Chandler, Nelson, & Hughes, 1998).

As the literature reviewed above demonstrates, there is increasing knowledge of the predictors of coercive interventions for short and medium term residential facilities, but less with regard to longer term treatment facilities. Since length of stay consistently is linked to number of coercive interventions across studies, studying long term facilities, or those with an average length of stay of 6 months or more, is a critical area of need. There is increasing evidence for the presence of different groups or patterns in terms of requiring coercive interventions across time in treatment, such as a high-use, moderate use, and no use group.

It is important to consider that not all coercive interventions are created equal. Each is a unique combination of child, staff, and environment, and each varies in intensity and duration. Some, but not all acts of aggression lead to coercive interventions. The literature base, while still sparse, is improving in terms of identifying and evaluating overall risk factors, but is even less developed in terms of compartmentalizing the severity of various incidents. Further

complicating matters is that the risk factors children bring with them into treatment then interact with the staff, environment, and overall culture of the treatment facility, introducing temporal effects and an almost limitless number of potential interactions. The research questions for this study were designed to begin teasing out some of these conflicting relations using a mix of longitudinal and cross-sectional data.

There are three primary research questions regarding this study:

1. Can a set of risk factors developed from prior research and developmental theory predict involvement in coercive interventions in a long-term intensive residential treatment facility?
2. Can youths with different coercive intervention usage patterns be (a) identified and (b) differentiated on the basis of the various risk predictors?
3. What is the relationship between recent staff training and involvement in coercive interventions?

The first question focuses on replicating some of the findings from short/medium term facilities in a long-term facility. The second question goes beyond previous work by integrating the prediction of coercive interventions with common patterns of coercive intervention involvement across time. Drawing on previous work (dosReis, et al., 2010), and based on the coercive intervention data from this study, several groups with varying patterns of coercive interventions over the course of treatment will be identified, such as no involvement, decreasing involvement, and high involvement of coercive interventions. These groups will then be compared on the various predictor variables to determine if there are significant between-groups differences. Question three takes a first look at the importance of training. As described below,

other variables are collected to conduct exploratory analyses aimed at further understanding the nature of client involvement in coercive interventions.

## **Hypotheses**

There are a significant number of variables that have been analyzed in the various prior studies regarding coercive interventions. Variables that have been predictors of involvement in coercive interventions in prior studies, or that differentiate groups of involved/not-involved youths, include age, diagnosis, gender, past hospitalizations, past residential treatment, history of abuse, length of stay, life stressors, global functioning, level of internalizing/externalizing problems, history of aggression, exposure to domestic violence, peer victimization, body mass index, callous/unemotional traits, and prescribed medication class. From this list, given prior research and theory, a set of predictors that is most promising can be identified. The demographic variables of age, gender, and BMI will predict involvement. For example, age and gender have been predictive of coercive interventions in studies of short- (Gullick, et al., 2005; Sourander, et al., 2002), medium- (Boxer, 2007; Stewart, et al., 2010), and long-term (Leidy, et al., 2006) facilities. BMI has also been shown to predict involvement (Boxer, 2007). By contrast, factors such as ethnicity have generally not been shown to be predictive of coercive interventions. Of the primary variables of interest, aggression is the primary precipitant of coercive interventions, and has been linked to use of these interventions in many of the studies discussed above, thus, a history of aggression is likely to predict involvement. Second, given research on inconsistent parenting, abuse, and domestic violence, and its impact on aggression, family discord and disruption is also likely to be predictive. This is expected to best be captured by length of, or age of DHR involvement with a child, since earlier involvement implies a longer, more extensive degree of dysfunction. Prior work also suggests that previous inpatient

and residential treatment will predict involvement. Finally, the presence of impulsivity, narcissism, and callous/unemotional traits will add significantly to the predictive power of the aforementioned variables, consistent with previous work on psychopathy, aggression, and coercive interventions (Stafford & Cornell, 2003; Stellwagen & Kerig, 2010a).

**Primary Model Predicting Any and the Extent of Involvement in Coercive Interventions.**

1. Consistent with previous research showing that coercive intervention use declines with age, there will be a significant relation between age of placement and involvement in restraint/seclusion, as well as in the extent of these interventions. There will also be a significant relation between previous inpatient/residential placements and coercive intervention involvement.
2. Previous aggression has been shown to predict coercive interventions. Consistent with the findings of Boxer (2007), it is expected that youths with a history of aggression will be more involved in restraint and seclusion.
3. Consistent with prior research suggesting that the presence of CU traits is predictive of aggression and the use of coercive interventions, as well as similar work with regard to other psychopathic traits such as narcissism and impulsivity, it is expected that a youth's rating on a measure of these traits will predict involvement in coercive interventions above and beyond any effect of diagnosis or aggression history alone.
4. Of the various predictors measuring family dysfunction and abuse, it is expected that the length of DHR involvement will be the strongest predictor of coercive intervention involvement. DHR primarily becomes involved due to abuse or neglect, and longer histories in DHR suggest more instability in primary caregiver and permanency planning. Thus, DHR involvement is likely to encompass and partially explain the impact of

several other variables, such as abuse history, number of foster placements, and discharge plan.

### **Patterns of Coercive Intervention Involvement.**

5. A number of homogenous groups of clients representing various patterns of coercive intervention involvement over time in treatment can be identified from the larger client population, including a group with a consistently high level of involvement, a group with low involvement, a group with no involvement, and a group with generally decreasing involvement.
6. Aggression history, psychopathic traits, and length of DHR history will predict membership in groups representing these patterns of coercive intervention involvement.

### **Other Hypotheses regarding Coercive Interventions.**

7. Staff training and administration have been shown to have a significant impact on restraint and seclusion use. It is expected that staff members' involvement in restraints and seclusions will vary between the period preceding in-service training and the period following training.

### **Exploratory Analyses**

Several exploratory analyses will be conducted; similar to those looked at by Leidy, et al. (2006), regarding time and treatment status of coercive interventions. For example, one possible explanation for the finding of more restraints early in the week and later in the evening is related to programming structure (Bell, 1997; Miller, Hunt, & Georges, 2006). For example, school is often a highly structured environment, even compared to other times in residential programs. Staff may also differ between school, non-school, and weekend periods. Leidy's data suggests more difficulties as structure decreases (e.g. later in the day) as well as during transitions from

one environment to another (e.g. from weekend to weekday). It is expected that a similar pattern would hold in a variety of treatment settings. Another factor that has received only minimal attention is the use of prn medication to manage aggression in children. One study noted minimal use of medication during episodes (Gullick, et al., 2005), while another included medication as a form of coercive intervention but did not look at predictors of medication separately from seclusion and restraint (Stewart, et al., 2010). The current study looks at differences in the predictors of involvement in seclusion, involvement in restraint, and administration of a prn medication, in addition to considering prescribed medications as a control variable. Information quality was also considered. Finally, information on other in-treatment indicators such as aggression/rule-breaking and treatment progress was collected to see if they evidence similar patterns to those underlying coercive interventions.

## **Method**

### **Design**

The primary independent variables of interest are the family context, diagnostic, and demographic variables known to the treatment facility as part of the intake process. The primary dependent variables were dichotomous- and count-variables for involvement in coercive interventions. This study was conducted as a file review study using information contained in each clients' clinical chart. Information regarding family history, diagnosis, previous evaluations, Department of Human Resources (DHR) involvement, and tentative discharge plans are required prior to or as part of the admission process.

### **Participants**

Participants for this study included all youth being treated within one year of December 31, 2009 in a long-term intensive residential treatment (IRT) facility in the southeast. The facility has 36 beds and admits children and adolescents between the ages of 6 and 18. Length of stay varied but is typically a minimum of 6 months and an average of 12 months. Discharges prior to 6 months are infrequent and typically result when patients require hospitalization due to their behavior or suicidal risk. For this study, less than 20% of the sample was discharged within 6 months of admission. All children admitted have a DSM-IV diagnosis and previous IQ testing, moderate or more severe intellectual disability is an exclusion criterion for treatment through the IRT program. The total number of participants was 99.

For the facility at which the project was conducted, a restraint is “the direct application of physical force to an individual, without the individual’s permission, to restrict his or her freedom of movement.” Seclusion is defined as “the placement of an individual alone in any room from which the resident is physically prevented from leaving.” These interventions are only used when there is an “imminent risk of harm” to the client or others. Although the definition of seclusion does not specify the location, and some incidents of seclusion do occur in other locations such as a child’s bedroom, facility policy dictates that seclusions generally occur in a time-out room that has a window and locking mechanism that must be continuously engaged by staff from the outside. While a single intervention may consist of a restraint, a seclusion, or both a restraint and a seclusion, these definitions and policies are such that there are fewer seclusion-only events than restraint-only or restraint and seclusion events. A seclusion only event would mean that the child did not need to be escorted to the time-out room, the seclusion took place in an alternative location, or a seclusion began while the child was in a time-out or calm-down (for example, a child in the time-out room who began spitting on staff). At the facility, detailed reports are completed following coercive interventions, described by the facility as “Emergency Safety Intervention Reports” or ESIRs, and include a description of the precipitating event, various approvals, reports on prn medication administration, and injury data. These reports were the source of the coercive intervention data.

Staff training information came from the facility’s training department. The facility’s training curriculum was largely self-made (A. Lockhart, Personal Communication, May 2008). Its development arose from two coercive intervention and aggressive behavior management programs: Prevention and Management of Aggressive Behavior (PMAB) and the Satori Alternatives to Managing Aggression (SAMA). The facility in question, having used PMAB

prior to 2002 and SAMA from 2002 to 2007 then developed the “CAP” program. CAP stands for Calm, Active Listening, Plan, and is a comprehensive approach to dealing with children who are emotionally reactive or at risk for aggression. It emphasizes a collaborative approach in which staff members learn to anticipate difficult situations based upon characteristics of the child and the environment, work to assist the child in emotional modulation, and then help the child problem solve and plan for future, similar situations. In addition, the facility teaches a variety of protection and containment (P&C) skills, which are the only authorized methods for coercive interventions. The P&C methods were continued from those taught by SAMA with the addition of a standing small-child containment (in 2009), as SAMA had no appropriate containment for small children. Staff members are required to complete training every 6 months, and to pass a quiz on each training module with a score of at least 80%. Those staff members who are delinquent on training at the end of any month are not allowed to work at the beginning of the following month until they are current on all required trainings. Other relevant training during the study period included modules on coercive intervention policies, procedures, and paperwork, CPR and first aid, prevention of blood-borne illness, and ethics.

## **Procedures**

The researcher worked with the facility to create a de-identified data set regarding patients and coercive interventions in compliance with HIPAA regulations. The University of Alabama Institutional Review Board (IRB) reviewed the protocol for compliance with all regulations regarding human subjects’ research. See Appendix A for a copy of the IRB approval notice. Data on coercive interventions was collected from two sources: 1) A computerized database containing most of the information, and 2) Other relevant variables compiled directly from the ESIR forms. The independent variables were compiled from a variety of sources in the

clinical charts, including information provided as part of the referral process, intake assessment notes, and previous psychological evaluations. Staff training information came from the facility's training department records.

## **Measures**

**Demographic variables.** Information on each patient's gender, age, race, body-mass index, and grade level was collected and analyzed using descriptive statistics and to predict and/or control for effects on the dependent variables.

**Treatment History.** These predictors were coded from intake and referral information based on previous treatment status:

1. *Previous inpatient placements:* Age and number of both prior hospitalizations and residential treatment placements.
2. *Previous services received:* Binary variables for outpatient services and in-home services.

**Individual risk factors.** These were coded from the intake and referral information for the following variables:

1. *Intelligence:* Full Scale IQ and the test from which it was obtained.
2. *Diagnosis:* This variable was coded based on the number of DSM-IV disorders falling in each of the following categories, with one variable per category: Mood disorders (bipolar, depression), Anxiety Disorders, Autism Spectrum Disorders, Behavior Disorders (Attention-Deficit/Hyperactivity Disorder [ADHD], ODD, and CD), Thought Disorders (psychotic disorders, schizophrenia, schizoaffective disorder), Other Disorders.

3. *Maltreatment*: Separate codes reflect the presence or absence of physical abuse, sexual abuse, and neglect. For these variables, zero (0) represent none noted, one (1) reflects a report that was “not indicated” or for which no legal status was available, and two (2) reflects substantiated or multiple reports of maltreatment.
4. *History of Aggression*: Fairly similar to the method used by Boxer (2007), individual variables were created for the following types of aggression: threats toward self; threats toward others; aggression toward peers, adults, animals, and property; self-harm, suicide attempts, and sexual aggression. Each variable was operationalized on a 3 point scale, with 0 representing the absence of any evidence for that type of aggression, 1 representing one or two reports of that form of aggression, and 2 representing more than two reports of that form of aggression. These scores were summed to create an overall aggression variable.
5. *Callous-Unemotional, Impulsive, and Narcissistic Traits*: The presence of CU traits was rated from information contained in each youth’s file using the *Psychopathy Checklist: Youth Version PCL:YV* (Forth, Kosson, & Hare, 2003). The PCL:YV is a 20 item rating scale designed to assess psychopathy in youth (see Appendix B). It is based on a widely used adult measure of psychopathy, the PCL-R. Psychopathy has been shown to be a significant predictor of institutional misconduct in incarcerated individuals (Edens, Poythress, & Lilienfeld, 1999; Forth & Book, 2010; Guy, Edens, Anthony, & Douglas, 2005; Leistico, Salekin, DeCoster, & Rogers, 2008). While institutional misconduct may not be directly comparable to situations leading to coercive interventions, there is likely significant overlap, particularly with regard to aggressive behavior. Some modifications have been made to extend the PCL-R

downward to youth, taking into account their likely life experiences and history. Typically, youths are scored based on information obtained during a semi-structured interview and a review of relevant records; however, for the current study, only a chart review will be utilized. Each item is scored on a 3-point scale ranging from 0 (*Does not apply to Youth*) to 2 (*Definitely Applies to Youth*).

Analyses of the PCL-YV have yielded multiple factor structures comprising personality and behavioral facets (Hare & Neumann, 2006). A 3 factor model of the PCL-R developed by Cooke and Michie (2001) uses thirteen items, of which four load onto a factor assessing arrogant interpersonal style (narcissism), four load onto a factor assessing deficient affective experience (callous/unemotional) and five load onto a factor assessing impulsive or irresponsible behavior. This three factor model also fits with data from studies of youth measures of psychopathy such as the Antisocial Process Screening Device (Vitacco, et al., 2003). Given the relevance of the 3-factor model to the constructs of interest in this study, that model will be used in the analysis. Reliability of the PCL:YV has been established through multiple studies. Inter-rater reliability coefficients are as high as .93 and internal consistency has been found to be as high as .83 for total scores (Forth & Burke, 1998). Inter-rater reliability for the specific sample being analyzed was .86. Factor scores were created by summing the item scores within each factor.

Although the PCL:YV was designed to utilize both a file-review and interview, the adult measure on which it was based, the PCL-R, has shown acceptable performance when ratings are based only on a chart review. For example, one study rating adults on the PCL-R using only case notes found that the measure exhibited the

same factor structure and acceptable reliability even in the absence of an interview (Reiss, Leese, Meux, & Grubin, 2001). The only difference they noted was somewhat lower overall scores and difficulty rating two items. Other studies have found similar utility without an interview (see, e.g., Grann, Langstrom, Tengstrom, & Stalenheim, 1998; Wong, 1988). For the current project, 15 (15%) of the cases were rated by two raters to establish inter-rater reliability; the remainder were rated by a single rater. The single measure intra-class correlation coefficient was 0.721, indicating acceptable agreement between raters ( $F[259,259] = 6.153, p < .001$ ) particularly in light of the use of only a file review. Absolute agreement, measured using Kappa, was also acceptable, with  $Kappa = 0.609, p < .001$ .

**Family risk factors.** Several variables regarding contextual risk factors were coded from the referral and intake information:

1. *History of mental illness:* Paternal and Maternal mental illness was extracted and coded from the intake assessment or other pre-admission sources for Mood disorders, Anxiety disorders, Externalizing Diagnoses, and Psychotic disorders. Only relatives within two degrees (e.g. parent/grandparent/1<sup>st</sup> cousin) were included.
2. *Criminal/Substance Abuse history:* The mother and father's criminal history and substance abuse history was rated based on intake information.
3. *Department of Human Resources involvement:* Variables for age of first DHR placement, number of foster care placements, involvement in therapeutic foster care, and discharge/permanency planning were coded from referral and DHR service plan information.

**Treatment Context Variables.** Several variables regarding treatment and treatment context were collected from internal agency records and clinical charts, including:

1. *Staff Training:* Staff members received in-service training regarding restraint/seclusion every 6 months. For those staff members who were involved in coercive interventions more than 6 months apart, the total number of coercive interventions in which they were involved was calculated for the 30 day periods prior to, and following, training. All staff members' coercive interventions were also coded into 30 day groups representing the time since training (i.e. 1-30 days, 31-60 days, continuing until the group representing 151-180 days), as well as a proportion of that staff person's particular training cycle.
2. *Medication:* These variables were coded to reflect the number of medications in each of 6 broad categories: Stimulant (e.g. amphetamine, methylphenidate, etc.), anti-depressant (fluoxetine, fluvoxamine, etc.), anti-convulsant (lamotrigine, valporic acid, etc.), anxiolytic (lorazepam), anti-psychotic (risperidone, aripiprazole, etc.) or other.
3. *Length of Stay:* Length of stay was coded based on the number of days between intake and discharge in the IRT program. For those clients who had not been discharged as of 6/30/2011, length of stay represented the number of days from intake until that date.
4. *Groundings:* The facility's standard consequence for aggression or other serious violation of rules (regardless of whether it results in a coercive intervention) is referred to as grounding. While grounded, during reward periods, a child must remain in his or her room and is provided with a restricted range of activities from which to choose. Lengths of groundings and the particular consequences vary

individually according to each client's particular treatment needs and progress.

Where available, the number of groundings by month in treatment was collected for each client.

5. *Level System Progress:* All children in the IRT program participate in a modified token economy system. A child earns a "stamp" for each 15 minute period of the day during which he or she follows all rules or directions and engages in no aggressive behavior. At 7 am each day, every child is assigned a level representing based upon the number of stamps he or she earned during the previous 24 hours. Clients who earn 90 (of a maximum 96) stamps earn Level 3; those earning between 84 and 89 earn Level 2, and those earning 83 or fewer earn Level 1. A child's level determines the privileges he or she has earned, such as time playing video games or participation in special activities or community outings. The daily level system is paired with a long-term phase system. All clients begin at phase-A. Clients accumulate periods of time in 2 week increments in each phase by having no more than three or four "problems" during that 2 week increment, with a problem is defined as any Level 1 day, grounding, or coercive intervention. After accumulating 4 weeks on phase-A (the introductory phase), clients transition to phase-B, the primary treatment phase. After 16 accumulated weeks on phase-B, clients move to Phase-C, which is the preparation for discharge phase. While in phase B or C, clients who exceed the maximum number of problems drop back one phase until they complete one week with no more than 1 problem, at which point they resume their previous phase and can begin accumulating weeks on phase again. They retain their previously accumulated weeks. Although the behavioral program is at times modified for

particular clients, for example, by using 1-week rather than 2-week increments, the daily level system structure and phase requirements are consistent across all clients. Thus, except in exceptional circumstances, 140 days in treatment is required to progress to phase-C; however, in practice, it typically takes significantly longer due to the nature of most clients' behavior and the time it takes to accumulate sufficient weeks. Where available, information was collected on the number of level-1 days by month in treatment for each client.

**Quality Control Variables.** Because the information collected came from several different sources within the clinical and agency records and could be ambiguous or incorrect (for example, family history may be incomplete), a number of quality control variables were coded to rate the confidence in the information. These variables were the quality of family history, quality of aggression history, quality of abuse history, and quality of total information. Each of these variables was rated on the scale shown in Table 2.

Table 2

*Quality Control Rating Scale.*

Rating	Description
1	Information came from single source and was incomplete or contradictory
2	Information was not contradictory but came from a single source and was incomplete or provided by someone who did not have personal knowledge of the information.
3	Rating is based on information provided solely by DHR
4	Rating is based on information that appears complete and is provided by a source who would be expected to have personal knowledge of the information (e.g. parents)
5	Rating is based on information that appears complete and is provided to multiple agencies or by multiple sources that would be expected to have knowledge of the information.

**Summary Variables:**

Because of these variables prominence in the literature and their previously shown predictive merit, the most promising predictors are expected to be history of aggression, length of DHR involvement, prior treatment, CU traits, narcissism, and impulsivity. History of aggression will be represented by the summation of individual forms of aggression. Family disruption and discord will also be operationalized as a summary variable, representing the sum of the 4 variables for family functioning: Total abuse history (0-2 as described above), family mental health history (0: none, 1: Maternal or paternal psychiatric disorder, and 2: Maternal and paternal psychiatric disorder), age of first DHR involvement (0: no DHR involvement, 1: age 6 or later, 2: before age 6), and permanency plan at intake (0: return to parent, 1: relative placement, 2: adoption with no identified resource).

## **Outcome and Dependent Variables:**

The primary outcome variables were the presence and number of coercive interventions while in treatment. In addition, the following information was collected from the ESIR forms completed for each coercive intervention (a copy of which is provided in Appendix C).

1. *Type and method of intervention:* Variables reflecting the nature (restraint, seclusion, or both) as well as the method of restraint (e.g. 2-person escort, elbow-to-hip hold, etc.). Mechanical restraints are not used in this facility, and prn medication is not reported on an ESIR form unless it is administered during a coercive intervention.
2. *Time and date of the intervention.* The time and date that the intervention occurred on
3. *Precipitating event.* The precipitating event for each intervention was coded into categories for aggression, disruptive/runaway behavior, provoking or not following directions, self-injurious behavior, other, or unknown. For those events under the aggression category, information on the target of aggression was coded, including peer, staff, or object.
4. *Length of intervention:* Total time in minutes that the intervention was utilized.
5. *Number of staff involved:* The total number of staff involved in implementing the intervention.
6. *Injuries:* Injuries are coded on the ESIR forms according to severity (0 = no injury, 1 = minor injury treated by nurse such as scratch, abrasion, etc., 2 = significant injury requiring medical attention such as broken bone, concussion, etc., and 3 = sentinel injury including permanent loss of function and/or death). Client injury information was collected for each intervention where it was available.

7. For the primary staff involved, the number of days since last training was calculated when available (see staff variable described above for description).
8. Number of coercive interventions for each client by month in treatment: This was used to determine the presence of identifiable patterns of coercive intervention involvement over time in treatment.

## **Data Analyses**

### **Step 1: Any Involvement in Coercive Interventions - Logistic Regression Model.**

Variables will be standardized and, when appropriate, transformed to meet assumptions of normality. To determine if the proposed risk factors can predict any involvement in coercive interventions, a two-step analysis was taken, similar to that conducted by Boxer (2007).

Variables within theoretically related risk clusters were analyzed in a separate set of logistic regressions (see Table 3). Significant predictors from each of the risk clusters as analyzed separately were then included in an overall model, with some modifications made on the basis of the initial results. Hierarchical logistic regression was used with significant control variables entered on step 1, followed by the remaining significant predictors identified within each cluster on step 2. Finally, the ratings of CU traits, impulsivity, and narcissism from the PCL:YV were entered on step 3, to determine if their inclusion significantly improved the model's predictive ability beyond the previously evaluated variables.

Table 3

*Risk Clusters for Predictors*

Individual (Control)	Individual	Treatment	Family	Psychopathic Traits
*Age	Diagnosis	*Previous Inpatient	*Age of DHR Involvement	*CU Traits
*Sex	Abuse History	*Previous Residential	Number of Foster Placements	*Impulsivity
*IQ	*Aggression	Previous In-Home Medication	Discharge Plan	*Narcissism
*BMI			Psychiatric History	
Race			Criminal History	

*\*Indicates expected significant predictors within a risk cluster based on theory and prior research*

**Step 2: Extent of Involvement in Coercive Interventions– Negative Binomial Model.**

For analyses regarding extent of involvement in coercive interventions, the assumption of normality inherent in most statistics is violated. Given that anticipated distribution likely will indicate a meaningful proportion of subjects with 0 coercive interventions and a decreasing number of subjects with increasing numbers of interventions, negative binomial regression is more appropriate than traditional regression methods. While both log-transformation and negative binomial regression are commonly used for count data such as these, there is some evidence that negative binomial and Poisson models perform better than log-transform except for certain specific distributions (O’Hara, 2010). The same method described in Step 1 above was used to develop and test the model for extent of involvement.

**Step 3: Identifying Patterns of Coercive Intervention Involvement – Mixture Model.**

The second research question involved determining the presence of various subgroups that show similar patterns in coercive intervention usage over time, and then to evaluate the various predictors identified earlier to see if they were useful in differentiating group membership. There are multiple ways to identify subgroups within a heterogeneous population, including a priori definitions (e.g. group “high” is those youths with > x number of coercive interventions while in treatment) or artificial cut-points, among others. If the expectation was to find only

groups whose intervention patterns were steady over time, those approaches would be appropriate here; however, given that the identified groups are expected to have varying rates of growth or decline in coercive intervention usage, another approach was called for here. Growth mixture modeling is useful in identifying non-linear subgroups within a heterogeneous population (Duncan, Duncan, & Strycker, 2006). See Figure 1 below for an illustration of the mixture model. Although the sample size of the present study was relatively modest, this model uses only a limited number of indicator variables to identify groups. There are no hard and fast rules for an appropriate sample size and the technique has been successfully used with samples comparable to the one used here (Ram & Grimm, 2009). Models ranging from one to seven groups were tested, with the expectation that the following groups could be identified: no use, low use, high use, and decreasing use resulting in a 4 group model as the best fit. The indicator variables were the number of coercive interventions of any type that they were involved in during months 1, 2, 3, 4, 6, and 8 of treatment. More early time points were included based on work done by dosReis, et. al. (2010) suggesting that coercive intervention usage is more unstable very early in treatment. Although mixture modeling is a flexible procedure and could be theoretically used to also examine the role of covariates or sequelae related to group membership, given the number of covariates, the appropriate sample size would be several hundred. As a result, the mixture model was used only for group identification and classification. Once groups were identified, ANOVA models were used to determine if the previously identified predictor variables were significant in predicting that group membership.

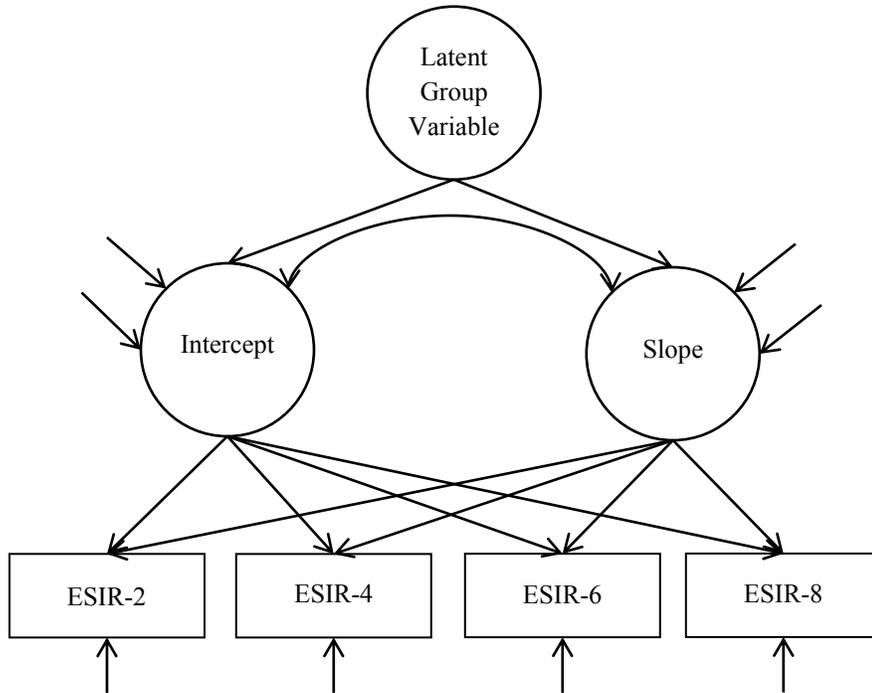


Figure 1: Mixture model for coercive intervention group membership.

**Step 4: Training and Coercive Interventions.** To assess the impact of staff training, the primary staff member involved in initiating each coercive intervention was identified from the report and a variable of time since last training was created based on the number of days since their most recent training. Staff involvement in coercive interventions was broken down into 6 buckets, with the first bucket containing the number of staff involved in coercive interventions whose training was 0-30 days ago, the next containing staff whose training was 31-60 days prior, and so on, with the final bucket containing staff whose training was 151 to 180 days, with chi-square tests used to test the obtained versus expected distributions. Paired sample t-tests were also conducted to compare rates from days 1-30 after training to days 151-180 after training.

## Power Analyses

Power is the ability of a statistical test to detect an effect when the effect does in fact exist (Cohen, 1977). Appropriate power is essential to finding the anticipated results and to correctly interpreting the absence of statistically significant results. Statistical power is a function of the effect size, sample size, and alpha level. Calculation of power ranges from relatively simple for inferential statistics such as *t* or *F*-tests, to substantially more complex for latent class analysis models. Power analyses were carried out using the GPower program, version 3 (Erdfelder, Faul, & Buchner, 1996; Faul, Erdfelder, Buchner, & Lang, 2009).

For the logistic regression models, effect size was estimated based on results found in two of the studies reviewed which directly reported odds ratios (*ORs*) or reported parameter estimates from which *ORs* could be extracted (Boxer, 2007; Sourander, et al., 2002). Odds ratios for various specific predictors varied significantly but typically ranged from 1.5 to 5 or higher, depending on the particular predictor. This corresponds to a small to medium effect size. Meta-analysis of the prediction of institutional misconduct based on psychopathy also suggests a moderate effect size is expected. For logistic regression, effect size is a function of the *OR* and the probability of an event under the null hypothesis – that is, the probability of having had a coercive intervention when the score for that predictor is at the mean (Faul, et al., 2009). Finally, the model also has to take into consideration the  $R^2$  of the other variables included in the logistic regression with the outcome variable, which was estimated based on the pseudo- $R^2=0.33$  for the model including all variables except for CU, impulsive, or narcissistic traits (whose inclusion represents the most extensive model). Given the odds of a youth being involved in a coercive intervention for the participants of this study ( $\sim 0.8$ ), the null hypothesis event probability was set

at 0.2, with an *OR* of 3.6 (that obtained for impulsivity in the initial stage-1 analyses). With a sample size of 99, this resulted in power of 0.985.

Similar procedures used to estimate the power to detect the role of additional predictor variables in hierarchical multiple regression to predict coercive interventions above and beyond already entered predictors, using a standard medium effect size ( $f = 0.15$ ) and 12 total predictors indicated that power given the sample size of 99 was greater than 0.95.

Direct power computations for the growth mixture modeling procedure are more difficult to compute due to the lack of previous research regarding effect sizes and population estimates for the heterogeneous subpopulations that are expected. Monte Carlo simulations used to evaluate power require complete parameter specification in order to generate the population covariance matrices required. Furthermore, there is no single statistical value of power to obtain, as each parameter being evaluated has its own power estimate in the resulting analysis. As discussed above, there is some support for sample sizes similar to that proposed here, particularly when the groups are expected to be well-defined. Although there is increasing dissatisfaction with generic sample size recommendations such as ten subjects or measurements per indicator variable (Westland, 2010), there is also no well-accepted alternative. Given that data were used from six discrete time points measuring coercive intervention rates, the obtained sample of 99 participants exceeds by more than 50% the standard recommendation of ten subjects per indicator variable.

## Results

The final sample consisted of 99 youths who were admitted to the Intensive Residential Treatment Program between 2009 and 2010. Two subjects did not have IQ scores as part of their records and were excluded from analyses with IQ as a predictor variable. Of the 99 subjects, 82 (83%) were involved in at least one coercive intervention during treatment. For the individual interventions, 82 (83%) were involved in at least one restraint, while 76 (77%) were involved in at least one seclusion. Table 4 presents the descriptive statistics on the outcome and predictor variables for the sample. Table 5 presents descriptive statistics for the outcome variables for all subjects and for the subset of youths who were involved in at least one coercive intervention during treatment. There were a total of 2828 coercive interventions for those 99 clients from the date of intake until date of discharge, or until June 30, 2011 for those clients that were still active as of that date. Of those, 284 (10%) involved only seclusion, 1099 (39%) involved only a restraint, and 1445 (51%) involved both seclusion and a restraint. The average length of seclusion was 13 minutes 46 seconds, while the average restraint lasted 4 minutes, 50 seconds (Table 6). Average length of the entire intervention was 12 minutes, 46 seconds. For the purposes of data collection, for those participants still receiving treatment on June 30, 2011, Length of Stay (LOS) was computed through that date.

Supplemental information related to the distribution of coercive interventions is located in Appendix D. Figure D1 through Figure D5 show the distribution of coercive interventions by location, day of the week, time of day, and year. Figure D6 shows the primary reason a coercive

Table 4

*Descriptive Statistics*

Predictor	<i>n</i>	<i>M</i>	<i>SD</i>	% 0's	%-1's	%-2's
<i>Aggression</i>						
Threat to others	99	1.49	0.660	9.1	32.3	58.6
Threat to self	99	0.76	0.730	41.4	41.4	17.2
Toward peers	99	1.8	0.473	3.0	14.1	82.8
Toward adults	99	1.39	0.780	18.2	24.2	57.6
Toward Animals	99	0.37	0.632	70.7	21.2	8.1
Property Destruction	99	1.29	0.799	21.2	28.3	50.5
Sexual Aggression	99	0.47	0.595	57.6	37.4	5.1
Self-Injurious Behavior	99	1.01	0.776	29.3	40.4	30.3
Suicide Attempts	99	0.26	0.527	77.8	18.2	4.0
Aggression Total	99	8.86	2.62			
<i>Abuse History</i>						
Physical	99	1.0	0.904	40.4	19.2	40.4
Sexual	99	0.96	0.880	40.4	23.2	36.4
Neglect	99	1.07	0.940	40.4	12.1	47.5
Abuse Total	99	3.03	1.57			
<i>Paternal History</i>						
				% 0's	% 1's	
Mood	99	0.22	0.418	77.8	22.2	
Criminal	99	0.20	0.404	79.8	20.2	
Substance	99	0.54	0.501	46.5	53.5	
<i>Maternal History</i>						
				% 0's	% 1's	
Mood	99	0.63	0.486	37.4	62.6	
Criminal	99	0.29	0.457	70.7	29.3	
Substance	99	0.75	0.437	25.3	74.7	
<i>Demographic</i>						
	<i>n</i>	<i>M</i>	<i>SD</i>	Skew	Kurtosis	
Age	99	10.57	2.11	0.168	0.748	
BMI	99	21.33	4.83	0.782	0.377	
Grade	99	4.76	2.11	0.326	0.631	
IQ	97	89.47	11.73	0.395	-0.187	
LOS	99	376.00	218.68	1.384	3.221	
<i>Treatment</i>						
Age of DHR involvement	89	7	3.612	-0.040	-0.492	
# Foster Care Placements	99	2.3	2.505	1.365	2.063	
Age of First Hospitalization	94	8.38	2.648	0.253	-0.558	
#Hospitalizations	99	2.78	2.01	2.056	7.269	
Age of First Residential	45	9.82	1.787	0.830	2.523	
#Residential Placements	99	0.62	.79	1.182	0.829	
<i>PCL:YV</i>						
PCL Total	99	10.21	4.54	0.838	1.002	
PCL Narcissism	99	1.04	1.21	0.940	-0.150	
PCL Callous/Unemotional	99	2.91	2.19	0.639	-0.313	
PCL Impulsive	99	3.36	1.17	0.181	0.606	

Table 4 (continued)

Predictor	<i>n</i>	<i>M</i>	<i>SD</i>		
<i>Diagnosis</i>					
Behavior	99	93%			
Mood	99	41%			
Anxiety	99	29%			
ASD	99	3%			
Psychosis	99	2%			
Other	99	56%			
<i>Gender</i>					
Male	61	62%			
Female	38	38%			
<i>Race</i>					
White	63	64%			
Black	26	26%			
Other	10	10%			
<i>Quality Variables</i>					
	<i>n</i>	<i>M</i>	<i>SD</i>	Skew	Kurtosis
Family History	99	2.87	0.829	-0.737	0.331
Aggression History	99	3.41	0.808	-0.544	1.123
Abuse History	99	3.10	0.721	-0.487	2.034
Total	99	3.16	0.548	0.084	0.093

*Note.* For family history variables, the mean represents the percentage of participants with at least one relative having been reported as having a mood disorder, criminal history, or substance use, respectively.

Table 5

*Outcome Variable Descriptive Statistics*

Criterion	<i>N (N &gt;= 1)</i>	<i>M (N &gt;= 1)</i>	<i>SD</i>	Sum
All Interventions	99 (82)	28.57 (34.49)	37.61	2828
Restraints	99 (82)	25.68 (31.00)	34.75	2542
Seclusions	99 (76)	17.46 (21.09)	25.25	1729
Coercive Interventions (First 12 months)	99 (82)	21.90 (26.43)	27.78	2168

Table 6

*Coercive Intervention Descriptive Statistics*

Criterion	<i>M</i> (length)	<i>SD</i>	Max
Restraints	4.87 minutes	6.59	70
Seclusions	13.78 minutes	14.28	300

physical intervention was required, grouped into 5 categories: aggression, disruptive or runaway behavior, provoking or not following directions, self-injurious behavior, other reasons, or unknown reasons. Figure D7 shows the target of the aggression for those grouped into the “Aggression” category. Finally, Figure D8 lists the most common types of physical intervention used.

Table 7

*Correlation Table for Criterion Variables and Length of Stay (LOS)*

Criterion	LOS	Time to 1 <sup>st</sup> Incident	Any Seclusion	Any Restraint	Any CI	Total ESIRs	Total Restraints	Total Seclusions
LOS	1							
Time to 1 <sup>st</sup>	0.24*	1						
Any Sec	0.30**	-0.547**	1					
Any Res	0.20*	-0.673**	0.828**	1				
Any CI	0.20*	-0.673**	0.828**	1.000	1			
Tot. CI	0.259**	-0.335**	0.414**	0.348**	0.348**	1		
Tot. Res	0.248*	-0.330**	0.402**	0.338**	0.338**	0.996**	1	
Tot. Sec	0.264**	-0.302**	0.382**	0.316**	0.316**	0.951**	0.932**	1

*Note.* \* indicates correlation is significant at the  $p < .05$  level, \*\* indicates correlation is significant at the  $p < .01$  level. CI = Coercive Intervention, Sec = Seclusion, Res = Restraint.

LOS ranged from 27 days to 1269 days, with an average of 380 days and a median of 352 days. LOS was significantly correlated with both the dichotomous event indicators (no coercive

interventions vs. one or more coercive interventions) and the total number of coercive interventions (see Table 7). However, because the data was collected based only on information known and received as part of the intake process, at which time LOS is of course unknown, the inclusion of LOS may also act as a confounding variable. Given that prediction of coercive interventions is a goal of the study, LOS should not necessarily be automatically included as a predictor variable. However, the inclusion of LOS did not typically affect the significance of other predictors and so to control for its effect, LOS was included in all analyses unless otherwise indicated.

There was no difference in aggression score, age, or PCL total score amongst any of the quality rating scales. Quality scores also did not significantly predict involvement in any coercive intervention or the extent of involvement in coercive interventions. As a result, the quality variables were not included in subsequent models.

### **Prediction of Any Involvement in a Coercive Intervention**

Similar to the procedure utilized by Boxer (2007), a two-stage approach was used to determine the predictors of coercive intervention involvement during treatment. Stage-1 entailed the separation of predictor variables into theoretically related categories, as outlined in Table 2.

Each category was tested separately to determine the predictors that were significant and therefore would be included in the final model. Variables were standardized prior to inclusion. The results of these first stage analyses are presented in Table 8.

For the individual control variables, age was a significant predictor ( $\beta = -0.728, p = .044$ ) and gender approached significance ( $\beta = -1.371, p = .051$ ). The remaining control variables, including LOS, were not significant. For the remaining individual predictors, Diagnosis was operationalized as four dichotomous variables indicating the presence or absence of a: 1) Mood

Table 8

*Stage 1 Logistic Regression Analyses for Involvement in Coercive Intervention*

Variables	$\beta$	<i>SE</i> ( $\beta$ )	Wald	<i>p</i>	<i>OR</i>
Group 1 ( $\chi^2 = 21.404$ , <i>df</i> = 6, <i>p</i> = 0.002):					
<b>Age</b>	<b>-0.728</b>	<b>.362</b>	<b>4.043</b>	<b>.044</b>	<b>0.483</b>
Gender	-1.371	.703	3.798	.051	0.254
Race	0.630	.761	0.685	.408	1.877
IQ	-0.381	.376	1.027	.311	0.683
BMI	-0.249	.301	0.684	.408	0.779
LOS	0.547	.466	1.382	.240	1.729
Group 2 ( $\chi^2 = 15.160$ , <i>df</i> = 6, <i>p</i> = 0.019):					
Other Disorder	-.160	.838	.037	.848	.852
Behavior Disorder	-1.271	1.594	.636	.425	.281
Mood Disorder	.234	.760	.095	.758	1.264
Anxiety Disorder	-.498	.935	.284	.594	.608
<b>Aggression</b>	<b>1.226</b>	<b>.433</b>	<b>8.018</b>	<b>.005</b>	<b>3.409</b>
Abuse	.087	.440	.039	.844	1.090
Group 3 ( $\chi^2 = 3.869$ , <i>df</i> = 4, <i>p</i> = 0.424, ns):					
In Home Treatment	.566	.649	.761	.383	1.761
Hospitalized	19.123	17589.865	.000	.999	2.0E8
Residential	-.823	.760	1.171	.279	.439
Total # of Medications	.096	.262	.135	.713	1.101
Group 4 ( $\chi^2 = 7.971$ , <i>df</i> = 6, <i>p</i> = 0.240, ns):					
Adoption			0.901	.637	
Discharge to Parent	-.603	.846	.509	.476	.547
Discharge to Relative	-1.015	1.134	.802	.371	.362
<b># Foster Care Placements</b>	<b>-1.002</b>	<b>.495</b>	<b>4.104</b>	<b>.043</b>	<b>.367</b>
<b>Age of DHR</b>	<b>-1.361</b>	<b>.670</b>	<b>4.134</b>	<b>.042</b>	<b>.256</b>
Maternal History	.410	.450	.827	.363	1.506
Paternal History	-.339	.389	.759	.384	.713
Group 4 ( $\chi^2 = 11.995$ , <i>df</i> = 3, <i>p</i> = 0.007):					
Narcissism	.200	.432	.214	.644	1.221
Callous	.018	.386	.002	.962	1.018
<b>Impulsive</b>	<b>1.291</b>	<b>.463</b>	<b>7.778</b>	<b>.005</b>	<b>3.638</b>

*Note.* \* Items in **Bold** were significant predictors within the specified group.  $\chi^2$  statistic in parentheses represents the improvement in model fit for the specified group of predictors beyond an intercept-only model.

Disorder, 2) Anxiety Disorder, 3) Behavior Disorder, and 4) Other diagnosis. Abuse history was operationalized as the total score on the three abuse variables, with a maximum range of 0 to 6.

Aggression was operationalized as the sum of the nine specific aggression variable scores, with a maximum range of 0 to 18. Aggression was the only significant predictor for this block ( $\beta = 1.226, p = .005$ ).

For the treatment block, medication was operationalized in two different ways. The first method involved creating dichotomous variables for the presence or absence of (a) Stimulants (b) SSRI's, (c) Anti-psychotics, (d) Anti-Convulsants, (e) Anxiolytics, and (f) Other medications. The second method involved creating a sum of the total number of medications prescribed at intake. None of the treatment variables, including medication, were significant predictors of incident involvement.

For the family risk factors, significant predictors were the age of first DHR involvement ( $\beta = -1.361, p = .042$ ) and the number of foster care placements ( $\beta = -1.002, p = .043$ ). Ten subjects with no DHR history were excluded from this analysis. For the psychopathic traits cluster, only impulsivity was significant ( $\beta = 1.226, p = .002$ ).

## **Stage 2 Analysis**

Following the analysis of the separate risk clusters, a second analysis was conducted in which the significant predictors from stage 1 were included in a total model. A correlation table for those predictors is presented in Table 9. Also included in the complete model were the remaining PCL-YV factors of callous/unemotional traits and narcissism. Following initial examination of the model fit and coefficients, two alterations were made to the model parameters. First, IQ was included as a predictor. Although IQ score was not significant when other control variables were included, it was initially estimated to be marginally significant; this may have been due to shared variance with another included variable. Examining the correlation matrix in Table 9 reveals that there may be a suppression effect, with IQ significantly negatively

correlated with Impulsivity but not with Coercive Interventions. Inclusion of IQ resulted in aggression becoming a significant predictor of coercive intervention involvement. Given this change, two theoretically relevant interaction terms were also included to determine if the model was improved: IQ by aggression and age by aggression. Parameter estimates and odds ratios for the variables included in the final model are presented in Table 10.

For the final logistic regression model, predictor variables were entered in blocks, with gender, LOS, and age in block 1, aggression and IQ in block 2, number of foster care placements and age of DHR involvement in block 3, and the 3 PCL factor scores in block 4. Aggression interactions were entered on block 2 in all models. Results from the final model are presented in Table 10.

Significant predictors of any coercive intervention were higher aggression history ( $\beta = 3.028$ ,  $OR = 20.647$ ,  $p = .029$ ) and impulsivity ( $\beta = 2.220$ ,  $OR = 9.203$ ,  $p = .042$ ). The interpretation of the *ORs* for these variables is that holding all other variables at their means, a one standard-deviation increase in aggression makes it 20 times more likely that one will experience at least one coercive intervention in treatment. Similarly, a one standard deviation increase in the PCL-YV Impulsivity score increases the odds of experiencing at least one coercive intervention by 9.2 times. For any involvement in a seclusion while in treatment, age ( $\beta = -1.872$ ,  $OR = 0.154$ ,  $p = .015$ ), aggression ( $\beta = 1.691$ ,  $OR = 5.425$ ,  $p = .024$ ) and impulsivity ( $\beta = 1.749$ ,  $OR = 5.748$ ,  $p = .031$ ) were significant. For each one standard deviation increase in aggression and impulsivity, the odds of having at least one episode of seclusion increase by 5.4 and 5.7 times, respectively. For each one standard deviation increase in age, the odds of having at least one episode of seclusion decrease about 6.5 times. Predicted versus observed frequency tables, along with sensitivity, specificity, false positives, and false negatives are presented in Table 11 and Table 12.

Table 9

*Correlation Table for Significant Predictors from Stage 1*

Criterion	Gender	Age	IQ	Agg.	Narciss.	CU	Impuls.	# FC	DHR Age	LOS	Rest.	Sec.
Gender	1											
Age	.074	1										
IQ	.297**	-.125	1									
Aggression	-.013	-.1	-.065	1								
Narcissism	.266**	.083	.041	.253*	1							
CU Traits	.014	.060	-.098	.402**	.406**	1						
Impulsivity	-.175	-.067	-.224*	.452**	.011	.307**	1					
# FC	.104	-.144	-.043	-.053	.056	-.023	-.031	1				
DHR Age	.064	.517**	.049	-.140	-.049	-.032	-.184	-.483**	1			
LOS	.051	-.151	-.103	.021	.002	-.020	.046	.187	-.187	1		
Restraints	-.172	-.322**	-.063	.264**	-.007	.286**	.513**	-.025	-.116	.259*	1	
Seclusions	-.091	-.384**	-.021	.188	.033	.250*	.496**	.012	-.212*	.264**	.828**	1

*Note.* \* indicates correlation is significant at the  $p < .05$  level, \*\* indicates correlation is significant at the  $p < .01$  level. Agg = Aggression, Narciss = Narcissism, CU = Callous/Unemotional Traits, Impuls = Impulsivity, FC = Foster Care Placements, Rest = Restraints, Sec = Seclusion

Table 10

*Final Logistic Regression Model for Involvement in Any Coercive Interventions*

Variable	$\beta$	SE ( $\beta$ )	Wald	$p$	OR	95% CI for OR
Involvement in Any Coercive Intervention						
Control Variables ( $\chi^2 = 12.266, df = 3, p = .007$ )						
Gender	2.584	1.446	3.194	.074	13.251	0.779-225.463
LOS	-.109	.786	.019	.890	.897	0.192-4.183
Age	-2.324	1.271	3.342	.068	.098	0.008-1.183
Block 2 ( $\chi^2 = 22.142, df = 4, p < .001$ )						
<b>Aggression</b>	<b>3.028</b>	<b>1.386</b>	<b>4.770</b>	<b>.029</b>	<b>20.647</b>	<b>1.364-312.447</b>
IQ	-1.091	.939	1.350	.245	.336	0.053-2.116
IQ x Aggression	-1.645	.938	3.079	.079	.193	0.031-1.212
Age x Aggression	-.911	.789	1.332	.248	.402	0.086-1.889
Block 3 ( $\chi^2 = 0.627, df = 2, p = .731, ns$ )						
# Foster Care Placements	.230	.914	.063	.801	1.259	0.21-7.55
DHR Age	.201	.901	.050	.824	1.222	0.209-7.142
Block 4 ( $\chi^2 = 8.550, df = 3, p = .036$ )						
Narcissism	.154	.710	.047	.828	1.167	0.29-4.694
Callous/Unemotional	.051	.518	.010	.921	1.053	0.382-2.903
<b>Impulsive</b>	<b>2.220</b>	<b>1.093</b>	<b>4.125</b>	<b>.042</b>	<b>9.203</b>	<b>1.081-78.356</b>
Involvement in Seclusions						
Control Variables ( $\chi^2 = 20.956, df = 3, p < .001$ )						
Gender	1.524	.981	2.413	.120	4.589	0.671-31.375
LOS	.688	.619	1.235	.266	1.990	0.591-6.698
<b>Age</b>	<b>-1.872</b>	<b>.773</b>	<b>5.866</b>	<b>.015</b>	<b>.154</b>	<b>0.034-0.7</b>
Block 2 ( $\chi^2 = 18.417, df = 4, p = .001$ )						
<b>Aggression</b>	<b>1.691</b>	<b>.751</b>	<b>5.071</b>	<b>.024</b>	<b>5.425</b>	<b>1.245-23.641</b>
IQ	-.183	.626	.086	.770	.833	0.244-2.839
IQ x Aggression	-.636	.608	1.094	.296	.530	0.161-1.743
Age x Aggression	.062	.699	.008	.929	1.064	0.271-4.188
Block 3 ( $\chi^2 = 2.548, df = 2, p = .280, ns$ )						
# Foster Care Placements	.625	.661	.893	.345	1.868	0.511-6.823
DHR Age	1.255	.730	2.958	.085	3.509	0.839-14.668
Block 4 ( $\chi^2 = 8.626, df = 3, p = .035$ )						
Narcissism	.047	.525	.008	.928	1.048	0.375-2.935
Callous/Unemotional	.172	.482	.128	.721	1.188	0.462-3.058
<b>Impulsive</b>	<b>1.749</b>	<b>.811</b>	<b>4.650</b>	<b>.031</b>	<b>5.748</b>	<b>1.173-28.179</b>

*Note.* Parameters in **bold** are significant at the  $p < 0.05$  level.  $\chi^2$  statistic in parentheses represents the improvement in model fit for the specified group of predictors beyond a model including all previous blocks

Table 11

*Observed and Predicted Frequencies for Any Involvement in Coercive Interventions*

Observed	Predicted		% Correct
	Yes	No	
Yes	71	3	95.9%
No	4	9	69.2%
Overall % Correct			92.0%

Sensitivity	95.9%
Specificity	69.2%
False Positive	5.3%
False Negative	25.0%

Table 12

*Observed and Predicted Frequencies for Any Involvement in Seclusion*

Observed	Predicted		% Correct
	Yes	No	
Yes	64	4	94.1
No	5	14	73.7
Overall % Correct			89.7

Sensitivity	94.1%
Specificity	73.7%
False Positive	7.2%
False Negative	22.2%

There are several methods for assessing the fit of logistic regression models. A Likelihood Ratio test can be used to compare the fit of nested models. The likelihood ratio test is computed by comparing the log-likelihoods for a model with one or more additional parameters to a model without the inclusion of additional parameters. The resulting statistic has a chi-square distribution with degrees of freedom equal to the number of additional parameters in the more specified model. The Hosmer and Lemeshow test assesses model fit, again using a chi-square distribution, using a null hypothesis that the model is a good fit to the data. Thus, an insignificant result suggests the model is a reasonable fit to the data. Finally, one can use one or more of several “pseudo”  $R^2$  measures. While an OLS  $R^2$  has a clear definition in that it

represents the amount of variance explained by the model, the interpretation of logistic regression pseudo- $R^2$  measures is not similarly intuitive (Hosmer & Lemeshow, 2000). It merely provides a descriptive approximation of model fit; note that various pseudo- $R^2$  statistics often vary significantly from one another for the same model.

The goodness-of-fit statistics for the final model are presented in Table 13. The Hosmer and Lemeshow test indicated that the model was a good fit for the data ( $\chi^2 = 0.820$ ,  $df = 8$ ,  $p = 0.999$ ). The likelihood ratio tests indicated that each block, with the exception of the third block (number of foster placements and age of DHR involvement) added significantly to the predictive ability of the final model. Finally, the Cox & Snell  $R^2$  of 0.394 and the Nagelkerke  $R^2$  of 0.692 both suggest the model explains substantial variance in involvement with coercive interventions.

Table 13

*Goodness of Fit Statistics for Final Logistic Regression Model*

Any Coercive Intervention	$\chi^2$	$df$	$p$
Likelihood Ratio*	43.584	12	< .001
Hosmer & Lemeshow**	0.820	8	.999
Seclusions Only			
Likelihood Ratio*	50.547	12	< .001
Hosmer & Lemeshow**	2.227	8	.973
Pseudo- $R^2$			
Cox & Snell	0.394	ESIRs	Seclusions
Nagelkerke	0.692	0.441	0.678

*Note.* \*The Likelihood Ratio test compares the final model to an intercept-only model, significance indicates the final model fits better than the intercept-only model. \*\* The Hosmer & Lemeshow test assesses fit against known outcomes; significance indicates the model does not fit the data well.

**Prediction of Total Involvement in Coercive Interventions**

To examine the role of the explanatory variables in explaining the total extent of involvement in coercive interventions during treatment, a Generalized Linear Model (GLM)

utilizing a negative binomial distribution was utilized. The negative binomial distribution is appropriate because the data consists of counts and is heavily positively skewed. Negative binomial regression typically performs better than Ordinary Least Squares (OLS) regression of log-transformed count data (Cameron & Trivedi, 1998). While Poisson regression may also be appropriate for count data, negative binomial regression is preferred when the data has significant levels of dispersion, which is evident in this data set by the standard deviation of the criterion indicator variables being larger than the mean of those variables. The predictor variables used in the GLM model were the same as those used in the final logistic regression models. The results for the GLM model for total ESIR's and total seclusions are presented in Table 14.

For the total coercive intervention model, adding in the PCL-YV factor scores significantly improved the overall model fit according to the likelihood ratio test ( $\chi^2=24.59$ ,  $df=3$ ,  $p < .001$ ). The PCL-YV factor scores also significantly improved the overall model fit for total seclusions ( $\chi^2=27.508$ ,  $df=3$ ,  $p < .001$ ). Of note, while the total aggression variable was not significant in the overall models, it was significant in the model excluding the PCL-YV factor scores. Significant predictors for total coercive interventions included LOS ( $\beta = 0.443$ ,  $p = .001$ ), age ( $\beta = -.688$ ,  $p < .001$ ), age of DHR involvement ( $\beta = 0.363$ ,  $p = .023$ ), CU traits ( $\beta = 0.364$ ,  $p = .015$ ), and impulsivity ( $\beta = 0.490$ ,  $p < .001$ ). The Age x Aggression interaction was also significant ( $\beta = 0.378$ ,  $p = .035$ ). For the total number of seclusions, significant predictors included LOS ( $\beta = 0.483$ ,  $p < .001$ ), age ( $\beta = -0.828$ ,  $p < .001$ ), CU Traits ( $\beta = 0.341$ ,  $p = .026$ ), and impulsivity ( $\beta = 0.562$ ,  $p < .001$ ).

Table 14

*Final Negative Binomial Model for Involvement in Coercive Interventions*

Predictor	$\beta$	<i>SE</i> ( $\beta$ )	Wald $\chi^2$	<i>p</i>
Involvement in all coercive interventions				
Gender	.443	.2669	2.751	.097
<b>LOS</b>	<b>.443</b>	<b>.1320</b>	<b>11.270</b>	<b>.001</b>
<b>Age</b>	<b>-.688</b>	<b>.1601</b>	<b>18.440</b>	<b>.000</b>
Aggression	.267	.1435	3.465	.063
IQ	-.070	.1418	.246	.620
IQ x Aggression	-.169	.1697	.988	.320
<b>Age x Aggression</b>	<b>.378</b>	<b>.1793</b>	<b>4.452</b>	<b>.035</b>
# Foster Care Placements	.012	.1432	.007	.932
<b>DHR Age</b>	<b>.363</b>	<b>.1593</b>	<b>5.200</b>	<b>.023</b>
Narcissism	-.058	.1312	.197	.657
<b>Callous/Unemotional</b>	<b>.364</b>	<b>.1494</b>	<b>5.950</b>	<b>.015</b>
<b>Impulsive</b>	<b>.490</b>	<b>.1439</b>	<b>11.592</b>	<b>.001</b>
Involvement in seclusions only				
Gender	.339	.2818	1.445	.229
<b>LOS</b>	<b>.483</b>	<b>.1368</b>	<b>12.487</b>	<b>.000</b>
<b>Age</b>	<b>-.828</b>	<b>.1734</b>	<b>22.822</b>	<b>.000</b>
Aggression	.221	.1573	1.970	.160
IQ	-.011	.1489	.005	.943
IQ x Aggression	-.236	.1802	1.720	.190
Age x Aggression	.350	.1953	3.211	.073
# Foster Care Placements	-.026	.1497	.029	.865
DHR Age	.290	.1603	3.267	.071
Narcissism	-.063	.1389	.207	.649
<b>Callous/Unemotional</b>	<b>.341</b>	<b>.1527</b>	<b>4.984</b>	<b>.026</b>
<b>Impulsive</b>	<b>.562</b>	<b>.1525</b>	<b>13.611</b>	<b>.000</b>

*Note.* Parameters in **bold** are significant at the  $p < .05$  level.

For the total involvement in coercive intervention model, the Age x Aggression interaction was significant. Figure 2 below provides a graphical depiction of this interaction. Consistent with the significant result for age, coercive interventions decline as age increases. However, for average age and older clients, coercive interventions increase with total aggression history. For clients with an age one standard deviation below the average, there is a slight

decrease in ESIRs as aggression history. This surprising effect is likely due to the presence of outliers in the data set at very young ages.

In addition to the model specified in Table 14, a model including all of the parameters listed in Table 8 was also specified and tested. When compared, the only significant difference between the two models was that the Age X Aggression interaction ceased to be significant; all other variables that were significant in the smaller model remained so, and none of the added variables were significant. Thus, the final model was the same as that specified in Table 14.

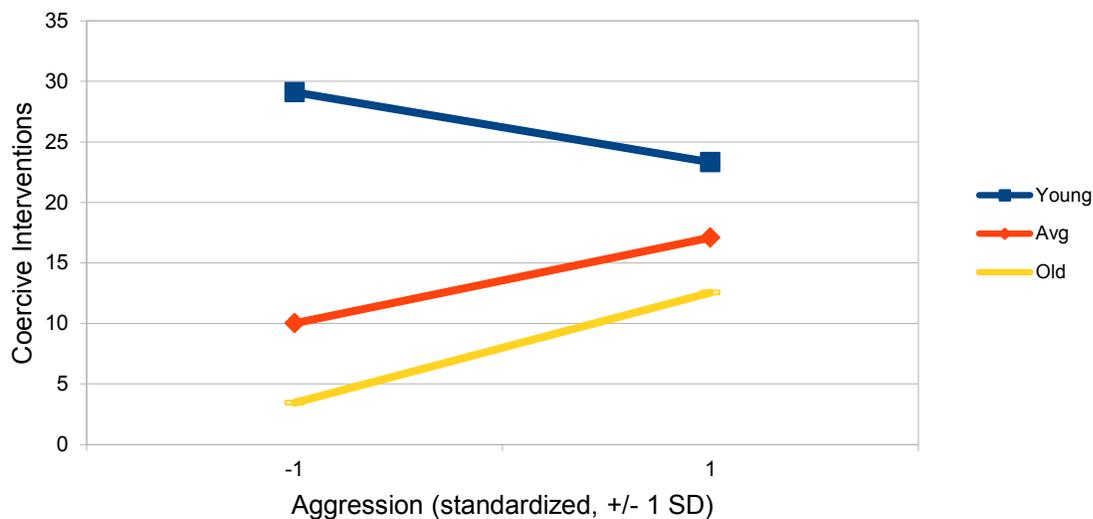


Figure 2: Age X Aggression interaction for total number of coercive interventions.

**Hypotheses Regarding Involvement in Coercive Interventions.** The data generally support the hypothesis that increasing age predicts reduced involvement in coercive interventions. Lower ages were predictive of involvement in CIs for the demographic variables-only model and for the final logistic regression model for involvement in seclusion. For the latter model, an increase in age of approximately 2 years resulted in a more than six-fold decrease in the odds of involvement in a seclusion. Younger age also significantly predicted more total coercive interventions, including seclusions. Previous inpatient or residential

treatment was not significantly related to coercive interventions; thus, that hypothesis was not supported.

Regarding the second hypothesis, aggression was only marginally significant in predicting total involvement in coercive interventions, insignificant for total involvement in seclusions, and there was an age-by-aggression interaction for total coercive interventions. Impulsivity appeared to share significant collinearity with aggression as its inclusion in the model reduced the significance for the aggression variable. Total aggression did predict *any* involvement in coercive interventions and *any* involvement in seclusions. Thus, the hypothesis that aggression would be related to involvement in these interventions was only partially supported.

Regarding psychopathic traits, impulsivity was a significant predictor in all models in which it was included, consistent with the hypothesized findings. CU traits, while not significant in predicting any involvement, were significant in predicting the extent of involvement in coercive interventions and seclusions. Narcissism was not a significant predictor in any model. Thus, the hypothesis that psychopathic traits would predict coercive intervention involvement was partially supported.

For the fourth hypothesis, regarding family dysfunction and abuse, while the length of DHR involvement was the strongest predictor (consistent with the hypothesis), it was significant only in the model that included only the family dysfunction variables and in the model predicting the total extent of involvement in coercive interventions. Furthermore, while in the partial model it was consistent with longer DHR involvement (i.e. a younger age of DHR entry) predicting involvement, for the extent of involvement model, it was in the opposite direction. Thus, while

partially supporting the hypothesis, the length of DHR involvement appeared to have, at best, only a marginal relation to the various outcome variables.

### **Trajectories of Coercive Interventions**

As discussed above, it was expected that identifiable subgroups of coercive intervention trajectories could be determined from the month by month data. Growth Mixture Modeling with MPlus 4.2 was utilized to try and identify homogenous subgroups of individuals within the heterogeneous sample based on the number of restraints and seclusions across months. As the final sample size was 99, six months of data were analyzed. The data consisted of the number of coercive interventions in months 1, 2, 3, 4, 6, and 8 of treatment. Greater coverage of the early months was included in order to identify any “honeymoon” or similar phenomena as the clients become adjusted to the IRT program. Individuals leaving the program prior to month 8 were included; however, those months were treated as missing data. This allowed classification based on the available data up to the month of discharge. Analyses were conducted with the number of latent class groups varying from one (no mixture) to seven. Graphs of the estimated means for each model are presented in Appendix E. The final supported 5-group model is presented in Figure 3, while Table 15 displays the Goodness of Fit Statistics for each model. Included are the Loglikelihood, the Akaike Information Criteria, and the Bayesian Information Criteria. Entropy, or the average probability of group membership for all subjects when placed in their individually most probable class, and the Lo-Mendell-Rubin (LMR) test, which compares the N-class model to the (N-1)-Class model, are also presented. For the LMR test, a low probability indicates that the model with the additional class is a significant improvement over the alternative model (Muthen & Muthen, 2000). Loglikelihood and Information Criteria statistics are also in a lower-is-better form.

The final selection of a model is a function of the goodness-of-fit data as well as the theoretical justification and usefulness of the classifications (Nylund, Asparouhov, & Muthen, 2007). As adding additional classes always improves model fit to some degree, it must be determined that the improvement is worth rejecting a parsimonious model for a more complex one. The LMR test, for example, is one such approach. Generally, the selected model should evidence good fit to the data, have entropy values close to 1, and contain meaningful groups that are large enough to be useful. For these data, the 5-class and 6-class models are both potentially appropriate, and in fact, the 6-class model's LMR value suggests it may be an improvement over the 5-class model. However, the additional class in the 6-class model contains only 2 subjects, too small to be clinically useful. In light of this, the 5-class model was chosen as the most appropriate for the data. It is also important to look at the individual curves for the participants classified into each trajectory to determine if the purported classifications appear to fit the data. Growth curves for individuals in each class are provided in Appendix G.

Table 15

*Goodness of Fit Statistics for the 1-class through the 7-class models*

Test	1-class	2-class	3-class	4-class	5-class	6-class	7-class
Loglikelihood	-1644.488	-1151.684	-1054.381	-1027.197	-1004.155	-985.718	-981.764
AIC	3292.976	2313.367	2124.762	2076.393	2036.31	2005.435	2003.528
BIC	3298.166	2326.343	2145.523	2104.939	2072.641	2049.552	2055.430
Entropy	-	0.961	0.934	0.898	0.903	0.896	0.847
LMR	-	918.948 ( $p = 0.003$ )	181.443 ( $p = 0.025$ )	50.692 ( $p = 0.37$ )	42.967 ( $p = 0.02$ )	34.38 ( $p = 0.007$ )	7.373 ( $p = 0.35$ )

*Note.* AIC = Akaike Information Criteria, BIC = Bayesian Information Criteria, LMR = Low-Mendell-Rubin Likelihood Ratio Test. Graphical depictions for each of the above models are provided in Appendix E.

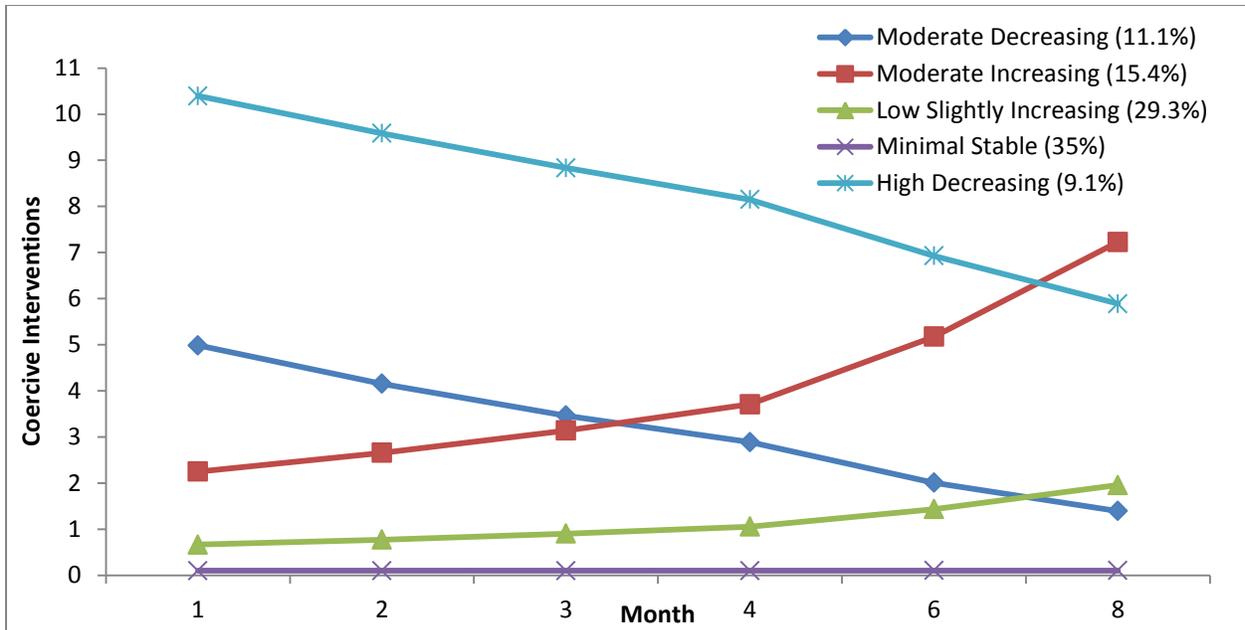


Figure 3: Group means for 5-class mixture model.

Note: From bottom to top at month 1, groups are: Minimal-Stable (35%), Low-Slightly Increasing (29.3%), Moderate-Increasing (15.4%), Moderate-Decreasing (11.1%), and High-Decreasing (9.1%).

For the final 5-class model, the groups identified correspond to a Minimal-Stable group ( $n = 35$ ), a Low-Slightly-Increasing group ( $n = 29$ ), a Moderate-Increasing Group ( $n = 15$ ), a Moderate-Decreasing group ( $n = 11$ ), and a High-Decreasing group ( $n = 9$ ).

In addition to the linear mixture model, following identification of the 5-class fitted model, and after looking at the divergence between individual values and group means, three alternate specifications were evaluated. The first alternative was to include a quadratic growth term to determine if the groups fit a quadratic pattern rather than a linear one; this would allow for a change in the direction of the trajectory. The final two alternatives were to fit a piece-wise mixture, with the first piece including months one to three and the second piece including months four, six, and eight. Both linear and quadratic approaches were tried for the piece-meal models. Estimated means for all three alternatives are shown in figures in Appendix F. Only the quadratic piece-wise mixture model was shown to support 5-classes ( $LMR = 58.738, p = .04$ ).

Although this model evidenced generally good fit; it was rejected in favor of the single-piece linear model shown in Figure 3 primarily due to the presence of two groups with only six subjects. Although these alternative models were rejected, all three appear to support the presence of a group not identified in the model above: Clients who start with a moderate or low number of restraints, increase over months two and three, and then decline again through month eight. A group generally fitting this description and containing 10-13 subjects was found in all three alternate models. In a larger sample, it may be possible to identify a model including such a group by including a larger number of data points per subject.

Once the trajectories were identified, each subject was assigned to the trajectory with the highest probability of membership. At that point, the GLM model specified in Table 14 was re-run with the addition of a trajectory membership factor. Parameter estimates for that model are listed in Table 16. The Likelihood ratio test indicated that the model including trajectory membership significantly improved fit ( $\chi^2 = 18.16$ ,  $df = 4$ ,  $p = .001$ ), suggesting that predicting trajectory membership can improve the prediction the total number of coercive interventions that a client will be involved in during treatment. Of the parameters that were significant in the original GLM model identified in Table 14, age, Age x Aggression, DHR age, and impulsivity were no longer significant with the inclusion of the trajectories.

To evaluate the utility of the trajectory categories and membership, a series of Analysis of Variance (ANOVA tests) were performed with trajectory classification as the independent variable and various predictor variables as the dependent variables. The results of those ANOVAs are presented in Table 17.

Table 16

*Parameter estimates for total involvement in coercive interventions with trajectory*

Predictor	$\beta$	<i>SE</i> ( $\beta$ )	Wald $\chi^2$	<i>p</i>
Gender (Male)	.186	.2805	.439	.508
<b>LOS</b>	.637	.1467	18.869	.000
Age	-.298	.1917	2.411	.121
Aggression	.195	.1496	1.707	.191
IQ	-.021	.1459	.021	.884
IQ x Aggression	-.146	.1772	.676	.411
Age x Aggression	.344	.1930	3.167	.075
# Foster Care Placements	.105	.1441	.528	.467
DHR Age	.058	.1822	.103	.748
Narcissism	-.217	.1435	2.293	.130
<b>Callous/Unemotional</b>	<b>.335</b>	<b>.1647</b>	<b>4.131</b>	<b>.042</b>
Impulsive	.201	.1702	1.398	.237
<b>Moderate-Decreasing</b>	<b>1.864</b>	<b>.4424</b>	<b>17.742</b>	<b>.000</b>
<b>Moderate-Increasing</b>	<b>2.116</b>	<b>.4209</b>	<b>25.272</b>	<b>.000</b>
<b>Low-Slightly Increasing</b>	<b>1.597</b>	<b>.3475</b>	<b>21.135</b>	<b>.000</b>
<b>High Decreasing</b>	<b>2.539</b>	<b>.5183</b>	<b>23.990</b>	<b>.000</b>
(Minimal Stable)*				
<b>Trajectory Overall</b>			<b>26.087</b>	<b>.000</b>

*Note.* \*The Minimal-Stable trajectory was used as the reference group. Parameters in **bold** are significant at the  $p < .05$  level

Several of the significant predictors from the Logistic Regression and GLM models showed significant differences between trajectory groups, including age ( $F[4, 99] = 2.649$ ,  $p = .038$ ), total aggression ( $F[4, 99] = 5.006$ ,  $p = .001$ ), CU traits ( $F[4, 99] = 3.618$ ,  $p = .009$ ), and impulsivity ( $F[4, 99] = 6.743$ ,  $p < .001$ ). Non-significant predictors typically showed no differences between trajectory groups, with the exception of total number of medications, for which the ANOVA was significant ( $F[4, 99] = 3.101$ ,  $p = .019$ ). The significant predictors of group membership, and their correspondence to the logistic and negative binomial models, further supported the hypothesis that these trajectory groups may be theoretically and clinically meaningful.

Table 17

*ANOVA tests with Trajectory as IV, Predictor Variables as DV*

Predictor	<i>F</i> -test	<i>p</i>	<i>R</i> <sup>2</sup>
<b>Age</b>	<b>2.649</b>	<b>.038</b>	<b>0.101</b>
<b>Aggression</b>	<b>5.006</b>	<b>.001</b>	<b>0.176</b>
IQ	0.396	.811	0.017
LOS	0.561	.691	0.023
Hospitalizations	0.064	.992	0.003
Residential	1.076	.373	0.044
Narcissism	0.448	.774	0.019
<b>Callous/Unemotional</b>	<b>3.618</b>	<b>.009</b>	<b>0.133</b>
<b>Impulsivity</b>	<b>6.743</b>	<b>&lt;.001</b>	<b>0.223</b>
Foster Care Placements	0.970	.428	0.040
DHR Age	0.369	.830	0.017
Abuse Total	0.393	.813	0.016
<b>Total # Medications</b>	<b>3.101</b>	<b>.019</b>	<b>0.124</b>

*Note.* Numerator *df* = 4 for all variables, denominator *df* = 99 for all except IQ (*df* = 97) and DHR age (*df* = 89)

Post-hoc tests were also conducted for those predictors who showed significant differences across trajectory groups. For age, the minimal-stable group was significantly older than the high-decreasing (mean difference [hereafter *d'*] = 2.06, *p* = .008) and moderate-decreasing (*d'* = 1.44, *p* = .044) groups. The low-slightly-increasing group was also significantly older than the high-decreasing group (*d'* = 1.72, *p* = .030). For aggression, the minimal-stable group had significantly lower total aggression in their history than the moderate decreasing (*d'* = 2.64, *p* = .002), moderate increasing (*d'* = 2.04, *p* = .008), and high-decreasing (*d'* = 3.15, *p* = .001) groups. For CU traits, the minimal-stable group had significantly lower ratings than the moderate decreasing (*d'* = 1.71, *p* = .019) and the moderate increasing groups (*d'* = 2.05, *p* = .002). The low-slightly-increasing group also had lower scores than the moderate decreasing (*d'* = 1.52, *p* = .042) and moderate increasing (*d'* = 1.85, *p* = .006) groups. For impulsivity, the minimal-stable group had lower ratings than all groups: moderate-decreasing (*d'* = 1.08, *p* = .004), moderate increasing (*d'* = 1.12, *p* = .001), slightly increasing (*d'* = 0.6, *p* = .025), and

high-decreasing ( $d' = 1.7, p < .001$ ). The high-decreasing group also had higher impulsivity ratings than the slightly-increasing group ( $d' = 1.1, p = .008$ ).

**Hypotheses Regarding Coercive Intervention Patterns.** Hypothesis five regarding the expected trajectory groups was supported by the data, with the finding of groups with high involvement, low involvement, no-involvement, and decreasing involvement. While the high-involvement group did show a decline over time, it remained high even after 8 months. As noted, in addition to these groups, a moderate-increasing group was also identified.

For hypothesis six, aggression history, CU traits, and impulsivity were significant predictors of group membership, consistent with the hypothesized findings. Narcissism and length of DHR history were not significant predictors of group membership, thus hypothesis six was partially supported.

### **Staff Training**

To examine the effects of training on the use of coercive interventions, the primary staff person for each coercive intervention episode was identified. Training files were analyzed to determine the relevant training dates for each staff member with more than 10 incidents in the database. A computer program then determined the number of days since the last training for each coercive intervention's primary staff person. This data was grouped into six 30-day buckets ranging from days 1-30 to days 151-180. Trainings are conducted every 6 months. Because a staff member who has worked for 7 months has two opportunities to engage in coercive interventions 1-30 days after training (i.e., month 1 and month 7) but only one opportunity for each of the other buckets, only those interventions occurring after the first training on file and before the last training on file were included. This ensures an equal number of training "cycles" is completed. Interventions occurring outside the range of 0 days to 180

days were also excluded. An initial chi-square test was conducted to determine if the actual distribution of restraints in each 30-day bucket differed from an even distribution where-in 1/6 of the total would be expected per bucket. That result showed that the distribution of coercive interventions was significantly different from an even distribution ( $\chi^2=30.722$ ,  $df=5$ ,  $p < .001$ ). The distribution of coercive interventions is shown graphically in Figure 4.

Given the significant finding for the distribution of coercive interventions, in addition to using an even distribution as the null hypotheses, a second analysis was conducted that attempted to correct the expected distribution for time of year. Two factors make such a correction potentially important: 1) The number of interventions varies across time of year, with peaks typically in early spring and early fall and a valley in summer and winter, and 2) Staff trainings do not occur evenly across the year. As a result, if, for example, all staff were trained in January, then you would expect a smaller number of interventions in the 151-180 bucket simply because there are a smaller number of interventions five to six months from that time point as there are fewer interventions during the summer months than the fall and spring months. The most common months of training were March, April, September, and October. To correct for this variation, for each month, a percentage of staff trained from each of the previous 6 months was calculated. The total interventions by the included staff for any given month were then divided between each of the preceding 6 months according to the percentage of staff trained in that month. See Appendix H for a more complete description of the adjustment methodology. This time-adjusted correction is also presented in Figure 4.

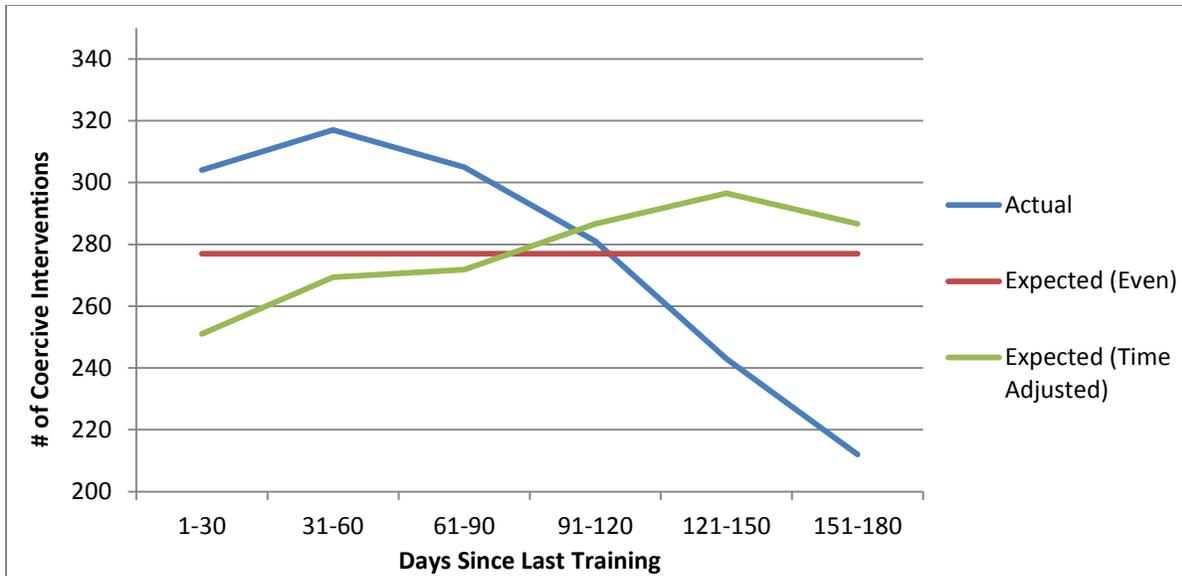


Figure 4: Distribution of coercive interventions by time since staff training.

A second chi-square test compared the actual distribution to the adjusted expected distribution, and the results were significant ( $\chi^2=52.86, df=5, p < .001$ ). An alternative correction which used the previous 5 months and the current month as the reference for each bucket (compared to using the previous 6) did not significantly impact these results, which still showed a significant difference ( $\chi^2=56.951, df=5, p < .001$ ). There was not a significant difference between the two different adjusted expected distributions ( $\chi^2=4.12, df=5, p = .53, ns$ ). There is a clear pattern that the number of coercive interventions by staff goes up after training and then declines until the following training. The actual and expected distribution counts are presented in Table 18. Although these corrections were done by months rather than day-by-day, given the lack of significant difference between the various corrections, it is unlikely a more refined correction for this time-varying behavior would significantly alter this finding.

Table 18

*Actual and Expected Coercive Interventions by Time since Training*

Model	Days Since Last Training					
	1-30	31-60	61-90	91-120	121-150	151-180
Actual	304	317	305	281	243	212
Expected (method 1)	251.05	269.34	271.81	286.64	296.52	286.64
Expected (Even)	277	277	277	277	277	277

*Note.* The total for all rows is 1662 – any discrepancies due to rounding for display in table.

One final alternative looked at was to consider the proportion of the training cycle completed for the staff member involved in a restraint. For example, an intervention occurring 30 days after training would be 16.67% of the way through a 180 day cycle, but only 14% through a 210-day cycle. This approach corrects for varying lengths of training cycles across staff members, and across time for those staff with more than 1 training cycle. However, it does prevent for a correction for seasonal variation in training dates and number of coercive interventions. Graphs for the number of coercive physical interventions by proportion of the training cycle are presented in Appendix H. Figure H1 includes both the first and subsequent training cycles, while Figure H2 excludes the first training cycle, to control for any difference in new staff members compared to older staff.

In addition to the  $\chi^2$  tests, a paired samples *t*-test was conducted to determine if the number of interventions a staff was involved in differed from the beginning of a training cycle until the end. There was a significant difference in the number of coercive interventions in days 1 to 30 after training and in days 151-180 after training ( $t[65] = 3.244, p = .001$ ). A separate calculation was made to determine the number of coercive interventions occurring in the 30 days just prior to training, which was approaching significance when compared to the 30 days after training ( $t[81] = 1.87, p = .06$ ).

**Hypothesis Regarding Staff Training.** While staff members' involvement in coercive interventions did vary across the time between trainings, consistent with the hypothesis, it was in the opposite of the expected direction. Specifically, staff members generally were involved in more interventions immediately, with declining involvement across time.

### **Exploratory Analyses Results**

As discussed above, the findings regarding the distribution of coercive interventions by time, day, and location are presented in Figure D1 through Figure D5. Regarding the use of prn medication, there was a significant correlation between the number of prn's and the number of coercive interventions ( $r = 0.856, p < .001$ ). Of the participants, 77% received at least one prn during treatment. Using the same models as was used to analyze the coercive interventions, only total aggression was significant in predicting whether a youth would receive at least one prn during treatment ( $\beta = 1.125, p = .008$ ; results presented in Table D1). For predicting the total number of prn's received during treatment (Table D2), the significant variables were LOS ( $\beta = 0.370, p = .007$ ), age ( $\beta = -0.657, p < .001$ ), total aggression ( $\beta = 0.327, p = .019$ ), age of DHR involvement ( $\beta = 0.332, p = .04$ ), CU traits ( $\beta = 0.348, p = .03$ ), and impulsivity ( $\beta = 0.439, p = .003$ ).

Growth mixture models were also fit to two alternative treatment indicators: 1) The number of groundings (received for aggression or serious rules violations), and 2) The number of days for which the client was at the lowest level of the behavioral system ("Level-1 days"). For both alternative treatment indicators, a 5-class model similar to the one for coercive interventions was obtained. While the number of individuals per class and the exact shape of the trajectories differed somewhat, there was significant similarity in the models, suggesting that a 5-trajectory

classification may be appropriate for a variety of treatment indicators across time. Graphs of the final models for groundings and Level-1 days, as well as fit indices, are provided in Appendix I.

## **Discussion**

The use of coercive interventions such as restraint and seclusion is accompanied by significant risks to clients, up to, and including, death. These risks have resulted in increasing restrictions on their use and prompted more investigation into isolating those factors that correlate with coercive interventions and therefore may be used to predict which clients will need more intensive treatment programs. The current study looked specifically at youths in intensive long term treatment, who typically have not responded to less intensive treatment options and are more likely to be involved in coercive interventions while in treatment.

In this study, the clinical files of 99 youths admitted to a long-term intensive residential treatment program were analyzed to assess whether the information available to the treatment team at intake could predict that youth's involvement in coercive interventions while in treatment. Risk factors were coded from the pre-admission and intake assessment records for each client. Coercive intervention data was obtained from the facility's computerized tracking database and the paper copies of post-intervention authorization and debriefing forms completed by staff following any coercive intervention. The analyses conducted showed that a modest number of variables were fairly consistent in predicting both any involvement and the extent of involvement in coercive interventions while in treatment.

### **Predicting any involvement in coercive interventions while in treatment**

The first of three primary research questions addressed by this study was whether a set of risk factors developed from prior research and developmental theory could predict involvement

in coercive interventions in a long-term IRT facility. This question was analyzed in two phases. Phase one looked at predicting if a client would be involved in at least one coercive intervention while in treatment, without regard to *how many* coercive interventions they were involved in. First, based on previous studies conducted primarily in hospitals and short-to-medium term treatment facilities, a set of 21 predictors was identified and grouped into 4 theoretically related groups: 1) Demographic variables, 2) Individual variables, 3) Prior treatment variables, and 4) Family variables. To these groups was added a fifth group: 5) Psychopathic traits. “Psychopathic traits” was analyzed using a 3-factor framework following the model of Cooke and Michie (2001), with a Narcissism factor, a Callous/Unemotional Traits factor, and an Impulsivity factor. Each of the 5 blocks was analyzed separately to identify potential candidates for inclusion in the final model. In this stage, five significant predictors were identified, which included age at admission, total aggression history, number of foster care placements, age of first DHR involvement, and Impulsivity. Gender was marginally significant.

In the final model, to these six variables were added length of stay (LOS), IQ, and the remaining PCL:YV factors, narcissism and CU traits. Age-by-aggression and IQ-by-aggression interactions were also included. This model correctly predicted coercive intervention involvement for 92% of the sample (90% for seclusions only). The final group of significant predictors for *any* coercive intervention involvement included only higher levels of aggression and impulsivity. Marginally significant ( $p < .08$ ) predictors included male gender, younger age, and the IQ x aggression interaction. Notably, the significant predictors were exclusively limited to individual risk factors. This differs significantly from the results found by other studies. For example, Boxer (2007) found that contextual factors such as previous hospitalizations and residential treatment stays were predictive; this result was not duplicated in this study. Similarly,

family history had no significant impact on the results here. While diagnosis has received mixed results in previous studies (Boxer, 2007; Sourander, et al., 2002), it was not a significant predictor here, potentially due to the coding approach utilized. Perhaps most surprising was the lack of significance regarding multiple placements. One potential explanation for the absence of any multiple-placement syndrome type youths is the extremely small number of participants in this study who had not previously been hospitalized ( $n = 5$ ) as well as the fact that the range for previous residential placements was limited to zero through three. It may also be the case that these variables influence is significantly related to other variables that were included such as aggression history, as youths with significantly more aggression would be (a) more likely to have been hospitalized or placed in a previous residential program and/or (b) more likely to have documentation of that previous aggression history included in the chart through things like hospital admission and discharge records.

### **Predicting the Amount of Involvement in Coercive Interventions**

Given that the majority of subjects in the current study were involved in at least one coercive intervention, the need to differentiate between those youths with differing levels of involvement becomes particularly important. To that end, the second phase of the first research question focused on predicting “how many” interventions different individuals would be involved in. The same set of predictors from the logistic regression model was used to analyze this question. Because the outcome (number of interventions) is a count variable and highly skewed, regular OLS regression is not appropriate, and negative binomial regression was used instead.

The final group of significant predictors for the total number of coercive interventions included longer LOS, younger age, younger age of DHR involvement, higher CU traits, higher

impulsivity, and the Age x Aggression interaction. Aggression was only marginally significant. When looking only at the number of seclusions, only LOS, age, CU traits, and impulsivity were significant. Age x Aggression and DHR age became only marginally significant. The age by aggression interaction term indicated that for average and older clients, interventions increased with aggression; however, for younger clients, the relationship was flat or slightly negative. This interaction may also be influenced by the presence of outliers. It is possible that some younger children, who, in general, experienced more interventions but also have a shorter history from which to draw information pertaining to aggression and other ratings, may have influenced the overall relation between age, aggression, and coercive interventions.

Here again, while there are similarities between these findings and past work, there are some notable differences as well. As with the “any-involvement” models, previous residential treatment was not a significant predictor of coercive interventions, despite previous research indicating its utility (Boxer, 2007). Age and LOS were significant, with longer LOS and younger age predictive of more involvement, consistent with past studies (Boxer, 2007; Leidy, et al., 2006). The role of psychopathic traits, particularly CU traits and impulsivity, was also significant, and in line with previous findings (Stafford & Cornell, 2003; Stellwagen & Kerig, 2010a).

At first glance, the lack of significance for aggression seems suspect, particularly given results from previous studies. However, further analysis revealed that this was due to the significant correlation between aggression and impulsivity. Indeed, removing impulsivity from the model resulted in aggression being significant; however, it also resulted in a significant decline in model fit. As noted by Boxer (2007), there are substantial advantages to the use of aggression variables similar to the one used here. It is easily obtained from a simple count of a

variety of aggressive episodes in a client’s history, and is easily integrated into an admission or initial evaluation protocol. Indeed, the current protocol used by the facility in this study need only be slightly modified to include increased categories and to include a count as opposed to asking only if they had ever occurred. Furthermore, despite the fact that compared to the general population youths in this study represent the extreme tail of the aggression distribution, the total aggression variable for this study was normally distributed, indicating significant variation even within this extreme sample.

### Trajectories of Coercive Intervention Involvement

Although being able to make a prediction regarding the involvement in coercive interventions could represent a significant step toward providing more individualized, tailored treatment programs, a total number alone is not the only consideration. Almost as important is identifying patterns or trends in youths’ involvement over time. Consider, for example, two youths who both are involved in 100 coercive interventions over a span of 10 months following intake, represented in Figure 5.

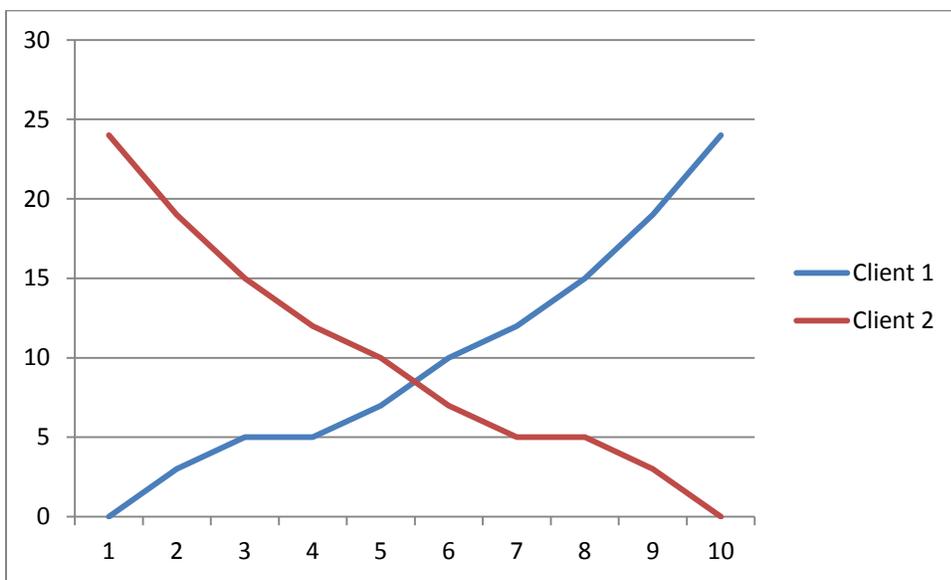


Figure 5: Two example trajectories for hypothesized clients by month in treatment.

Client one represents a poor treatment responder, while client two represents a good treatment responder. Although both have identical numbers of coercive interventions, clearly one has benefited from the treatment program while the other may require a different program or approach. It may be that the pattern of interventions required is as, or more, important than the specific number required across time.

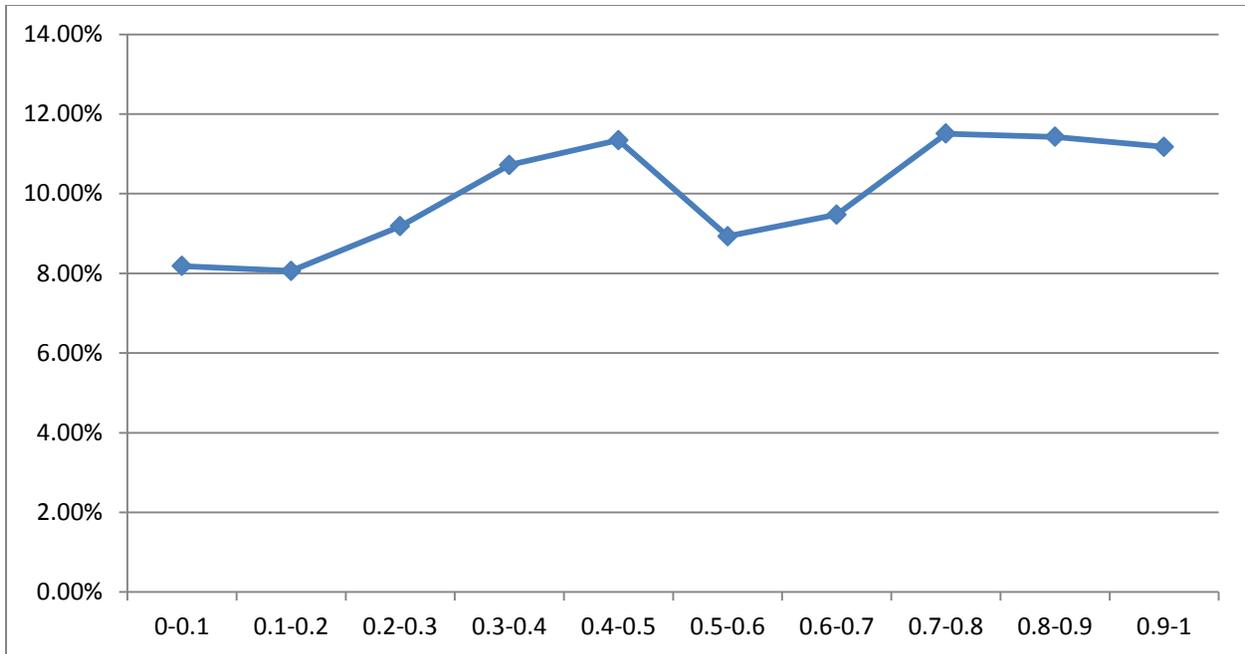
To evaluate this, several Growth Mixture Models were run on six months of coercive intervention data for each client. The months used were one through four, month six, and month eight. These months were chosen as they allowed for both linear and quadratic trends as well as for an evaluation of any potential “honeymoon” effect, whereby a child comes in, does well for some period of time, and then begins to show increasing levels of negative behavior. The data supported a 5-trajectory model: 1) Minimal-Stable, 2) Low Slightly Increasing, 3) Moderate Increasing, 4) Moderate Decreasing, and 5) High Decreasing. The appropriateness of these trajectories was bolstered by multiple pieces of evidence. The identified groups (each comprising at least 9% of the sample) fit with those that were expected and were large enough to allow for meaningful comparison. These groups were also consistent with the author’s experience in this population, as well with the training curriculum used by the facility, which emphasizes treatment responders and non-responders. Quantitatively, the inclusion of trajectory also significantly improved the model fit when considering the extent of involvement with coercive interventions. Finally, very similar predictors to those in the original models were significant in predicting trajectory membership, including age, aggression, CU traits, and impulsivity.

Although alternative trajectory models that included quadratic or piece-wise terms were explored, ultimately none represented a significant improvement from the 5-trajectory linear

model that was chosen. Despite this, one notable fact arose from the consideration of these models: The potential for identification of a “honeymoon” group comprising 10-13% of the sample. A group roughly matching this presentation was identified in each of the three alternative models, and overlap across these models for the members of that group was generally around 50%, or higher, with mismatches generally being classified in the next most similar group. With more data points in a higher sample, it may be possible to more fully identify that potential trajectory group within a larger set of trajectories.

The finding that a small number of clients are responsible for a large percentage of the total coercive interventions, which was seen both in the distribution of intervention totals as well as the trajectory classes, is consistent with previous studies. For example, Boxer (2007) identified a group of three outliers (of nearly 500 participants), while Gullick, et. al. (2005), found an outlier group of approximately 10%. This is also consistent with the adult literature (Hendryx, Trusevich, Coyle, Short, & Roll, 2010), which identified high users of coercive interventions as a group comprising 5-10% of all inpatients.

Another approach to identifying the overall trajectory of coercive intervention usage is to look at the distribution of interventions by phase of treatment. Using this approach, for those clients for whom a discharge date was available, the distribution obtained is depicted in Figure 6.



*Figure 6: Percentage of coercive interventions occurring in each treatment decile.*

Note that this pattern, which increases across treatment phase, differs significantly from that found in a study of adolescent females (Leidy, et al., 2006), which showed a more progressive decline but with an increase in the middle and again as discharge neared. Some of the increase around the middle phase of treatment may reflect again the concept of a “honeymoon” effect wearing off, as the youths become more comfortable and used to the new, highly structured environment. The subsequent decline and increase towards the end of treatment may reflect concern about post-discharge plans, such as returning to a potentially chaotic family situation or to an environment where they have previously experienced significant difficulties. The near-discharge increase may also reflect frustration over not being able to discharge when the youth feels that he or she is ready, perhaps due to lack of an appropriate caretaker. Finally, this chart also reflects those clients who discharged to the hospital for stabilization, who may have seen a steeper increase in coercive interventions prior to that point or a different distribution entirely. More information regarding the type and nature of the discharge would allow for a more sophisticated analysis of this pattern.

## Staff Training

The final research question sought to explore the role and influence of staff training on the use of coercive interventions. While the present study represents only a modest look at the question, the results were quite surprising. Far from finding that staff members typically engaged in fewer coercive interventions immediately after training, these data showed that the use of coercive interventions *increased* after training, remained relatively steady for 2-3 months, and then declined until the following training period. This result remained despite attempts to control for a variety of potential confounds. Interventions after the last training on file were excluded (to prevent having only an additional fraction of a cycle), as were staff who had been employed less than 180 days. Furthermore, the obtained numbers were even compared to expected numbers that incorporated both monthly variations in coercive intervention numbers across the program and monthly variations in the number of people trained. In conjunction with this finding, discussions with various staff and the training department coordinator for the center resulted in some potential hypotheses for the pattern found: 1) Better reporting of interventions immediately after training, 2) Changes in the center's operationalization of seclusions, 3) The effect of new employees, 4) More comfort with performing the interventions immediately after training, and 5) Shortened training cycles for some staff. Each of these are discussed in turn.

Increased regulatory and legislative attention to the use of these interventions has resulted in an expanding set of actions being qualified as a "restraint" or "seclusion." Particularly relevant is the classification of escorting a youth to a calm-down area. Such an act typically involves only brief, minimal use of physical force, such as holding a child's hand or shoulder. This type of "restraint" appears to be qualitatively different from many other actions that are clearly restraints, such as two staff members holding a child on the floor for five or more

minutes. Thus, one potential explanation for the pattern found would be an increase in the reporting of these “marginal” coercive interventions followed by a decline until reinforced at the following training. Although there is no way to identify post-hoc which restraints may be attributed to this more “marginal” category, the current study did look at the average length of restraints in each post-training period as well as the pattern of “1-minute or less” restraints in each post-training period.

Restraints lasting 1 minute or less (all recorded as 1 minute in the computerized database and generally on the paper forms as well) may be seen as a rough proxy for a potential class of “marginal” restraints. The results, however, showed that length was generally consistent across training periods, around 5 minutes on average. While there was a drop in 1 minute restraints in the 151-180 day period after training, the number of 1 minute restraints in the other periods was fairly consistent, which differs from the overall pattern of decline in months four through six. Thus, increased reporting of “marginal” restraints appears to be insufficient to explain the observed data. While this does not exclude the possibility that significant numbers of more lengthy restraints are being un-reported, it is difficult to understand how such a large number of clearly coercive interventions would be going unmissed despite the presence of multiple staff and supervisors, the frequency of training, and the existence of monitoring equipment.

Another potential explanation is the effect of new employees. While the results looked only at employees who had been employed at least 180 days, it did not exclude coercive interventions occurring before the 180<sup>th</sup> day, if the individual staff member ended up being employed for the 180 day period. If new staff members demonstrate a particular pattern that quickly dissipates (within about three months of their initial training) and does not repeat, and if a sufficient number of new staff members are represented in the data, such an effect could

potentially explain the observed pattern. To this end, an alternative, exploratory analysis was conducted. In this version, coercive interventions by any particular staff member occurring before their 180<sup>th</sup> day of employment were excluded. For those staff for whom accurate hiring dates were not available, the first training on file was considered the date of hire. In essence, each staff members' first training cycle was excluded. The results from that analysis showed an even more consistent pattern, shown below in Figure 7. Use of coercive interventions declined even more steadily than in the original model, with only one period showing an increase. This model was also significantly different from both steady and seasonally adjusted distributions. Thus, while it is certainly possible that newly hired staff show a different pattern of coercive intervention usage, such a difference, if any, cannot explain the observed data.

Although changes in the center's operationalization of coercive interventions may cause one time effects on the rates, by itself this is unlikely to have significantly affected the overall pattern, due to the cyclic nature of training (repeating every 6 months) as well as the variation in times that staff members are trained. This is particularly so when considering that the data set included coercive interventions from a more than two year period, further reducing the potential effect of any one-time changes. Still, this cannot be ruled out on the basis of the data available, particularly if such a change occurred at a critical juncture in the data-set and at a time when the majority of staff were being trained within a short time-frame.

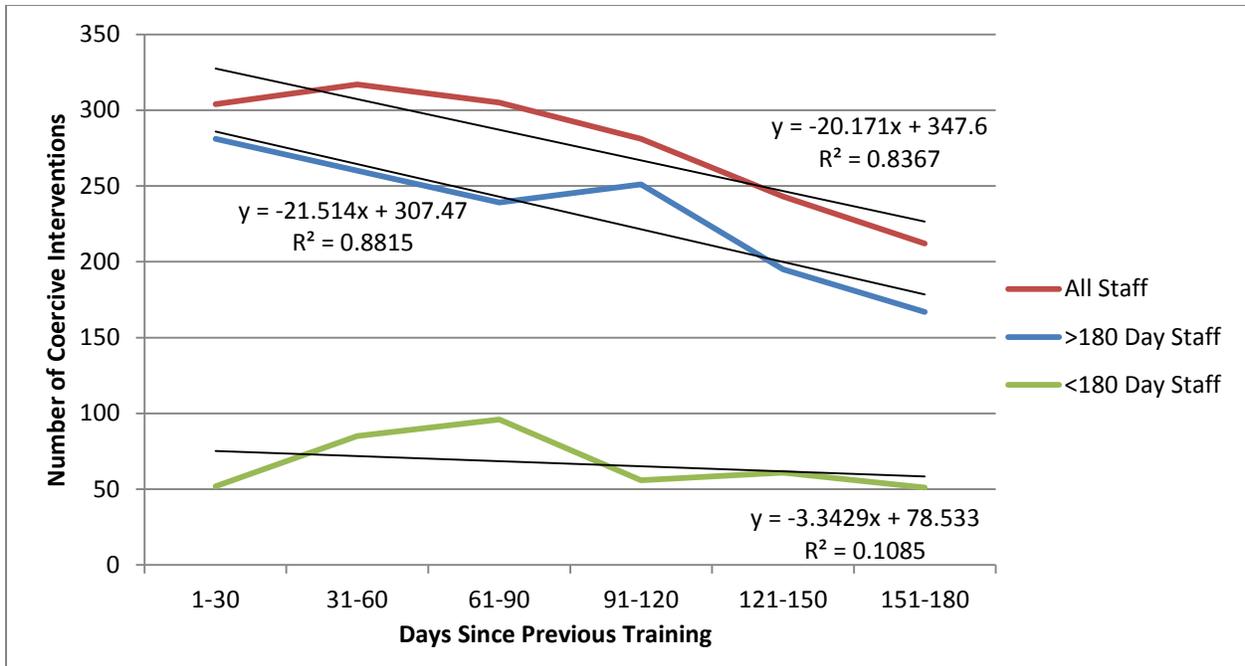


Figure 7: Long term staff vs. all staff. Note that the <180 day and >180 day lines do not sum to the total line due to the use of a minimum days employed filter for the All Staff line

Another alternative hypothesis considered is that staff members may be more comfortable with performing these interventions immediately after training. Such an explanation is both plausible and would explain the observed pattern. It should be noted, however, that training consists of practice and evaluation in using physical intervention techniques, education in the policies and requirements of their use, and of practice and education in verbal de-escalation techniques. If increasing comfort with the interventions does explain the observed pattern, it would suggest that staff gain significantly more comfort with using physical intervention techniques than they do with using verbal de-escalation techniques. This may suggest a need to re-evaluate the effectiveness and/or training on these verbal de-escalation techniques. Although it is not possible to directly test this explanation, one might expect that increasing comfort with the use of these interventions would be accompanied by fewer injuries

during their use. Figure 8 shows the percentage of interventions that resulted in a noted injury on the ESIR form separated into the 30-day buckets:

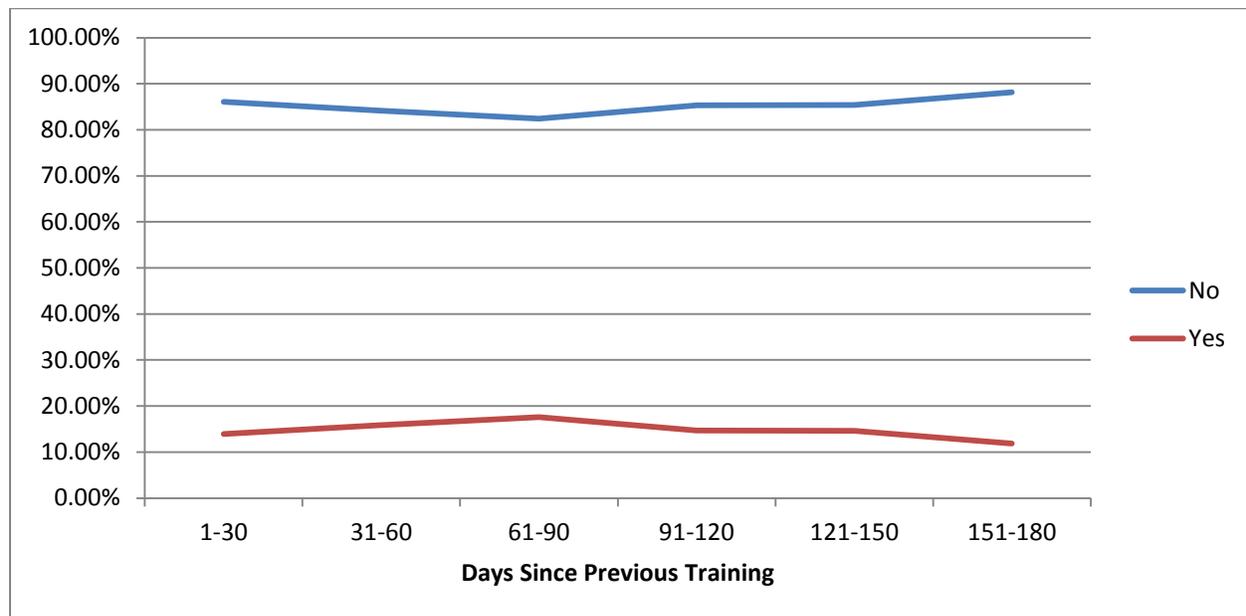


Figure 8: Percentage of interventions with injury reported by interval.

As the data available was not sufficient to determine the severity of the injury in all cases, and based on the fact that nearly all reported injuries were minor complaints of pain or scratches, the injury scales were collapsed into a yes/no format only. More complete injury information would likely require integrating several sources of information throughout the chart, including nursing notes and physician visit reports; however, for the purposes of this study, only the information available as part of the ESIR form was utilized. As illustrated in the table, if decreasing comfort with the interventions explains some of the decline in their use, this is not accompanied by any increase in the percentage of interventions involving injuries. Again, however, this is not a direct comparison to the idea that staff members feel more comfortable with the interventions after training, and should be understood in that context.

The final potential explanation centers around the training cycle itself. While staff members are only required to be trained every 6 months, and the average length of time between

trainings was 196 days, it is possible that some staff members are completing their bi-annual trainings in such a manner that their total training cycle length is less than 180 days. This would have the effect of removing interventions from the (likely) 151-180 day period into the next cycle. An exploratory analysis was undertaken to determine if using a bin size of 15, rather than 30, days could identify this pattern. The results of this analysis are depicted in Figure 9 below. While there is a decline in the last 15 day period consistent with the hypothesis, the overall results still suggest a downward trend, and the results are significantly different from the expected even distribution. Thus, while this “compressed” training cycle hypothesis may explain some of the decline, particularly in the last period; it appears to be insufficient to explain the overall pattern absent substantial numbers of staff being trained significantly early, a possibility that appears mostly foreclosed by the average time between trainings.

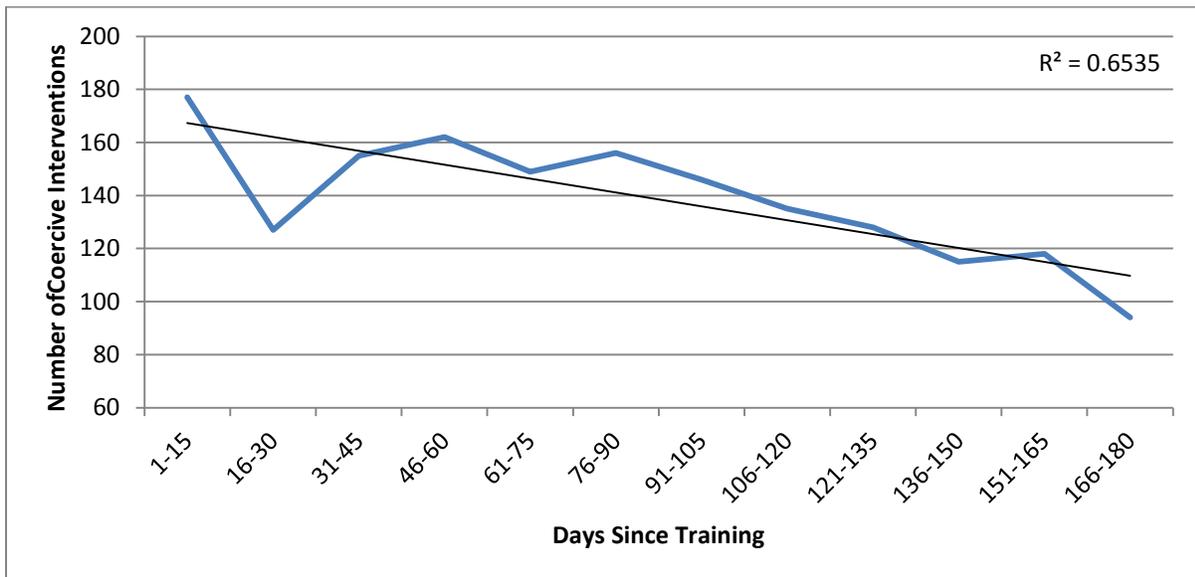


Figure 9: Coercive interventions by 15-day intervals.

### A Contextual Model of Residential Treatment

With the increasing emphasis on “individualized treatment” in the context of the client or patient, it is important to consider more carefully the other individuals who are a part of that treatment, from direct care staff to teachers to therapists to administrators. In essence, coercive

physical interventions represent one observable outcome of a Bronfenbrenner-style (1992) current treatment context superimposed on the child's unique previous life experiences, which are often quite traumatic. Figure 10 presents one potential diagram of such a system.

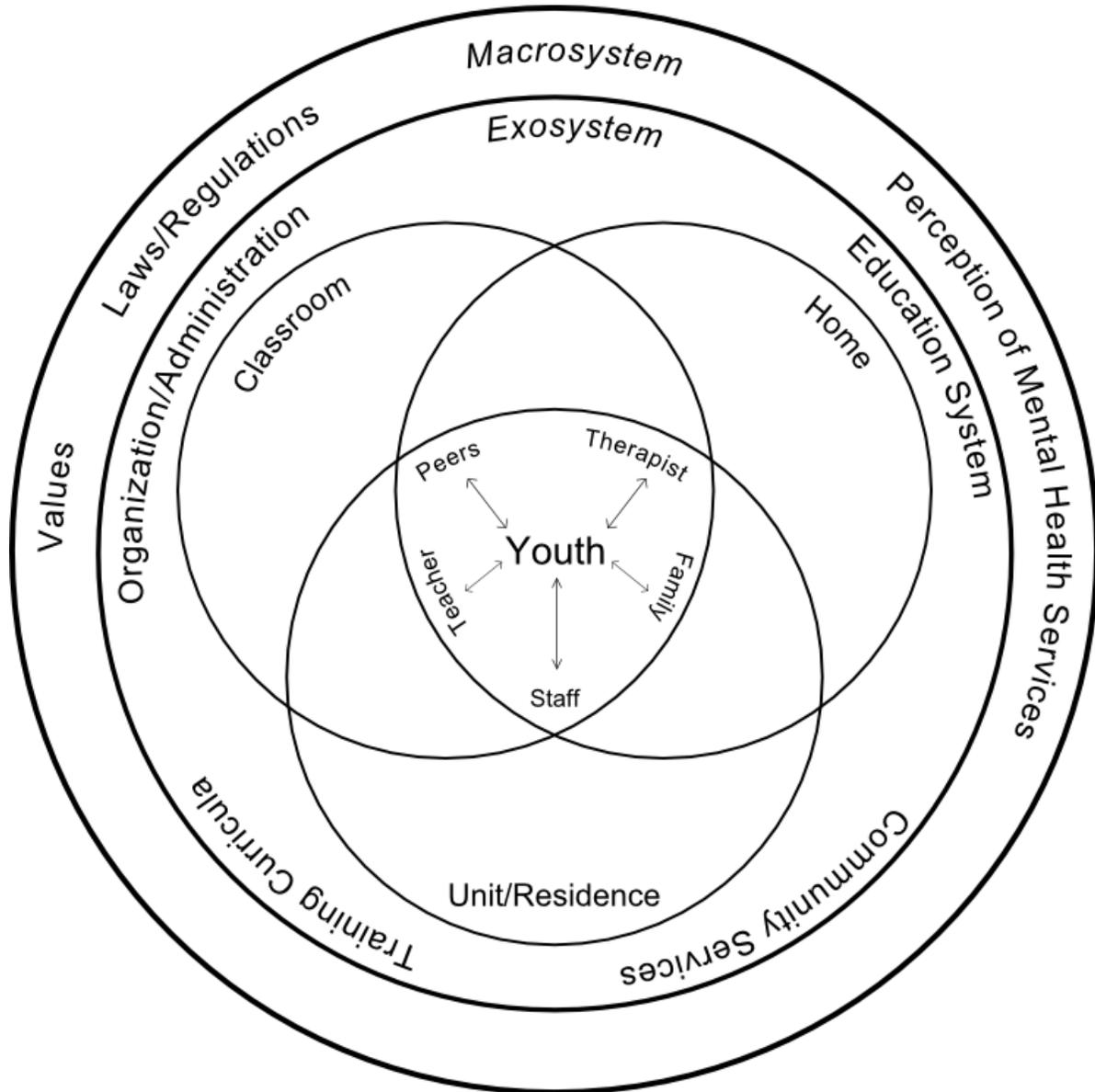


Figure 10: Ecological model of treatment environment

Many of the risk factors looked at in this and similar, previous studies, such as abuse history, aggression history, diagnosis, etc. lay at the intersection of the youth's previous

microsystems and the chrono-system representing time. These become aspects of the youth's individual profile (e.g. risk or protective factors) in the treatment context. While in treatment (the current context), the youth interacts with various direct care and professional staff, family, and peers (microsystems) as he or she rotates through life in the residential area, classroom and potentially home visits (mesosystem). These interactions and microsystems operate under the influence of various organizational/administrative philosophies, training curricula, community services, educational system inputs, and DHR involvement (exosystem). Finally, all of this takes place in the broader macrosystem, which includes the broader regulatory/legal framework for service provision, the values of the public, the individuals involved, and the legal decision-makers, and other factors such as the perceptions of mental illness and severe emotional/behavioral disorders. Each system interacts with all of the others and influences the success or failure of the overall treatment context. As a result, a complete understanding of the factors influencing that outcome requires a more complete understanding of each piece of the various systems and how it interacts with the other pieces of the systems.

**Microsystem Factors.** Residential treatment itself typically involves two highly structured, overlapping microsystem environments, that of the residence and that of school. Many of the relationships between youth and those around them, such as peers and staff, cross these system boundaries. Other individuals, such as teachers, may be involved in only one of these systems, depending on the specific program structure. Although staff are a critical part of the treatment milieu (Crosland, Dunlap, et al., 2008; Donat, 2002; dosReis & Davarya, 2008; Farragher, 2002), there is also an awareness that burnout is a common issue due to the demanding nature of the job (Myers, Bibbs, & Orozco, 2004). It is also important to consider the difficulties many of the youths in treatment have with attachment and how that impacts the

interpersonal feedback that staff and client receives from each other. Coercive interventions represent a breakdown in the idealized treatment process and are highly emotional events that can have lasting repercussions for both staff and clients (A. Day, Daffern, & Simmons, 2010; Steckley & Kendrick, 2008). There are other, more basic forces at work as well. For example, Myers, et. al. (2004) discusses the effect of fatigue on workers and how it may impact their job performance. For the present study, the pattern of coercive interventions on weekends (Figure D4) may be an illustrative example of fatigue, as the number of interventions rises steadily across the 12 hour shift (7 am until 7 pm), at which time a shift change occurs and the number of interventions declines.

***Therapeutic Alliance.*** The relationship between therapist and youth may also be an important factor in treatment response, and therefore an important factor in involvement in coercive physical interventions. This is particularly the case as family or parental involvement in therapy may be secondary to directly working with the child, which is somewhat of a departure from most efficacious outpatient programs for behavioral interventions, which emphasize the role of parents/guardians in treatment (Barkley, 1997). In general, meta-analyses have demonstrated that there is a modest relation between therapeutic alliance and outcomes in children, consistent with the adult literature (Shirk & Karver, 2003; Shirk, Karver, & Brown, 2011). While there is some evidence that the therapy setting has no significant impact on this finding (Shirk & Karver, 2003), most of the studies from which previous meta-analyses have drawn was conducted in outpatient settings. While there is some evidence that behavioral therapies are more associated with positive outcomes than non-behavioral therapies (B. Weiss & Weisz, 1995a, 1995b; Weisz, Weiss, Han, Granger, & Morton, 1995), a small meta-analysis of 16 studies found that the relation between alliance and outcome for behavioral therapy was

higher than for non-behavioral therapy, but not statistically significant (Shirk, et al., 2011). There is some evidence from more intensive settings that higher youth ratings of therapeutic alliance correlate with fewer aggressive incidents (Bickman et al., 2004); however, in a residential family-style placement facility, therapeutic alliance was shown to be only marginally related to positive outcomes such as reduced problem behavior (Handwerk et al., 2008).

It is important to note that in the family-style residential study, therapy is not the primary intervention and the youths included therefore had problem behaviors above and beyond that of their residential peers; therapeutic alliance may be more impactful in environments such as locked residential treatment facilities, which may emphasize therapy as a primary intervention. Also important is an understanding that the very concept of therapeutic alliance as applied to the adult-therapist relationship requires modification when applied to the youth-therapist relationship (Shirk, Caporino, & Karver, 2010), given that youths frequently are brought to treatment by their parents. They may have different conceptualizations regarding the goals of treatment as well as the complicating factor of parent and/or family involvement bringing additional alliance issues into play (Shirk & Karver, 2003). This situation is further complicated in involuntary treatment or treatment in authoritarian contexts similar to residential treatment (Cunningham, Duffee, Huang, Steinke, & Naccarato, 2009; Orsi, Lafortune, & Brochu, 2010), where, among other factors, traditional concepts like confidentiality are lost in the constant sharing of information between professional and direct care staff, social workers, parents, courts, and others.

***Teacher-youth relationship.*** The role of teachers in the treatment process is an important one; however, it is important to recognize that their role is sometimes unclear (Carman, Dorta, Kon, Martin, & Zarrilli, 2004). While many of the youth served in residential care have or are currently receiving special education services, some have not previously received such services.

While school behaviors are frequently a contributing factor to placement in an IRT program, there are youths for whom it is home behaviors or other factors that necessitate placement. In this sample, the average IQ score was more than 10 points below the overall population average, which suggests that many of these youths are likely to function significantly below their peers even prior to taking into account their emotional or psychiatric condition. Thus, school represents the most structured period of the day as well as a place where they are mostly likely to be asked to work diligently on assignments that may be particularly difficult for them. In addition, given the high comorbidity of learning disorders with behavior disorders such as ADHD (Capano, Minden, Chen, Schachar, & Ickowicz, 2008; Sundheim & Voeller, 2004), there may be fundamental impairments in these youths' ability to succeed in the classroom. When combined with the expectation for failure that many of these children have developed over the years, this can make for a highly combustible atmosphere. This is evidenced in the fact that in this sample, more coercive interventions occurred at school than any other shift. Other studies have shown similar high levels of these interventions in school (Miller, et al., 2006).

***Peer relationships.*** In addition to the professional- and direct-care staff-youth relationships, the peer group relationship also plays a critical role in the therapeutic milieu. The issue of a deviant peer group has received extensive attention in the literature regarding anti-social behavior in children and adolescents, and has implications for residential treatment given the highly aggressive and anti-social behaviors that these youths typically display, even if in the presence of a comorbid psychiatric disorder. In a recent study of deviant talk in a residential treatment facility, peer deviant talk related to a more negative treatment response in youth with more anti-social behaviors, suggesting that the role of deviancy training remains relevant in this therapeutic milieu (Zakriski, Wright, & Cardoos, 2011). The authors also found that rule-

breaking behavior in the group was predictive of negative rule-breaking outcomes, suggesting that both modeling of negative behaviors and peer approval of negative behaviors play a role in treatment outcome. This is consistent with previous work regarding the role of peer groups in reinforcing anti-social behavior in children and adolescents (see, e.g. Lochman & Wells, 2002a). There is also evidence that youths with higher psychopathic traits do indeed have stable, bilateral friendships (Munoz, Kerr, & Besic, 2008). In a residential environment with a deviant peer group and sufficient time to develop friendships, that stability and bilaterality might even amplify this deviancy training effect.

**Caregiver relationships.** Parents or guardians provide another important influence within youths' microsystems. Depending on the particular child there may be a history of maltreatment and/or abuse, no history of any kind—in the case of prospective adoptive/foster parents—or something in between. There is evidence that early behavior problems coupled with lack of parental warmth and poor parent-child communication can place children at risk for increased callousness in adolescents (Pardini & Loeber, 2007, 2008). Given the relation between callousness and coercive interventions found in this study, this pathway may be particularly important in residential treatment, as these traits show some stability across adolescence and may be resistant to change by the time a child enters residential care (although see Salekin, 2002). Furthermore, parents may provide models for inappropriate conflict resolution that perpetuate hostile or overly aggressive interaction styles. Other youths may be dealing with attachment issues related to abuse, abandonment, or transitioning to a community placement other than their parents, such as foster care or a relative.

**Other System Factors.** As discussed above, youths rotate through these primary microsystems even while in treatment. While there is relatively high consistency between the

residential living area and the classroom setting, the consistency between a home/community environment (if there is one) and either of the treatment environments is likely substantially more variable. While some youths may be transitioning to a therapeutic foster care placement with structure and no siblings or other children in the home, others may be returning to the very environment that contributed to their current difficulties, with caregivers who may or may not have made changes in parenting style as a component of the current or previous treatments. Thus, even within the treatment context, youths may be subject to pull in several directions from the influences of peers, parents, and staff. This may perpetuate aggressive responses requiring coercive interventions even late in residential treatment.

Exosystem and macrosystem influences, discussed some in the introduction, introduce further sources of variability and outside influence into the treatment environment. Although this study did not look extensively at these aspects of the treatment context, the results for the effect of training on coercive interventions by itself provides substantial support for the need to look more closely at these factors in the broader context of coercive interventions.

**System Interactions.** The previous research looking at influences of children's anti-social and/or aggressive behavior and the knowledge about the risk factors that predominate in clients requiring residential treatment, when coupled with the findings of this study, strongly support the role of a complex, multi-component system in the use and sustainment of coercive interventions. Microsystem influences, such as parents, teachers, and peers, range from positive to negative; consistency across microsystems varies considerably. Exosystem pressures such as the organizational philosophy, training, and educational system bear directly on the individuals working with the youth and may be at cross purposes to their beliefs and understanding regarding treatment in general and these interventions in particular. Broader macrosystem forces

such as laws, regulations, and values influence the other layers and change across time, presenting a moving target and forcing continual adaptation and change in a residential treatment environment that is predicated on stability and consistency.

### **Limitations**

While this study represents a step forward in the research base on coercive physical interventions, as with any study there are limitations due to the design and methodology that bear noting. While the ecological validity of this study is high due to its use of actual clinical data contained in client records, this constraint necessarily limits the exploration of relevant factors to those for which data is actually collected and evaluated prospectively. The translation of the clinical records to relevant theoretical constructs introduces some degree of error. Most importantly, the presence or absence of risk factors in the clinical record may or may not correspond to the presence or absence of those same factors in the client's history (Boxer, 2007). Only where that information had been included in the admission records was it available to be coded. Given the nature of the sample, some risk factors likely have a higher likelihood of being omitted. For instance, given the chaotic family histories in some of the participants, the lack of significance regarding psychiatric and/or criminal history may reflect a lack of accurate information more than a true absence of significance.

As with any study, the power to detect significant effects necessarily corresponds to the sample size obtained. While the present investigation used a moderate sample size of 99, the use of more individuals would allow for increased power to detect significant predictors and/or interactions. In this case, those predictors that were only marginally significant may indicate that more data is needed to confirm or reject their relevance to the constructs in question. Sample

size also dictated some of the procedures used in the growth mixture modeling, preventing the inclusion of covariates that may be helpful in explaining the obtained groups.

A third limitation relates to the extent and accuracy of the information collected during treatment regarding coercive physical interventions. There are two considerations regarding this limitation. First, the data on coercive interventions only identifies those situations in which one was used. There is no corresponding record of those times when a client is successfully de-escalated (with or without the assistance of staff). Accurately representing treatment progress requires (a) Looking at these interventions as but one factor among several, including rule violations, point-and-level system progress, response to therapy, etc., and (b) incorporating information about those interventions that were not required because of successful de-escalation. Absolute counts of interventions provide no information about the relatively frequency of need, given a child's emotional state. Second, information regarding the use of these interventions exists only to the extent that staff completes the required documentation. Given the sheer volume of interventions, some error in this regard is expected. The staff training findings also may indicate some level of documentation non-compliance.

Fourth, the coding used for variables in this study may have limited the ability to detect significant effects. There are two areas in which this is most likely to have affected the findings. The first regards diagnosis. Although different categories of diagnoses were analyzed, individual diagnoses themselves were not analyzed. This decision was made primarily due to the uncertain quality of previous diagnoses, with the belief that category information may make up for in accuracy what it is missing in specificity. Categorizing diagnoses may have masked the any underlying significance in an individual disorder. Looking at specific disorders, particularly for behavior disorders such as ADHD, ODD, and CD, may allow for a more complete analysis. The

second area in which coding may have affected the results regards medication. Here again, categorization may have masked significance in one or more underlying specific medications potential relation to coercive physical interventions. In this case, categorization was used not due to concerns about accuracy—medication data at intake is typically very accurate—instead, it was utilized due to the number of different psychotropic medications prescribed in the population. A larger sample size and more specificity in medication coding may result in a significant result, where categories of medication did not.

The presence of some of the system factors discussed above also creates methodological challenges with regard to data analysis. For example, as with more traditional schools, participants in this study are nested in classrooms, and classroom membership, while relatively stable, does change due to age/academic ability, classroom fit, or a need to balance the classroom environment and structure in response to intakes, discharges, or other factors. Youths are also nested within one of three residential units, and here again may transition between units during their treatment. Residential unit moves, while not frequent, do tend to be more frequent than classroom moves. Finally, clients are also nested within one of five or more therapists (there are five full time therapist/case-coordinators; however, student trainees also may see clients for therapy over the course of a semester or year). Each therapist may bring a different approach and/or orientation that might impact involvement in coercive interventions, as there is no standardized or manualized treatment approach across the facility. A hierarchical linear model that could account for these various nested relationships may be helpful in analyzing some of the system factors that might influence the use and involvement of coercive physical interventions.

## **Future Directions**

The results for this study provide further support for the role of previous aggression and impulsive behavior in identifying those youths who are likely to experience increased numbers of coercive physical interventions while in residential treatment. Awareness of those factors which correspond to the use of these interventions is an important aspect of the organizational approach to reducing their use (Stewart, et al., 2010). The present study also identified several areas which should be explored in more depth in future studies.

First, it is important to recognize that while the models identified in this study are termed “predictive,” they were created based on already existing records. Future work should focus on validating these models with a different sample to confirm their utility and to mitigate any effects of over-fitting the training data.

Second, the role of family history and previous treatment factors should be carefully analyzed in future studies. While those factors were not significant in the present investigation, other researchers have found them to be more relevant. As discussed above, one issue may be in the availability of information, particularly regarding the family history variables. Given this, and relevant in its own right, it may be helpful to consider alternative methods of operationalizing family history or dysfunction. For instance, given the relatively high proportion of DHR involved youths, a reasonably substantial amount of family dysfunction would be expected. Alternative approaches may take into account the success in using a total aggression variable as used here and in other work, despite the high prevalence of aggression in this population in general. Looking at the diversity in family dysfunction may provide additional variance that would allow for findings of significance.

Third, the role and importance of training should be explored in more depth. There is increasing awareness that some training programs are associated with reductions in the use of coercive physical interventions. These studies typically explore the introduction of a new method of training. Comparatively, there is less research looking at the role of ongoing “booster” style training. Given the importance of organizational philosophy and approach, it is important to consider that new training programs are often accompanied by significant investment across the organization in their implementation. Some of the success may be attributable to the organizational commitment rather than strictly the use of a new program. More work is needed to see how various training programs, both new and old, continue to fare as staff complete multiple training cycles. The results of this study suggest that as staff members receive these “booster” training sessions, their use of coercive interventions increases rather than declines, and it would be beneficial to know how this compares to other training methods’ cyclical outcomes. Given the limited information regarding the staff, more comprehensive analytical techniques could not be conducted. Perhaps staff characteristics, such as length of employment, demographic variables, and personality styles could explain some of the variation in individual staff training cycle patterns. Methods such as Cox regression and survival analysis could provide important information regarding training that may help to explain the significant results obtained in this study.

Most importantly, more work is needed in exploring the interaction between youths and staff during treatment. This is true for several reasons. First, similar to outpatient therapy, these youth spend far more time interacting directly with direct care staff than with their primary therapist, and in some cases, even more than they would with their parents or guardians at home. Thus the staff-client interaction is a significant component of the total treatment environment

(Myers, et al., 2004). While previous work has examined organizational commitment (Pollard, Yanasak, Rogers, & Tapp, 2007), implementation of training (Borenstein, 2008; Nunno, Holden, & Leidy, 2003; Russell, Maher, Dorrell, Pitcher, & Henderson, 2009), staffing levels (Donat, 2002), and point-and-level behavioral modification systems (Mohr, Martin, Olson, Pumariega, & Branca, 2009), to this point deeper explorations of the staff-client interaction context has focused more on qualitative or interview style approaches (Steckley & Kendrick, 2008). As discussed in the contextual model for residential treatment, it may well be that staff members, who bring a wide range of personality styles, strengths, and weaknesses have an impact as large as, or larger than, any of these other factors.

While coercive physical interventions are but one indicator of treatment progress and outcome, they are coupled with significant risks to client and staff, significant impact on the therapeutic environment, and significant outside influence on their use and role. They have transitioned from being seen as a therapeutic intervention in the last century to being viewed as a breakdown of therapeutic intervention in the present century. The findings of this study suggest that clients requiring these interventions may be predicted from pre-existing risk factors prior to treatment, including younger age, more extensive history of aggression, higher levels of impulsivity, and higher levels of CU traits. The results also support the presence of trajectories of coercive intervention involvement in treatment. Early identification of these trajectories may allow for treatments that are specifically targeted to different trajectories. For example, youths who steadily increase their involvement in coercive physical interventions are clearly not benefiting from the treatment program and may require different intervention techniques. Similarly, the treatment emphasis for youths with minimal or no involvement in coercive interventions is likely to be different from the emphasis for youths with significant involvement

in coercive interventions. And regardless of the interventions used, they should be performed by staff members who operate in an environment that provides appropriate training and extensive support for the emotional and physical demands of that environment. When children are a serious danger to themselves or others, appropriate intervention methods are necessary to help both that child and those around him or her to remain safe. It is incumbent upon all involved to ensure that the use of coercive physical interventions is limited to truly dangerous situations. To accomplish this, residential facilities must provide the most appropriate treatment program given a youth's history, presenting problem, and response to treatment. Programs must also ensure that coercive interventions are performed safely and appropriately by trained staff. Coercive interventions represent, at best, an incomplete treatment process, and at worst, a failure of the treatment process. The goal of any treatment program should be to assist the child in developing the skills necessary to avoid engaging in aggressive or dangerous behaviors. By understanding the risk factors for coercive interventions, by seeing coercive interventions as a breakdown in treatment rather than a part of treatment, and by tailoring treatment to the specific needs of each child, residential treatment programs can ensure that coercive interventions are rare and used only as a last resort. E. M. Weiss (1998) and Nunno et al.'s (2006) reports calling attention to the deaths and serious injuries resulting from coercive interventions have been followed by regulatory and policy changes in the use of coercive interventions and a focus on the causes and risk factors for their use. At the core, the approach to, and understanding of, coercive interventions must be motivated by the understanding that children in residential care have often endured significant hardship and/or abuse. True treatment should never add to the trauma that many of these children have previously experienced.

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## Appendix A IRB Approval Information

Office for Research  
Institutional Review Board for the  
Protection of Human Subjects

April 7, 2011

THE UNIVERSITY OF  
**ALABAMA**  
R E S E A R C H

Ross Grimes  
Department of Psychology  
College of Arts & Sciences  
The University of Alabama

Re: IRB Protocol # 11-005-ME  
"Predicting Involvement in Coercive Interventions from  
Individual and Contextual Risk Factors and Treatment Context"

Mr. Grimes:

The University of Alabama Medical IRB has received the revisions requested by the full board on 3/25/11. The board has reviewed the revisions and your protocol is now approved for a one year period. You have been granted the requested waiver of patient authorization to use PHI in research as well as a waiver of the requirement to obtain informed consent. Please be advised that your protocol will expire one year from the date of approval, March 10, 2011.

Should you need to submit any further correspondence regarding this proposal, please include the assigned IRB application number.

Good luck with your research.

John C. Higginbotham, Ph.D., MPH  
Medical IRB Chair  
The University of Alabama



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**UNIVERSITY OF ALABAMA  
INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS  
REQUEST FOR APPROVAL OF RESEARCH INVOLVING HUMAN SUBJECTS**

**I. Identifying information**

	Principal Investigator	Second Investigator	Third Investigator
Names:	Ross Grimes	Randy Salekin, Ph.D.	
Department:	Psychology	Psychology	
College:	Arts & Sciences	Arts & Sciences	
University:	Alabama	Alabama	
Address:	Box 870356	Box 870356	
Telephone:	(205) 246-4049	(205) 348-5000	
FAX:			
E-mail:	grime014@bama.ua.edu	rsalekin@bama.ua.edu	

Title of Research Project: Predicting involvement in coercive interventions from individual and contextual risk factors and treatment context.

Date Submitted: 4/1/2011  
Funding Source: Self

Type of Proposal	<input checked="" type="checkbox"/> New	<input checked="" type="checkbox"/> Revision	<input type="checkbox"/> Renewal Please attach a renewal application	<input type="checkbox"/> Completed	<input type="checkbox"/> Exempt
Please attach a continuing review of studies form					
Please enter the original IRB # at the top of the page					

UA faculty or staff member signature: \_\_\_\_\_

**II. NOTIFICATION OF IRB ACTION** (to be completed by IRB):

Type of Review:  Full board  Expedited

**IRB Action:**

Rejected Date: \_\_\_\_\_  
 Tabled Pending Revisions Date: \_\_\_\_\_  
 Approved Pending Revisions Date: \_\_\_\_\_

Approved-this proposal complies with University and federal regulations for the protection of human subjects.

Approval is effective until the following date: 3-10-12  
 Items approved:  Research protocol (dated \_\_\_\_\_)  
 Informed consent (dated \_\_\_\_\_)  
 Recruitment materials (dated \_\_\_\_\_)  
 Other (dated \_\_\_\_\_)

Approval signature \_\_\_\_\_

## Appendix B

### Items and Factor Structure of PCL:YV

Table B1: *Items and Factor Structure of PCL:YV*

Item	3-Factor Model
1. Impression management	Arrogant
2. Grandiose sense of self-worth	Arrogant
3. Stimulation Seeking	Impulsive
4. Pathological Lying	Arrogant
5. Manipulation for personal gain	Arrogant
6. Lack of remorse	Affective
7. Shallow affect	Affective
8. Callous/lack of empathy	Affective
9. Parasitic Orientation	Impulsive
10. Poor anger tolerance	-
11. Impersonal sexual behavior	-
12. Early behavior problems	-
13. Lacks goals	Impulsive
14. Impulsivity	Impulsive
15. Irresponsibility	Impulsive
16. Failure to accept responsibility	Affective
17. Unstable interpersonal relationships	-
18. Serious criminal behavior	-
19. Serious violation of conditional release	-
20. Criminal versatility	-

## Appendix C BPCC Emergency Safety Intervention Report

L.I.P ID	Client Case #	Client Name	Age	Gender	Start Time (for LIP)	End Time (for LIP)	R.U.	Location
	000-			<input type="checkbox"/> M <input type="checkbox"/> F				

Date of Intervention: \_\_\_\_\_ Time Initiated: \_\_\_\_\_ AM / PM Location where incident began: \_\_\_\_\_

**Staff Involved:** (In order of involvement, list staff initiating Intervention)

Intervention(s)	Duration(s):	<u>Intervention</u>	<u>Monitoring</u>	<u>Debriefing</u>
<input type="checkbox"/> Restraint	_____	_____	_____	_____
<input type="checkbox"/> Seclusion	_____	_____	_____	_____

**Restraint Type:**  Standing Hug  Small Child Standing Containment  Standing Elbow-to-Hip  Kneeling Elbow-to-Hip  Follow to Ground

Assist to Ground – Hug  Assist to Ground – Elbow-to-Hip  2-person Containment/Escort  Other: \_\_\_\_\_

If intervention was not a standard restraint, please describe restraint and reason for variation: \_\_\_\_\_

TO > 15" (R)  Inclusionary Location: \_\_\_\_\_ Monitor (name/ credentials): \_\_\_\_\_

TO > 30" (OP) Length: \_\_\_\_\_  Exclusionary  Client Initiated  Staff Suggested  Staff Directed

**Authorization rationale:** Describe the situation leading to the intervention(s), any alternative interventions attempted, and the client's response. Check alternative interventions attempted before physical intervention:

- |   |   |   |
|---|---|---|
| 1. <input type="checkbox"/> "Thinking C.A.P.": <u>C</u> alm self                      | 6. <input type="checkbox"/> Distraction/Alternate activity              | 11. <input type="checkbox"/> Verbal redirection             |
| 2. <input type="checkbox"/> "Thinking C.A.P.": <u>C</u> alming talk and body language | 7. <input type="checkbox"/> Helped resolve peer conflict                | 12. <input type="checkbox"/> Removed audience               |
| 3. <input type="checkbox"/> Prompted "I Can Plan"                                     | 8. <input type="checkbox"/> Made expectations clear                     | 13. <input type="checkbox"/> Separated from group/situation |
| 4. <input type="checkbox"/> Praised progress toward desired behavior                  | 9. <input type="checkbox"/> "Thinking C.A.P.": <u>A</u> ctive Listening | 14. <input type="checkbox"/> Other: _____                   |
| 5. <input type="checkbox"/> Provided support/Assistance                               | 10. <input type="checkbox"/> "Thinking C.A.P.": <u>S.O.D.A.S.</u>       | 15. <input type="checkbox"/> Alternative not feasible       |

**Reason for Restraint, Seclusion:**

Assault on peer  Assault on staff  Self-injurious behavior  Suicidal behavior  Runaway  Other: \_\_\_\_\_

**Describe the dangerous behavior:**

**Describe the situation and the child/youth's behavior/response to staff:**

**Staff Signature & Credentials:** \_\_\_\_\_

**Monitoring:** Continuous Monitoring – Condition of client at 5-minute intervals (use codes below):  
 \_\_\_\_\_ 5 \_\_\_\_\_ 10 \_\_\_\_\_ 15 \_\_\_\_\_ 20 \_\_\_\_\_ 25 \_\_\_\_\_ 30 \_\_\_\_\_ 35 \_\_\_\_\_ 40 \_\_\_\_\_ 45 \_\_\_\_\_ 50 \_\_\_\_\_ 55 \_\_\_\_\_ 60

**\* STOP AND REFER TO NURSING STAFF**

- |  |  |   |
|--|--|---|
| A. Struggling or physically aggressing   | E. Difficult, shallow, or rapid breathing* | I. Drowsy, decreased alertness*           |
| B. Yelling, screaming, or cursing loudly | F. Complaining of pain/injury*             | J. Extremities cold*                      |
| C. Attempting to injure self             | G. Pale or unusual coloring*               | K. Other sign of possible undue distress* |
| D. Calm                                  | H. Excessive perspiration*                 |   |

Client provided respect and privacy  
 Client provided meals, drinks, and bathroom access as needed  Does not apply

**If PRN was given:**

**VITAL SIGNS** Notified \_\_\_\_\_ am / pm Taken \_\_\_\_\_ am / pm

BP \_\_\_\_\_ R \_\_\_\_\_ T \_\_\_\_\_ Pulse \_\_\_\_\_

Initials \_\_\_\_\_ Title \_\_\_\_\_

Oral/IM	Time	Ordered by
_____	_____ am/pm	_____
_____	_____ am/pm	_____
_____	_____ am/pm	_____

**Debriefing with Client:** (Any staff person may complete this section at conclusion of intervention. Check each issue reviewed.)

- "Thinking C.A.P.": **C**alm – Calmed self; used calming talk
- "Thinking C.A.P.": **A**ctive Listening – Caring body language [**Reason for intervention(s):** Safety concerns about behavior]
- "Thinking C.A.P.": **A**ctive Listening – S.O.D.A.S.; Situation, Options, Disadvantages, Advantages, Solution
- "Thinking C.A.P.": **P**lanning – Plan for future [**Prevention of future intervention(s)**]
- "Thinking C.A.P.": **P**lan and assist with return to group/milieu
- Client's emotional condition: \_\_\_\_\_
- Client's physical condition: \_\_\_\_\_

Client referred to nurse for injury related to this intervention?  No  Yes  
 If **Yes**, explain: \_\_\_\_\_

Staff injury related to this intervention?  No  Yes  
 If **Yes**, explain: \_\_\_\_\_

English as Second Language/Deaf/Hard of Hearing?  No  Yes  
 Interpreter needed?  No  Yes  
 Interpreter present?  No  Yes  
 Any problems with communication/interpretation?  No  Yes  
 If **Yes**, explain: \_\_\_\_\_

Client's comments: \_\_\_\_\_

**Staff Signature:** \_\_\_\_\_

**LIP Initial Order:** Time \_\_\_\_\_ AM / PM  In-Person  Oral/Phone

**Reviewed with/by LIP:**  LOS/any precautions needed: \_\_\_\_\_

Any restrictions? ( ) Remove shoes ( ) N/A

Situation/events ( ) Clear pockets

Client's mental, behavioral status ( ) Other: \_\_\_\_\_

Client's physical condition

Plans to help client regain control

**LIP Ordered:**  Restraint  Seclusion  Other: \_\_\_\_\_

**Rationale:** At risk to harm:  Self  Peer(s)  Staff  Other \_\_\_\_\_

**Maximum Duration:**  1 hour  < 1 hour

**New (2<sup>nd</sup>) Order** (to extend beyond 1 hour):  Verbal  Written Time: \_\_\_\_\_ AM / PM Order:  Continue  Other \_\_\_\_\_

Child's Tx Team LIP notified:  N/A (LIP is child's Tx Team LIP)  Routinely (next working day)  Immediately

**Behavioral criteria for release (as soon as possible):** Client exhibits adequate self-control to refrain from dangerous behavior upon release, as evidenced by such behaviors as ceasing struggling, decreasing yelling, agreeing verbally to control self.

**LIP Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**LIP Face-to-Face Evaluation Re: Restraint or Seclusion Within 24 Hours (1 Hour for IRT Program):**

Completed: (date) \_\_\_\_\_ (time) \_\_\_\_\_ AM / PM

**Post-Intervention follow-up needed:**  Continue treatment/ESIR review  Treatment team review of treatment plan

Counseling/support re: intervention  Increased LOS  High LOS  Treatment Plan Addendum Completed

Observations/plan: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Was client referred for Nursing assessment *related to this intervention*?  No  Yes Referred for Vital Signs?  No  Yes

If referred for assessment of injury, give reason:  monitoring concern (see above): \_\_\_\_\_

client complaint: \_\_\_\_\_  injury observed: \_\_\_\_\_  other: \_\_\_\_\_

Staff Debriefed by LIP ( See Staff Debriefing Form: Attached)

**LIP Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Parent/Legal Guardian Notification:**  Immediate  Later, per agreement By:  LIP  PC  MHP  \_\_\_\_\_

Person Contacted: \_\_\_\_\_ **Contact Note:** \_\_\_\_\_

\_\_\_\_\_ **Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

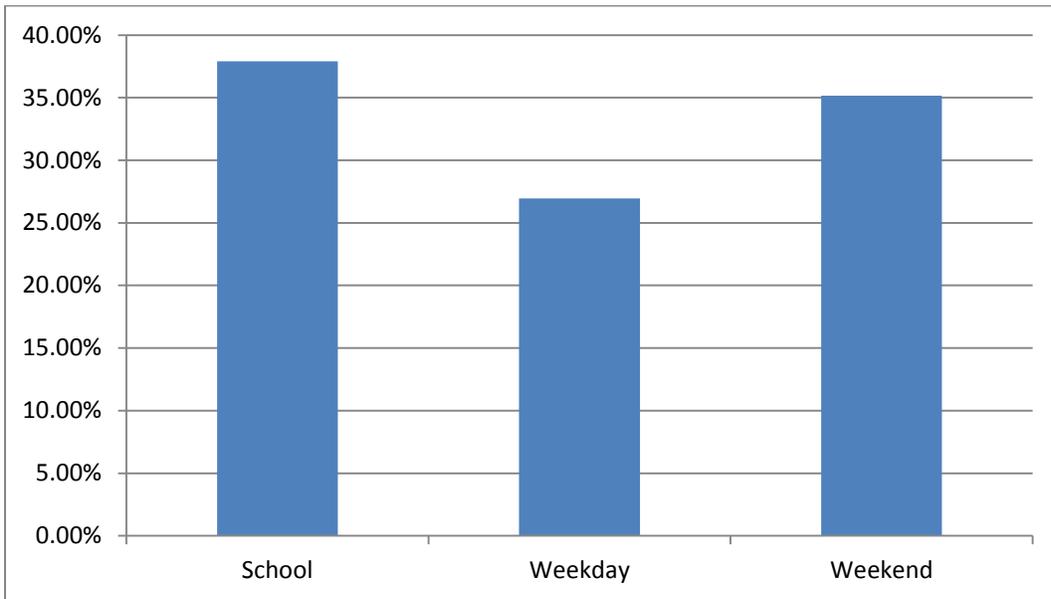
Will treatment team be convened because the following threshold has been met – the client has had more than 3 restraints and/or seclusions, or a total duration of restraint and/or seclusion of more than 2 hours, within a 24-hour (residential) or 12-hour (outpatient) period?  Yes  No

**Reviewed by MD (IRT Program):** \_\_\_\_\_ **Date:** \_\_\_\_\_

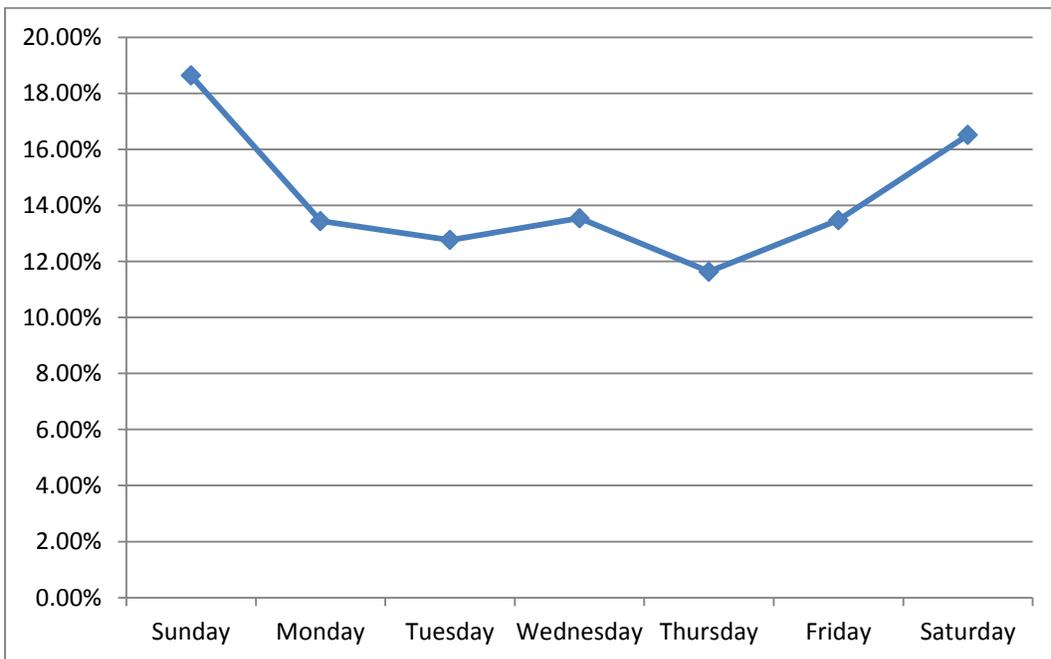
**Signature of Program Coordinator:** \_\_\_\_\_ **Date:** \_\_\_\_\_

The ESIR must be completed and forwarded for review by the end of the shift, and the Program Coordinator/designee must forward the ESIR

**Appendix D**  
Coercive Intervention Distributions and PRN Models



*Figure D1:* Percentage of interventions occurring in each primary shift type.



*Figure D2:* Distribution of coercive interventions by day of week.

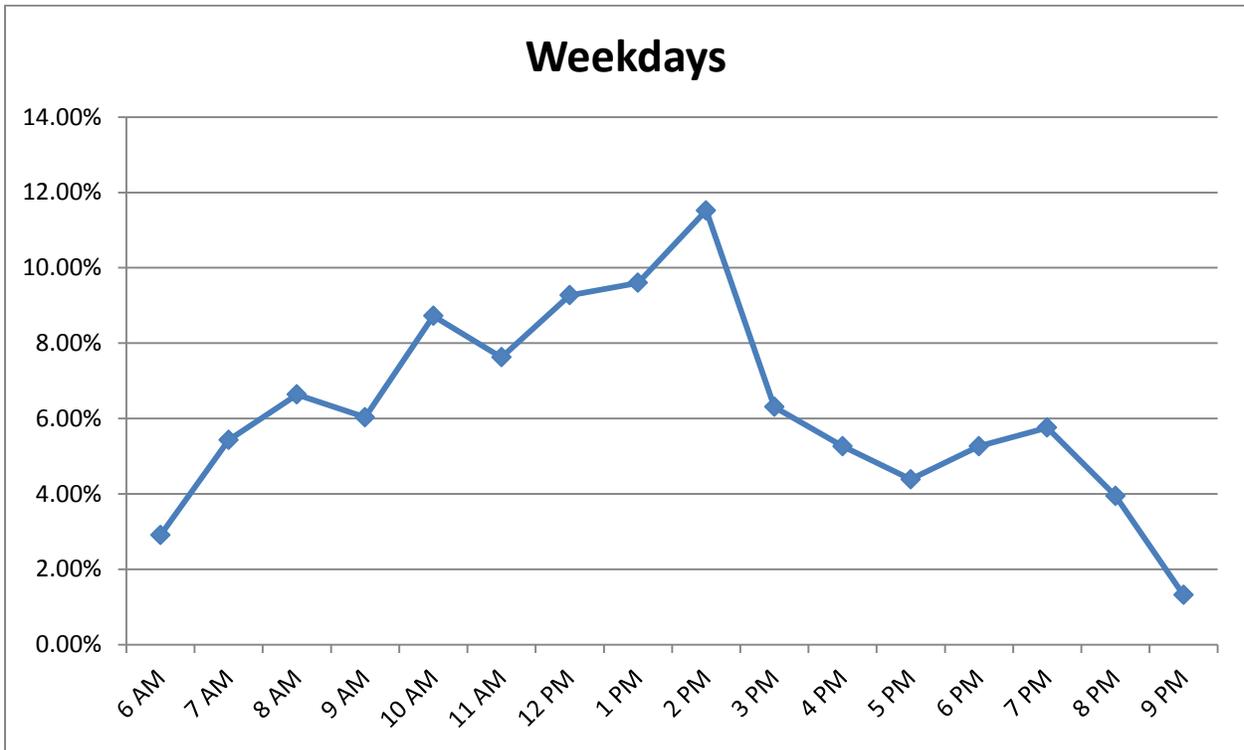


Figure D3: Percentage of coercive interventions occurring by hour on weekdays.

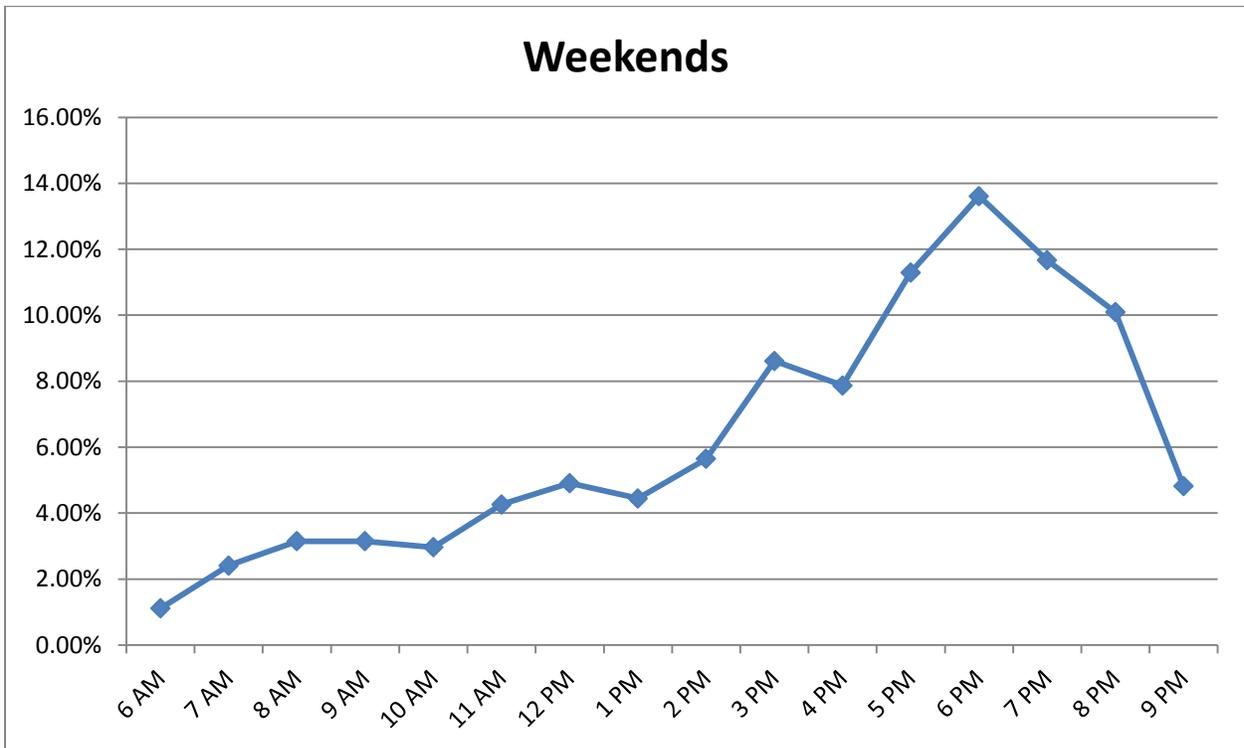


Figure D4: Percentage of coercive interventions occurring by hour on weekend days.

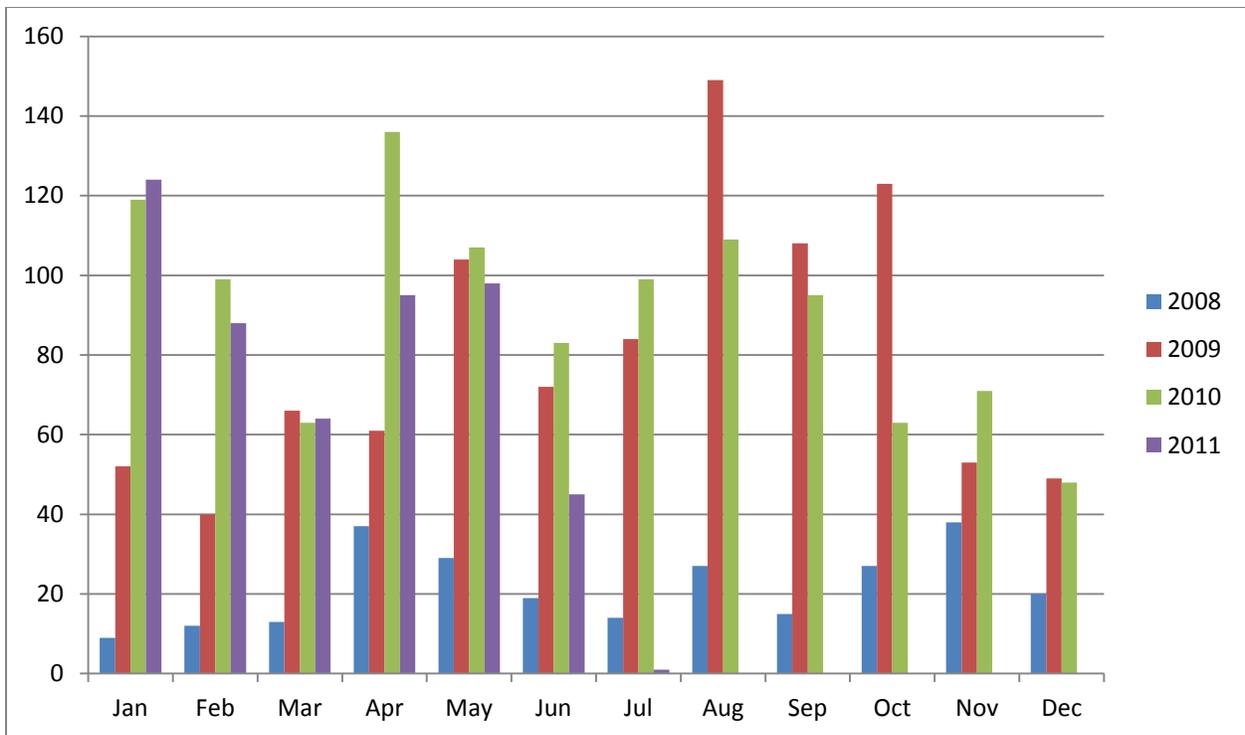


Figure D5: Number of coercive interventions by month and year.

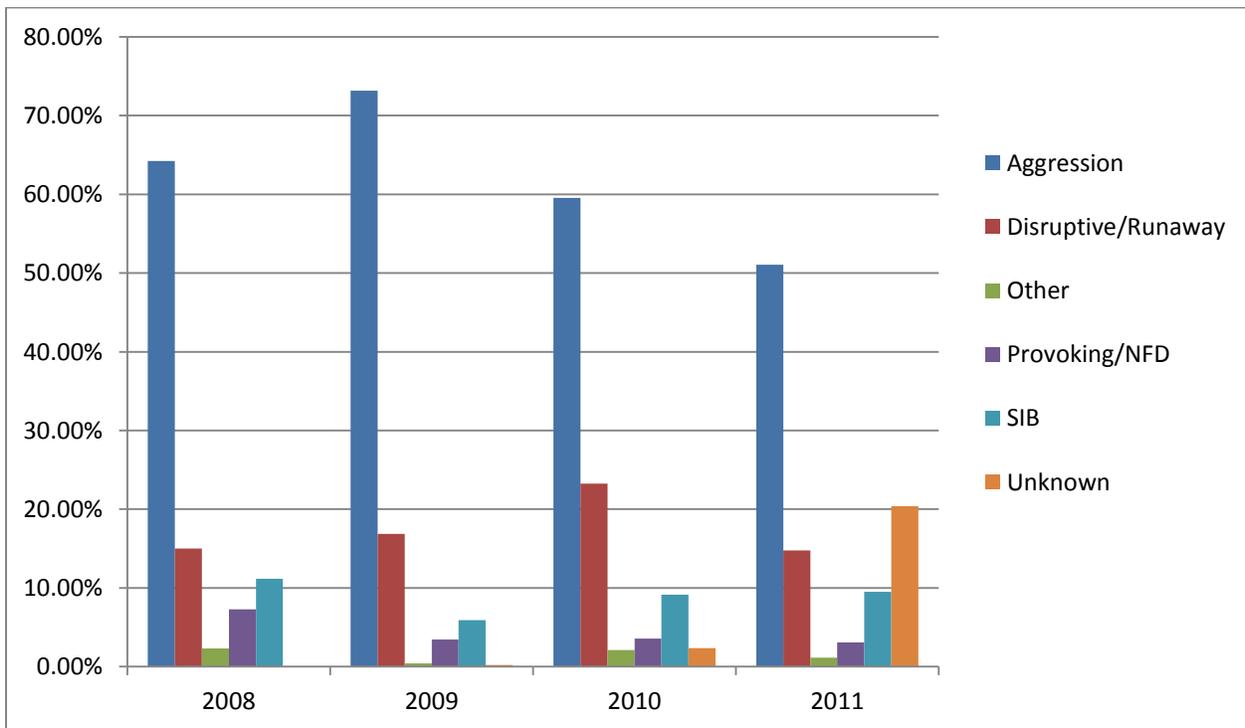


Figure D6: Primary precipitant of coercive interventions as percentage of total number of interventions for the year.

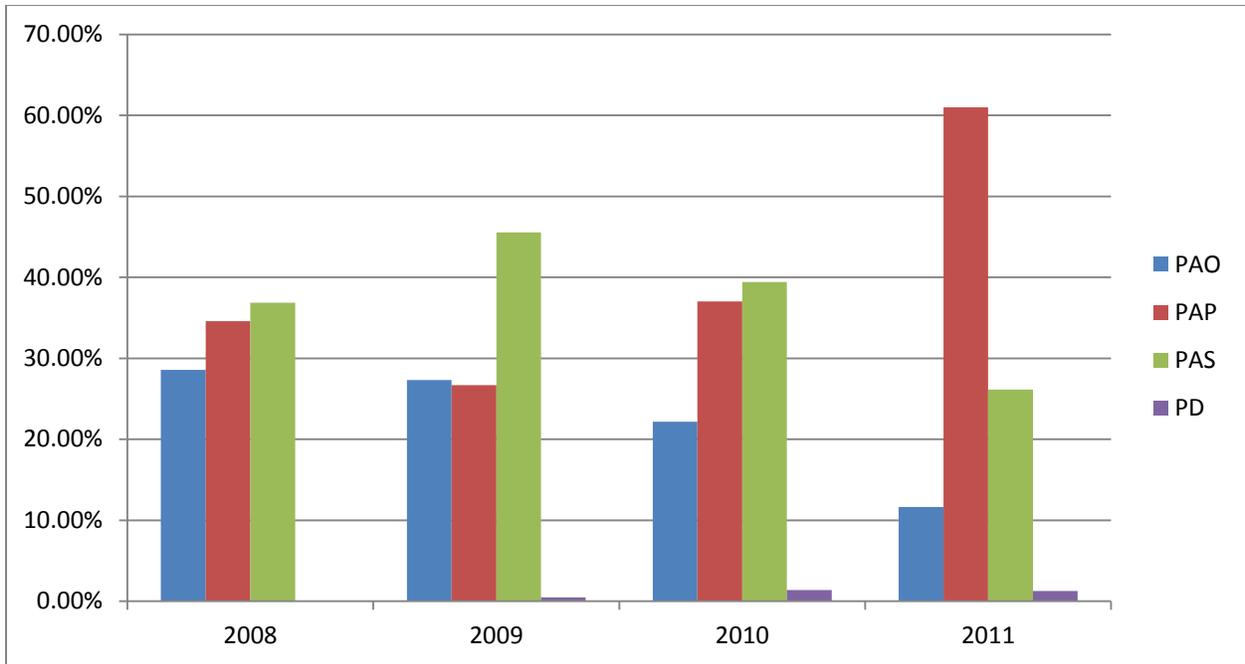


Figure D7: Percentage of interventions by type of aggression and year  
 PAO = (Physical Aggression) against Objects, PAP = Peer, PAS = Staff, PD = Property Destruction

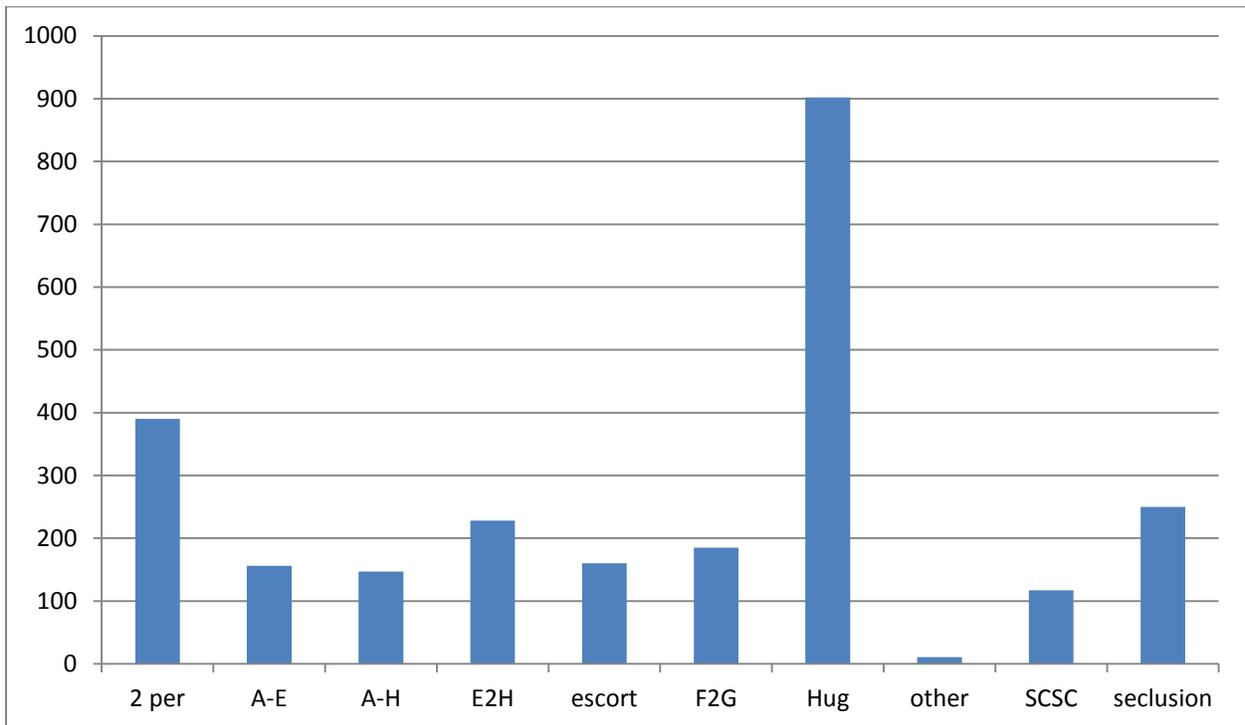


Figure D8: Type of physical intervention used in coercive interventions  
 2 per = 2 person escort; A-E = Assist to Ground, Elbow to Hip; A-H = Assist to Ground, Hug;  
 E2H = Elbow to Hip, F2G = Follow to Ground; SCSC = Small Child Standing Containment  
 (after 9/1/09 only)

Table D1

*Logistic Regression Model Predicting Receiving at least 1 PRN during Treatment*

Variable	$\beta$	<i>SE</i> ( $\beta$ )	Wald	<i>p</i>	<i>OR</i>	95% CI for <i>OR</i>
Involvement in Any Coercive Intervention						
Control Variables ( $\chi^2 = 2.179$ , <i>df</i> = 3, <i>p</i> = .536, ns)						
Gender	-.163	.640	.065	.799	.850	0.242-2.982
LOS	.018	.329	.003	.956	1.019	0.535-1.94
Age	-.210	.404	.271	.603	.811	0.367-1.789
Block 2 ( $\chi^2 = 15.544$ , <i>df</i> = 4, <i>p</i> = .004)						
<b>Aggression</b>	1.125	.424	7.026	.008	3.079	1.341-7.074
IQ	.087	.370	.055	.814	1.091	0.528-2.255
IQ x Aggression	.039	.382	.010	.920	1.039	0.491-2.198
Age x Aggression	.304	.460	.439	.508	1.356	0.551-3.339
Block 3 ( $\chi^2 = 0.117$ , <i>df</i> = 2, <i>p</i> = .943, ns)						
# Foster Care	.046	.397	.013	.908	1.047	0.481-2.28
DHR Age	.136	.429	.100	.751	1.146	0.494-2.657
Block 4 ( $\chi^2 = 1.238$ , <i>df</i> = 3, <i>p</i> = .744, ns)						
Narcissism	-.227	.352	.417	.518	.797	0.399-1.589
Callous/Unemotional	.356	.375	.901	.343	1.428	0.684-2.981
Impulsive	.071	.375	.036	.849	1.074	0.515-2.239

Table D2

*Negative Binomial Model Predicting PRNs Received during Treatment*

Predictor	$\beta$	<i>SE</i> ( $\beta$ )	Wald $\chi^2$	<i>p</i>
Gender	.185	.2768	.446	.504
<b>LOS</b>	.370	.1377	7.223	.007
<b>Age</b>	-.657	.1572	17.462	.000
<b>Aggression</b>	.327	.1397	5.488	.019
IQ	-.052	.1497	.122	.727
IQ x Aggression	-.123	.1755	.488	.485
Age x Aggression	.317	.1778	3.184	.074
# Foster Care	.111	.1331	.694	.405
<b>DHR Age</b>	.332	.1619	4.217	.040
Narcissism	-.044	.1404	.099	.754
<b>Callous/Unemotional</b>	.348	.1609	4.688	.030
<b>Impulsive</b>	.439	.1455	9.092	.003

**Appendix E**  
Estimated Means for 1-class through 7-class Mixture Models

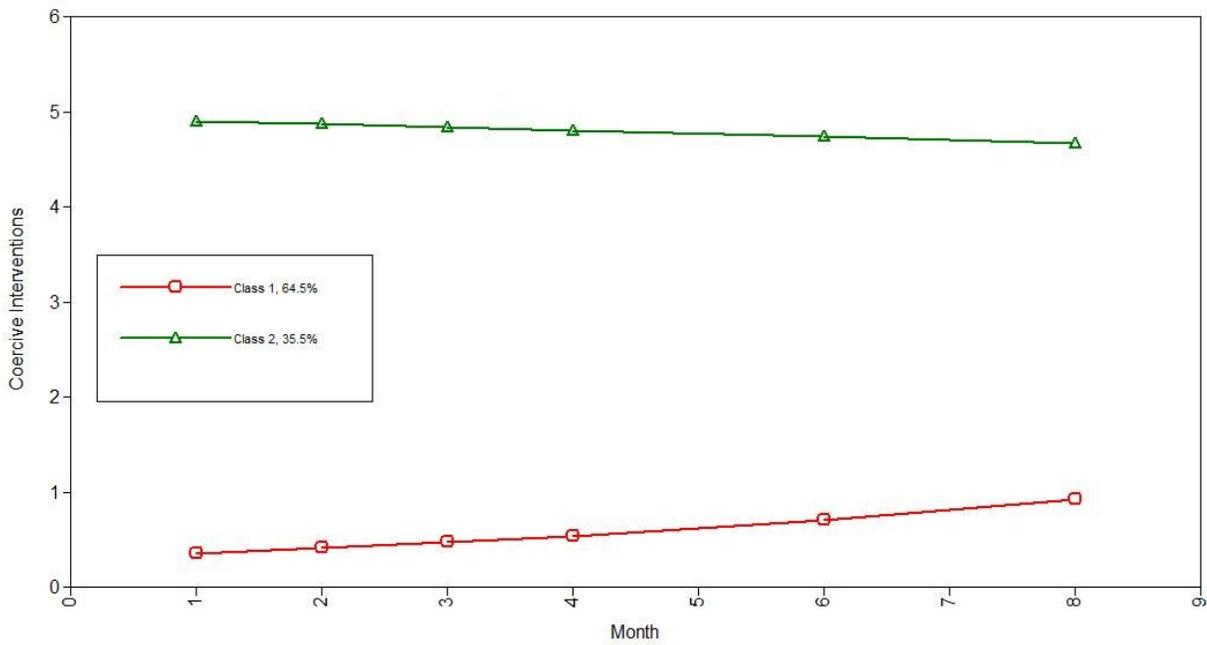
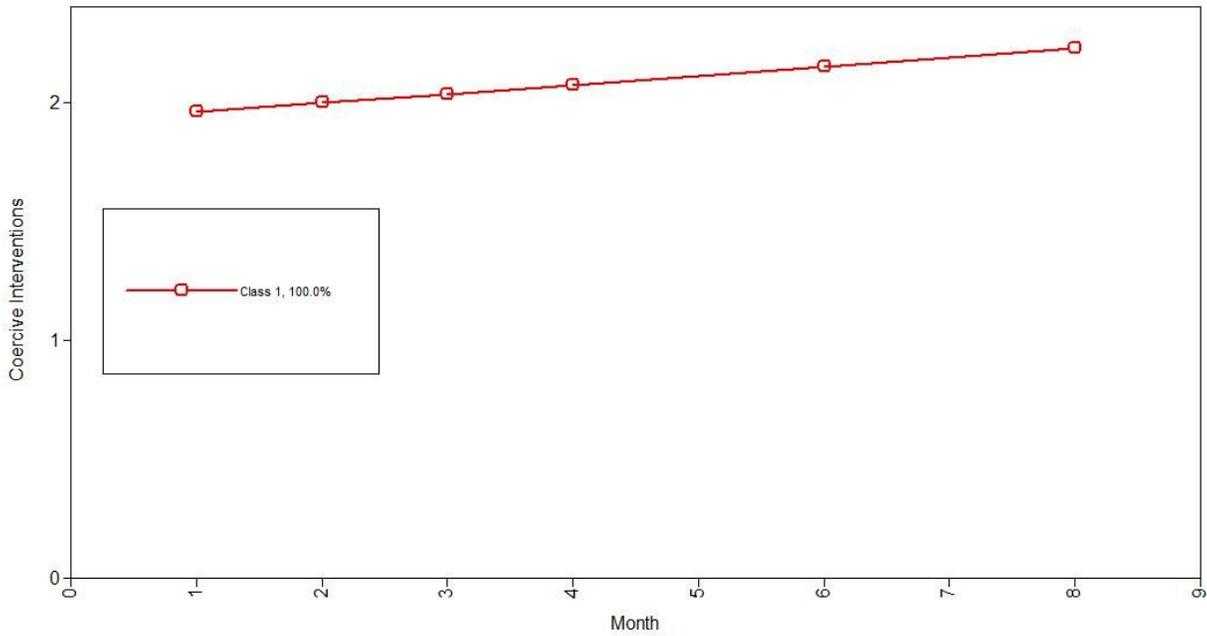


Figure E1: One (top) and two (bottom) class estimated means.

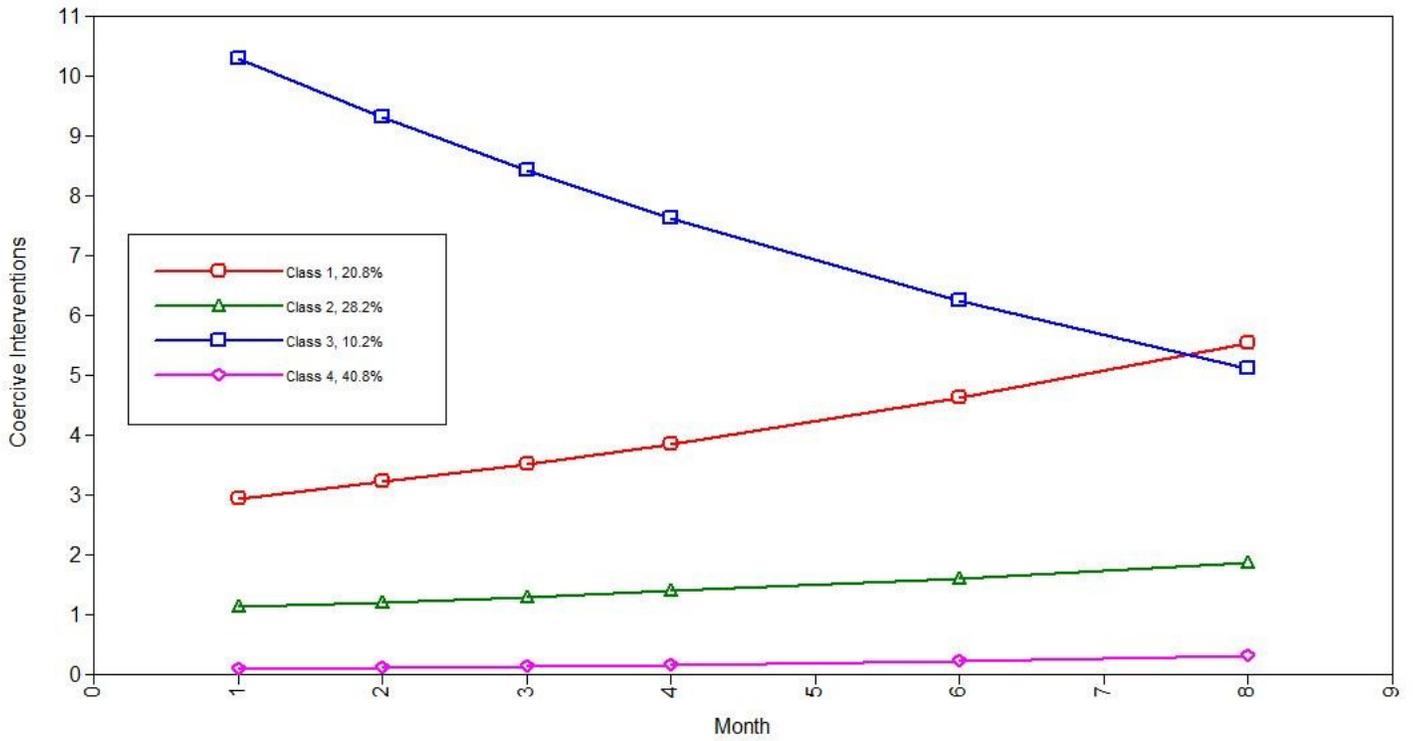
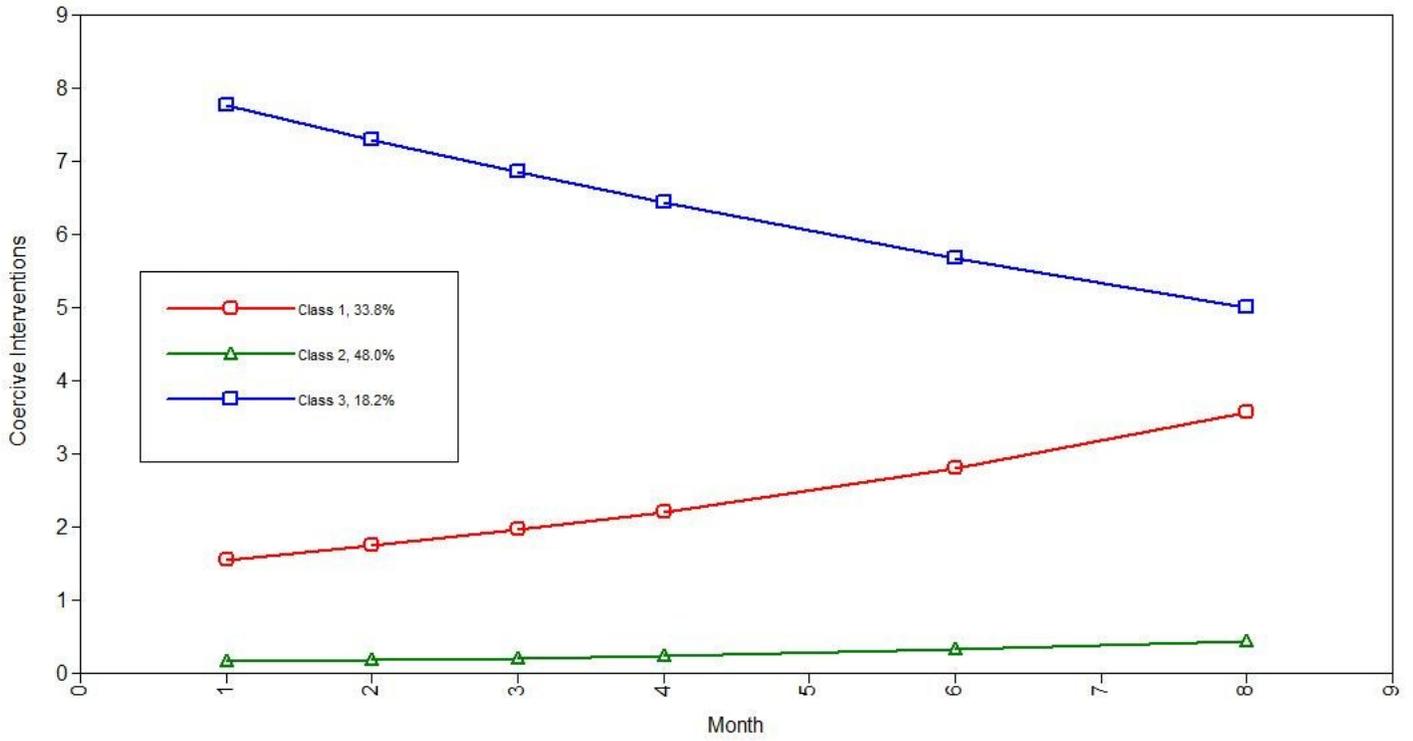


Figure E2: Three (top) and four (bottom) class estimated means.

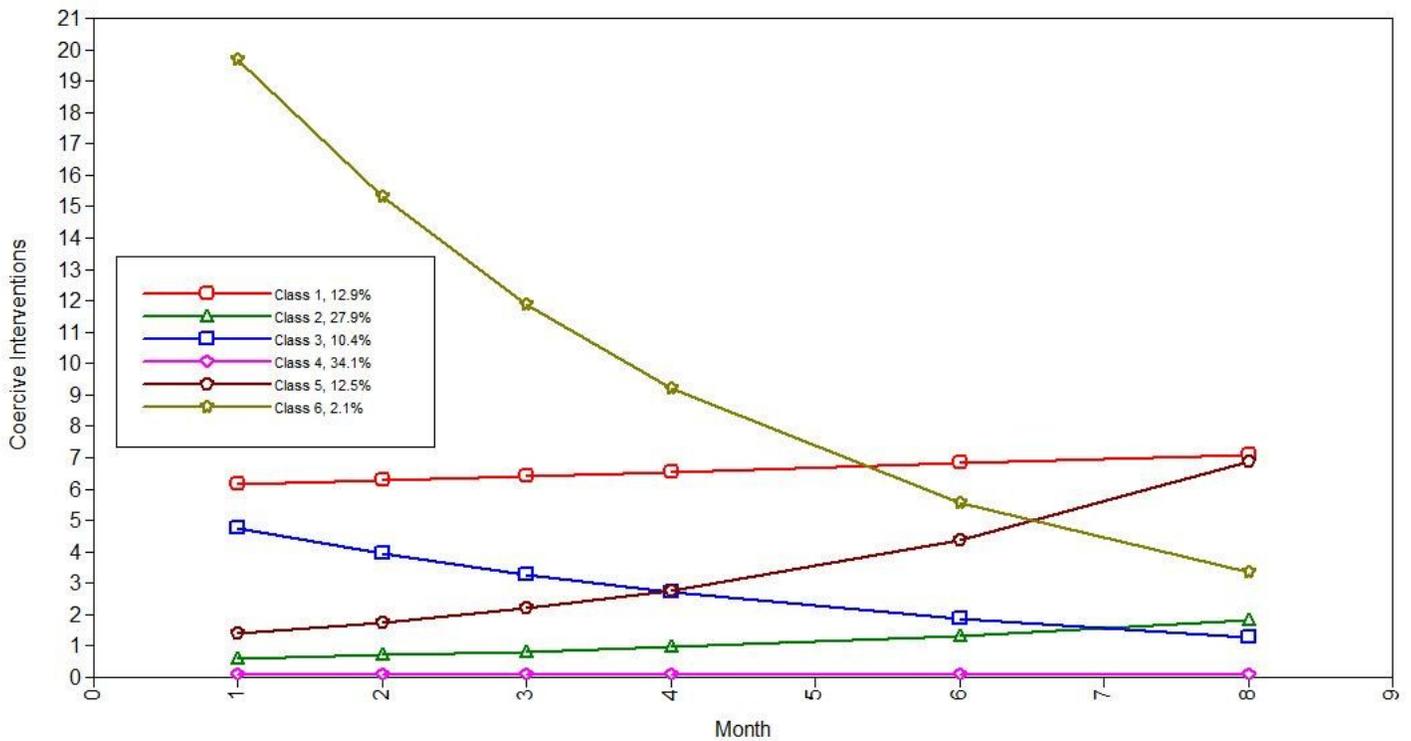
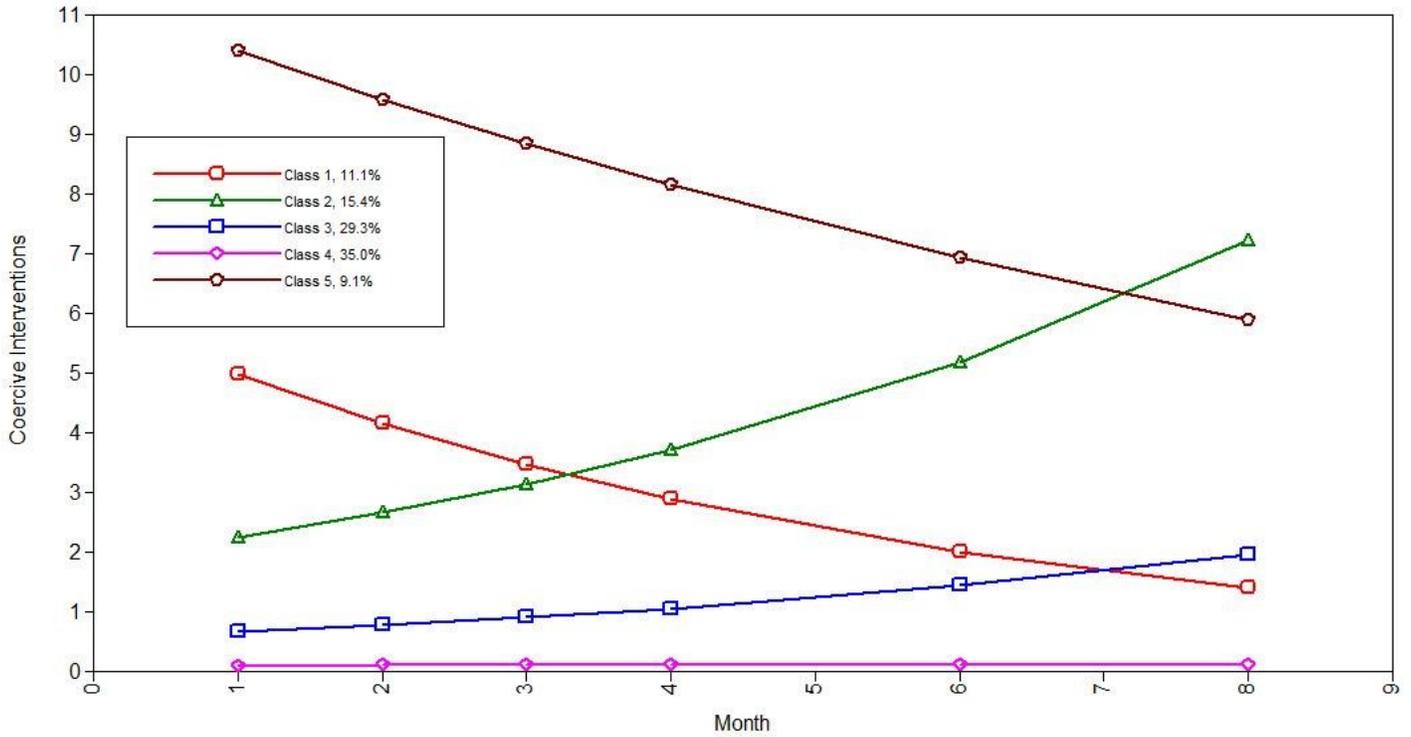


Figure E3: Five (top) and six (bottom) class estimated means. Note that five class model shown at the top of this figure selected as the final model as it best fit the data.

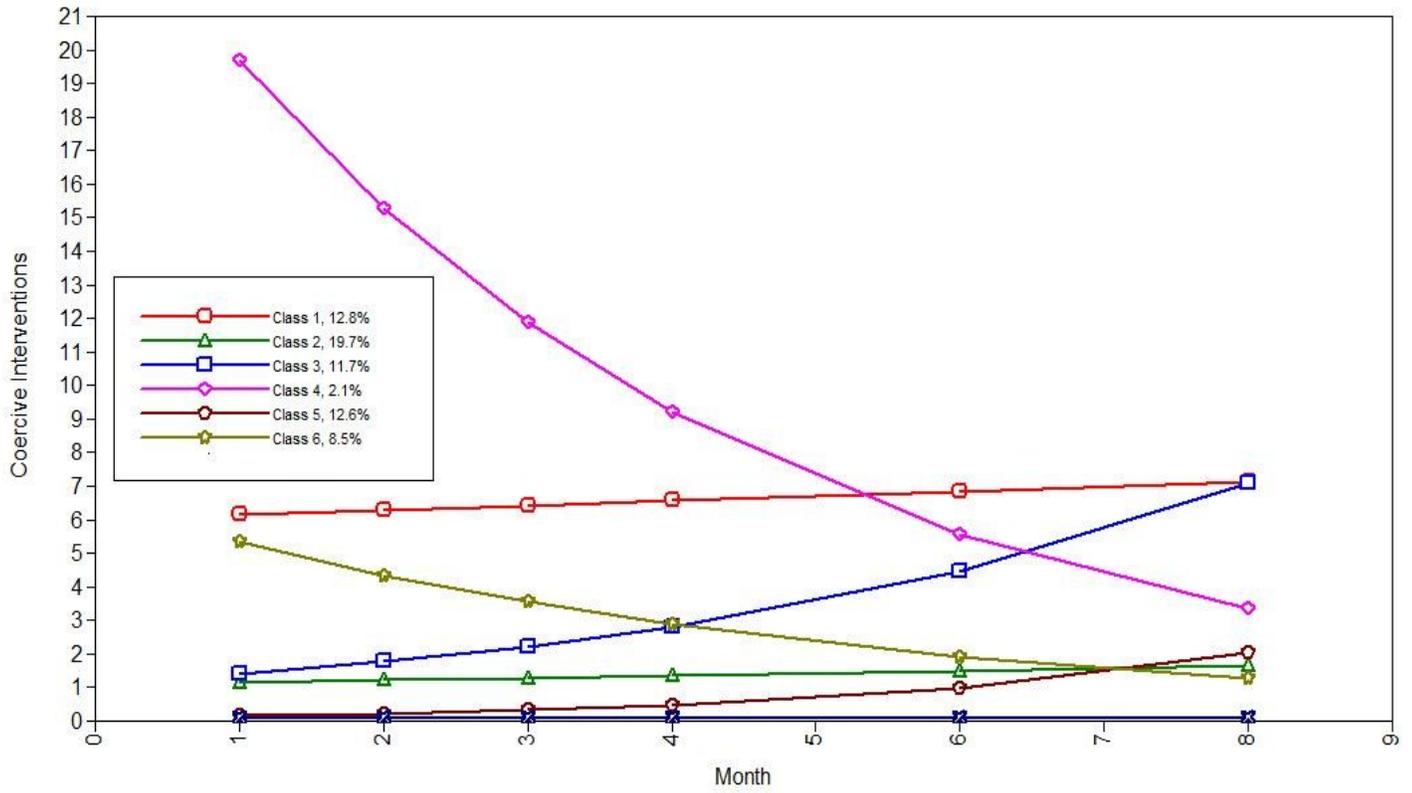


Figure E4: Seven class estimated means.

## Appendix F

### Estimated Means for Alternate GMM Models

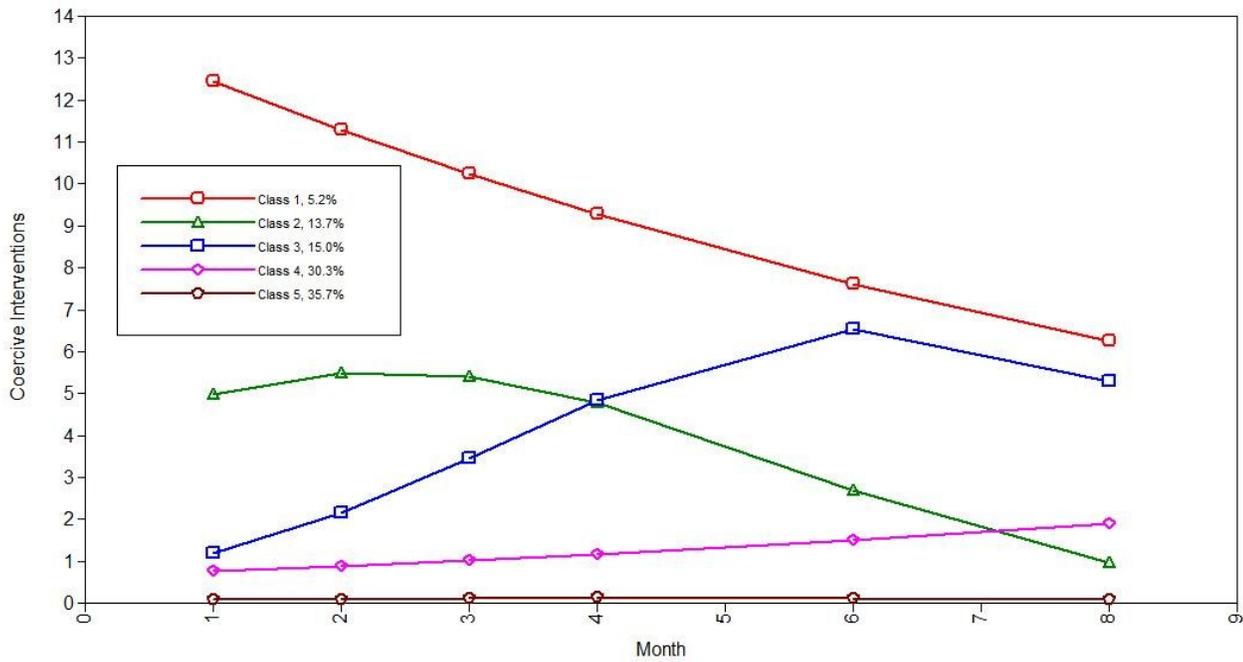


Figure F1: 5-class mixture model with quadratic term.

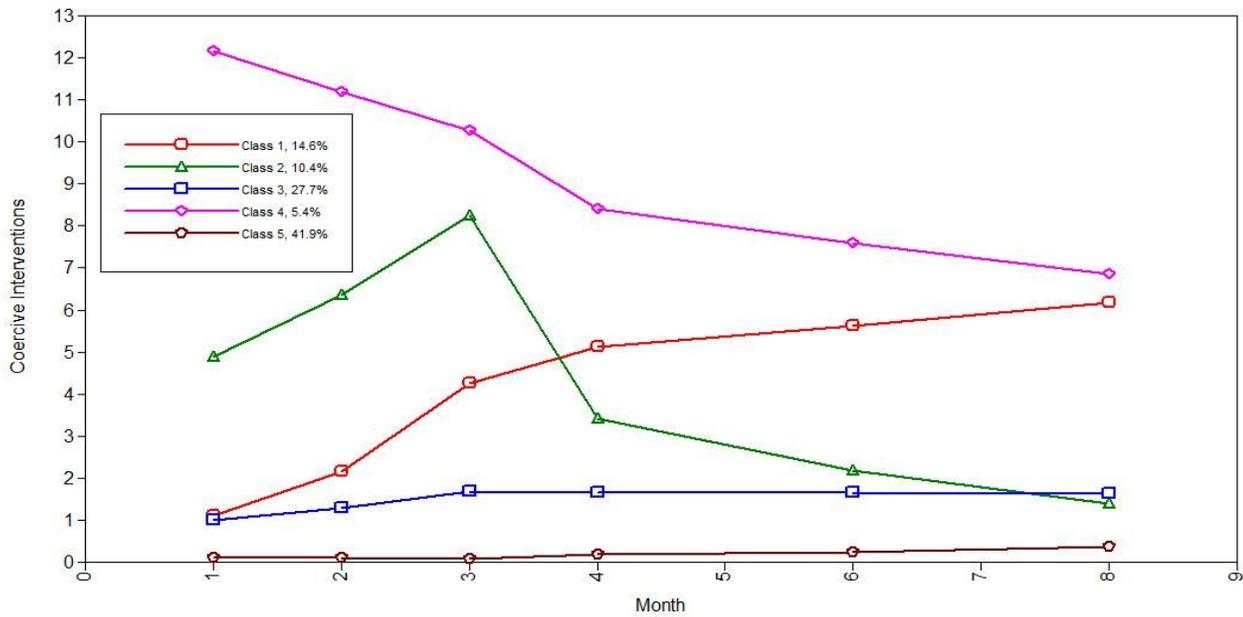
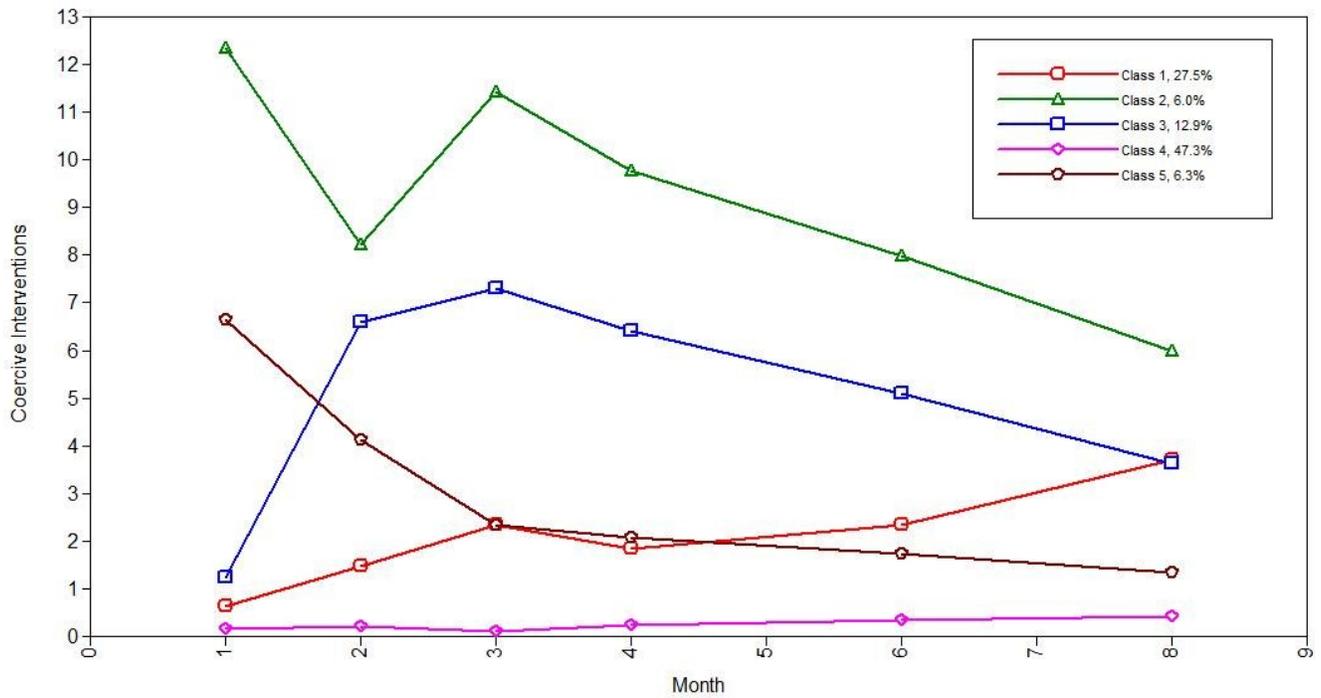


Figure F2: 5-class model with linear 2 piece-wise linear components.



*Figure F3: 5-class model with 2 piece-wise components.*  
 The first piece-wise component includes months one through three and has a quadratic term. The second component includes months 4 and higher and is linear.

## Appendix G

### Estimated Means and Observed Individual Values for 5-class Mixture Model

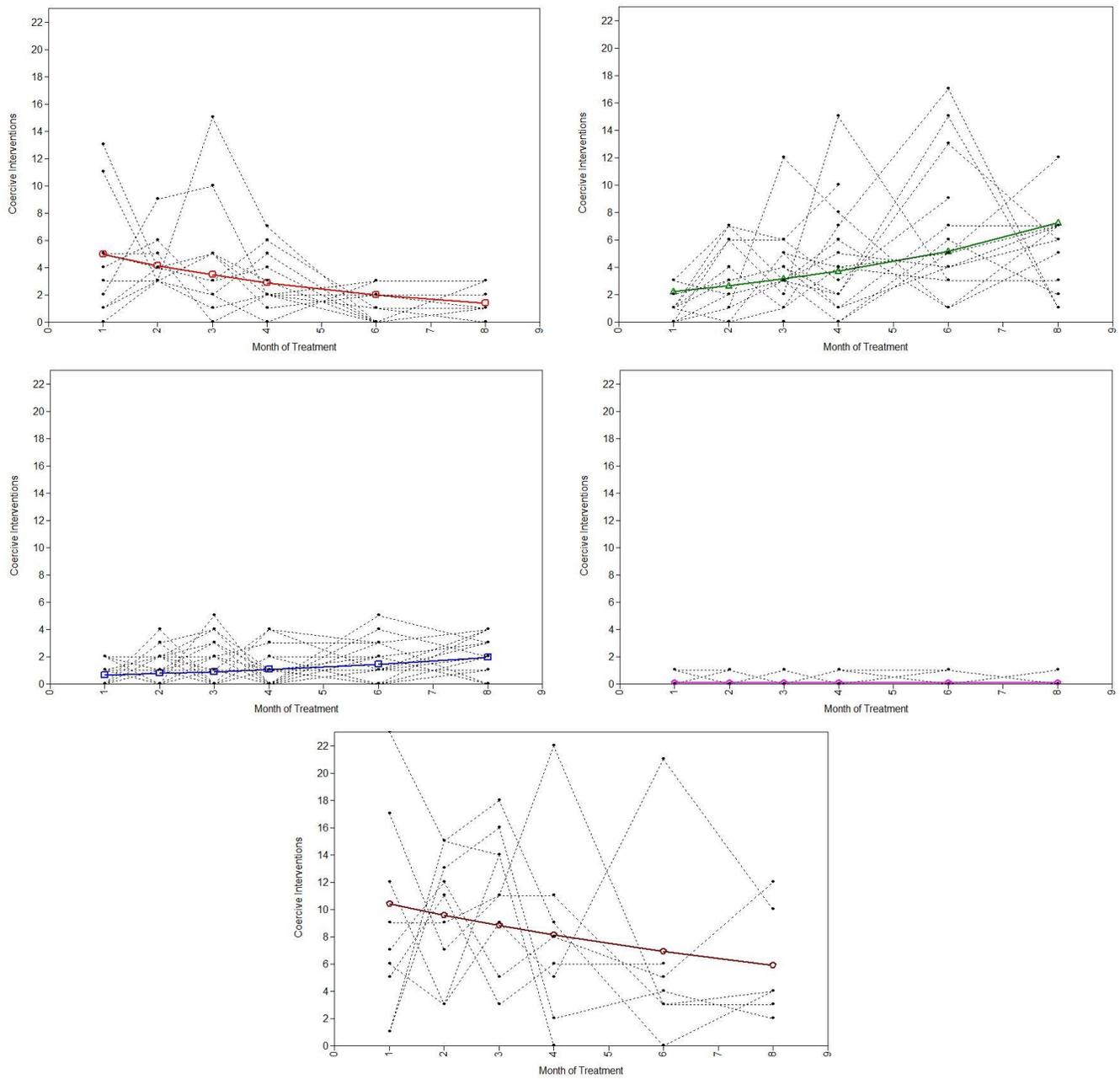


Figure G1: Estimated class means and observed individual values.

## **Appendix H**

### Training Adjustment Approach and Alternate Training Analysis Models

#### **Adjustment of Expected Distribution of Interventions**

Comparing the obtained training distribution with an even or “flat” distribution may be inappropriate due to monthly variations in staff training rates and monthly variations in coercive physical intervention rates. To correct for this, the number of coercive interventions that would be expected to occur in each 30-day bucket can be estimated from the total number of interventions and the distribution of staff training for each month. Although not an exact analog, months are used for these frequencies rather than 30-day intervals to simplify the adjustment calculations as there is not enough consistency in daily coercive intervention or staff training rates to justify the 60-fold increase in calculations necessary. As will be seen, while these adjustments do slightly modify the expected distribution, they are not significantly different and thus the use of months rather than 30-day intervals is unlikely to affect the results.

As an example of the method of adjustment used, assume that for August 2009, 25% of the staff was trained 3 months ago and 6 months ago and 50% were trained 2 months ago. No staff was trained 1 month, 4 months, or 5 months ago. If there were 100 coercive interventions in April 2009, then, assuming an even distribution across buckets, it would be expected that 25 were done by staff trained 3 months ago, 25 by staff trained 6 months ago, and 50 were done by staff trained 2 months ago. By doing this for each month in the data set, an expected number of interventions in each 30-day bucket can be derived that accounts both for the variation in interventions and the variation in training across time of year. Conceptually, this corresponds to

assuming all training is completed on the first day of a month. A table extending this example over 5 months is presented below:

Table H1

*Adjustment of Expected Distribution Example*

Month	# of interventions	# of staff trained	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	Total
Jan		25							
Feb		0							
Mar		0							
Apr		25							
Jun		50							
Jul		0							
Aug	100	10	0	50	25	0	0	25	100
Sep	150	20	17.65	0	88.2	44.1	0	0	150
Oct	75	20	14.3	7.1	0	35.7	17.9	0	75
Nov	50	50	8	8	4	0	20	10	50
Dec	25	0	8.3	3.3	3.3	1.7	0	8.3	25
<b>TOTAL</b>			48.25	68.4	120.5	81.5	37.9	43.3	400.0

Let  $n_i$  represent the number of coercive interventions in month  $i$ . Let  $t_i$  represent the number of staff trained in month  $i$ . Then, the number of number of interventions expected to belong to people trained in month  $i-x$  (where  $x$  is 1 to 6 corresponding to the columns above) is

$$c_x = n_i \times \frac{t_{i-x}}{\sum_{k=1}^6 t_{i-k}} \quad (1)$$

Note that the sum of each row is equal to the total number of interventions for that month, and the sum of the last row is equal to the total number of interventions for the 5 months (numbers in table are rounded).

Two alternative methods were also tried. The first used the training data from the current month and previous 5 months, rather than the previous 6 months. Conceptually, this corresponds to all training occurring on the last day of the month:

$$c_x = n_i \times \frac{t_{i-x+1}}{\sum_{k=0}^5 t_{i-k}} \quad (2)$$

The final method calculated the percentage of trainings based on the total number of trainings across the entire data set (rather than using only the previous 6 months):

$$c_x = n_i \times \frac{t_{i-x}}{t_{total}} \quad (3)$$

Due to staff turnover, the total trainings for any defined period of time is unlikely to exactly correspond to the number of staff employed at that point in time. This problem becomes larger as the length of time included increases, and thus the third method, which bases training percentage on the entire data set (43 months, in this case), results in a total number of coercive interventions across the 6 buckets that is significantly different from the actual total. The results from these adjustment methods were therefore scaled up by a constant factor prior so that the sum of the expected and actual distributions was the same. The scale factor for the method 1 above was 0.9884, the scale factor for method 2 was 0.9975, while the scale factor for method 3 was 1.4186. The final counts for the actual distribution and the 3 adjusted distributions are presented below:

Table H2

*Actual and Expected Coercive Interventions by Time Since Training*

Model	Days Since Last Training					
	1-30	31-60	61-90	91-120	121-150	151-180
Actual	304	317	305	281	243	212
Expected (method 1)	251.05	269.34	271.81	286.64	296.52	286.64
Expected (method 2)	273.16	253.36	271.78	274.26	289.47	299.97
Expected (method 3)	265.92	285.86	279.22	282.54	282.54	265.92
Expected (Even)	277	277	277	277	277	277

*Note.* The total for all rows is 1662 – any discrepancies due to rounding for display in table.

The chi-square probability matrix for each distribution compared to the other distributions is presented below:

Table H3

*Chi-Square Probability Comparing Actual and Adjusted Distributions*

	Actual	Adj. 1	Adj. 2	Adj. 3	Even
Actual	-				
Adj 1	<0.001	-			
Adj 2	<0.001	0.53	-		
Adj 3	<0.001	0.50	0.11	-	
Even	<0.001	0.42	0.46	0.92	-

Note that while the actual distribution is significantly different from the various adjusted distributions, none of the adjusted distributions are significantly different from each other or from an even or flat distribution that does not adjust for training or intervention frequency changes.

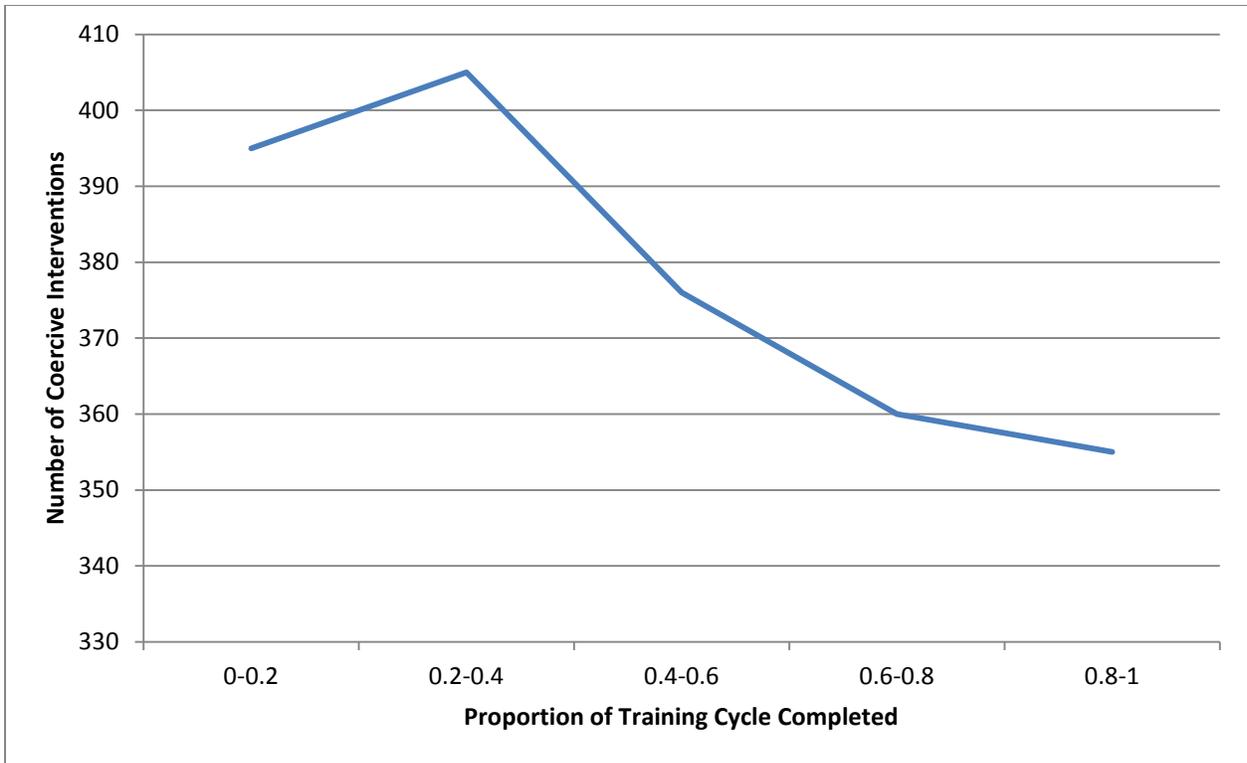


Figure H1: Coercive Interventions by proportion of training cycle, including 1<sup>st</sup> cycle.

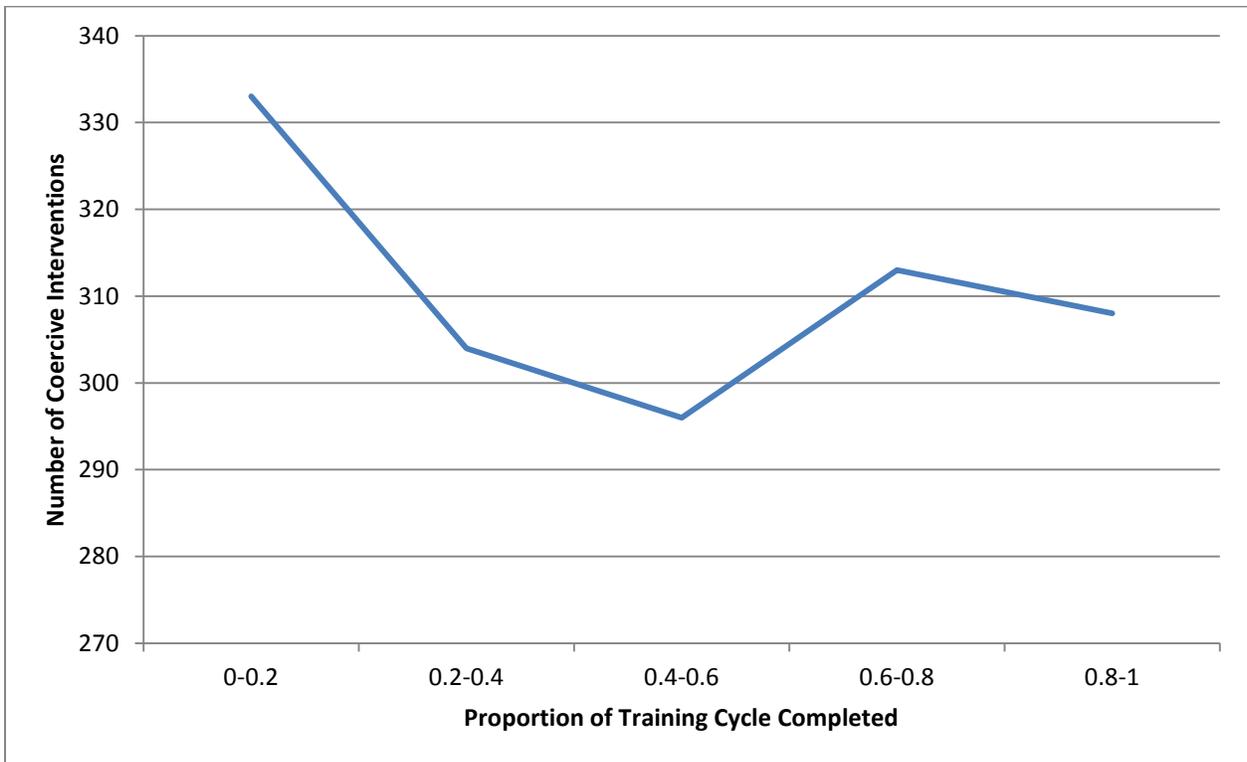


Figure H2: Coercive Interventions by Proportion of Training Cycle (excluding 1<sup>st</sup> cycle).

## Appendix I

### GMM for Alternate Treatment Indicators

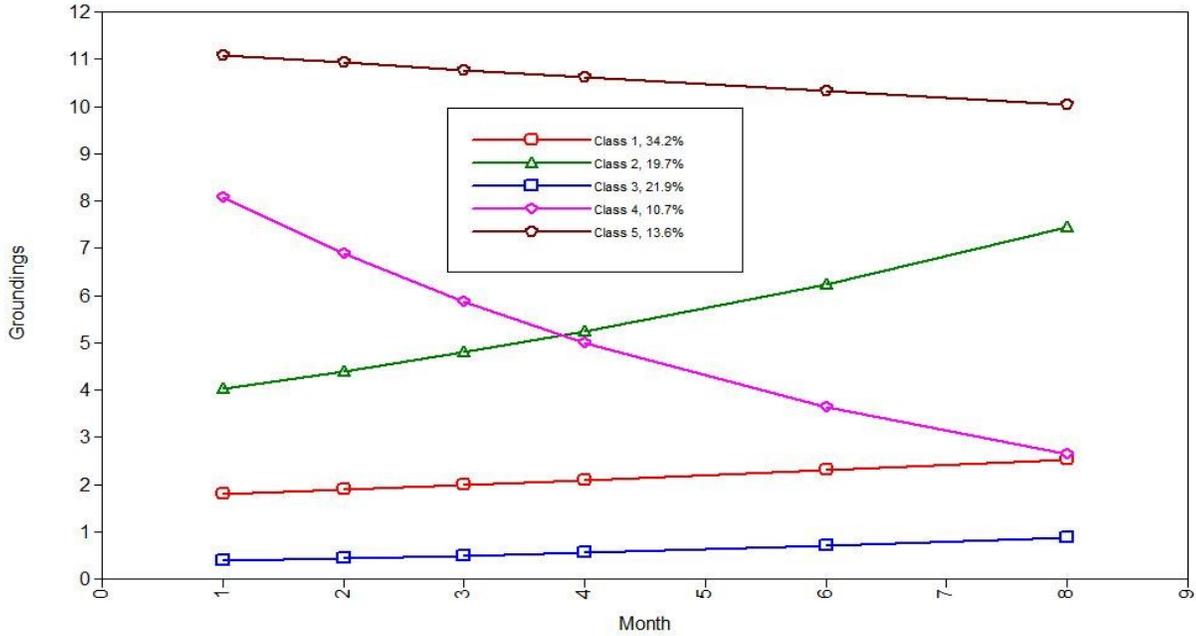


Figure II: GMM for groundings per month.

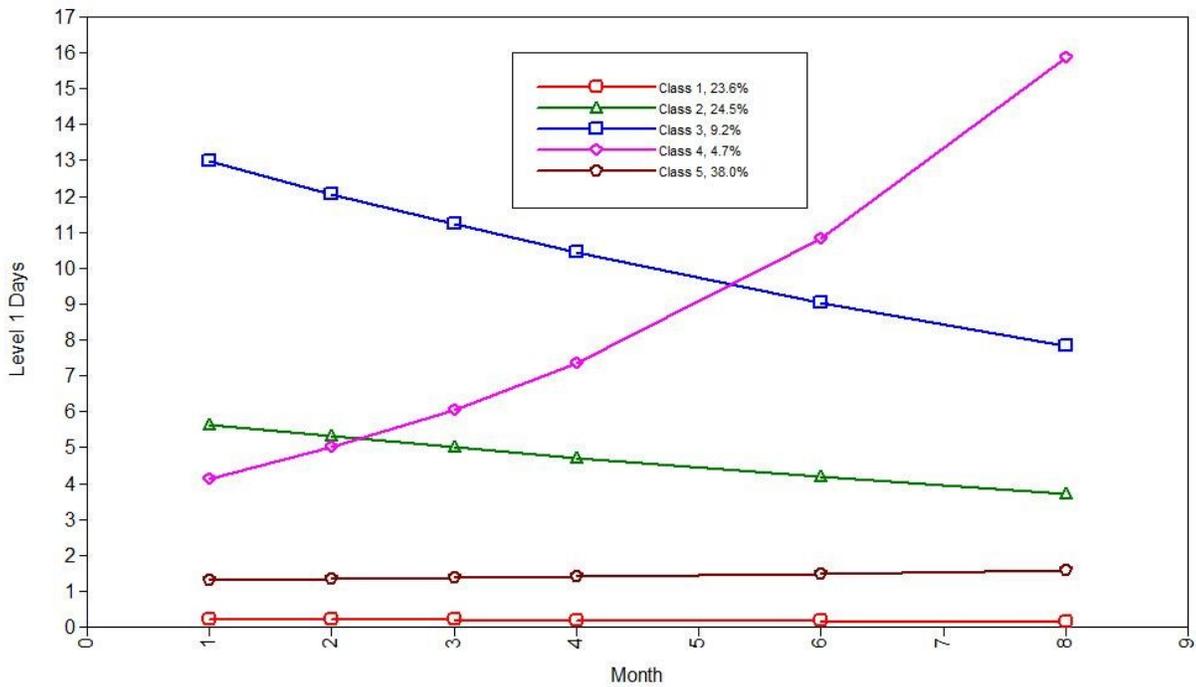


Figure I2: GMM for level-1 days per month

Table I1

*Fit Statistics for Groundings GMM*

Test	1-class	2-class	3-class	4-class	5-class	6-class
Loglikelihood	-1592.261	-1216.989	-1156.770	-1133.885	-1119.586	-1112.951
AIC	3188.523	2443.978	2329.540	2289.770	2267.173	2259.903
BIC	3193.630	2456.748	2349.971	2317.863	2302.927	2303.318
Entropy	-	0.958	0.914	0.853	0.840	0.829
LMR	-	750.544 (p < 0.001)	120.438 (p = 0.22)	45.770 (p = 0.10)	28.598 (p = 0.034)	13.270 (p = 0.155)

Table I2

*Fit Statistics for Level-1 Days GMM*

Test	1-class	2-class	3-class	4-class	5-class	6-class
Loglikelihood	-1662.670	-1152.788	-1088.998	-1055.413	-1039.319	-1034.000
AIC	3329.340	2315.576	2193.997	2132.826	2106.638	2102.000
BIC	3334.447	2328.345	2214.428	2160.919	2142.392	2145.416
Entropy	-	0.986	0.921	0.900	0.898	0.880
LMR	-	1019.764 (p < 0.001)	127.579 (p = 0.45)	67.171 (p = 0.36)	32.188 (p = 0.004)	10.638 (p = 1.0)

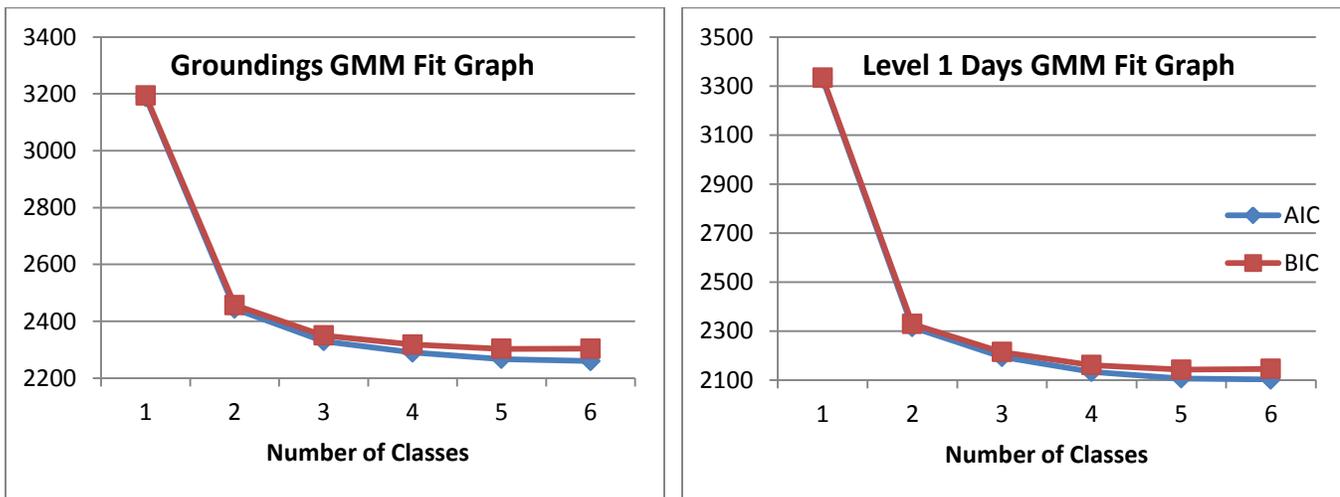


Figure I3: BIC/AIC fit graphs for groundings and level-1 days.