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### DOSAGE MATTERS: WHAT IS DOSAGE

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**DOSAGE MATTERS: WHAT IS DOSAGE**

A Thesis Presented in Partial Fulfillment of the Requirements

for the Master of Arts in Criminal Justice

John Jay College of Criminal Justice

City University of New York

Doyoung Kim

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# **DOSAGE MATTERS: WHAT IS DOSAGE**

Doyoung Kim

This thesis has been presented to and accepted by the Criminal Justice Master's Program, John Jay College of Criminal Justice of the City University of New York in partial fulfillment of the requirements for the Master of Arts in Criminal Justice degree.

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## **Abstract**

To reduce recidivism, many correctional programs and interventions have been introduced to offenders. Though, the rate of recidivism remains exceedingly high. To improve program outcomes, it is important to match the dosage of a program to risk levels. However, there is not a standardized definition and measurement of program dosage. This thesis extends the study on identifying the definition and measurement of dosage and the effectiveness of the programs by conducting a systematic review of prior research. The results indicate that as a treatment dosage, treatment duration was more frequently used compared to treatment intensity to reduce recidivism rate of the incarcerated participants. However, due to limited sources more data must be searched and identified for further study

*Keywords:* recidivism, correctional intervention, dosage, risk-level

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## Chapter One: Introduction

According to the U.S. Department of Justice (DOJ), the U.S. prison population reached over 1 million by the end of 2019 (Carson, 2020). The high incarceration rate may lead to overcrowding of correctional facilities, which is one of the biggest problems in our criminal justice system. One way to reduce the incarceration rate is to help released individuals avoid recommitting crimes. According to the DOJ, the incarceration rate increased every year from 2005 to 2014, with an 83% rearrest rate after nine years of release (Alper, Durose et al, 2018).

One of the best ways to reduce the recidivism rate is to provide effective interventions. There are many different types of interventions provided to offenders, including cognitive-behavioral therapy (Allen et al., 2001; Lipsey et al., 2007; Lipsey et al., 2001; Pearson et al., 2002), educational treatment (Davis et al., 2013; Davis et al., 2014; Hall, 2015; Jancic, 1998), and substance abuse treatment (Ashley et al., 2003; Mccollister et al., 2003). Such programs do not only curtail the recidivism rate but also reduce individuals' criminal behavior.

In his 1974 study, "What works? – questions and answers about prison reform," Robert Martinson purports that rehabilitation programs are not effective in decreasing recidivism. To refute these claims, many studies have been conducted studying the efficiency of correction programs in an effort to reduce the likelihood of inmates reentering prison (Allen et al., 2001; Landenberger & Lipsey, 2005; Pearson et al., 2002; Peter, Haas, & Hunt, 2001; Sperber & Lowenkamp, 2017; Wikoff et al., 2012). While Martinson suggests that rehabilitation treatment is largely ineffective, subsequent studies have found that rehabilitation programs have the ability to reduce the recidivism rate.

Treatment dosage is an essential factor in how correctional treatment programs impact recidivism (Andrews & Bonta, 2010). Treatment dosage is often described as how long or how

frequently participants participate in the assigned correctional program; however, it is measured differently in each study. According to Duwe (2017), treatment dosage does affect the offender's future criminal behavior, especially for high-risk offenders. This study will focus on how treatment dosage was construed in different correctional interventions, the outcomes of programs based on different treatment dosages, and how treatment dosage was applied to individuals of different risk levels (Sperber & Lowenkamp, 2017). Specifically, the goal is to identify how dosage is defined and measured in correctional intervention research to reduce recidivism after participants' release. The study aims to determine effective treatment dosages for each risk level group.

### **Purpose and goal of the study**

According to Collins et al. (2004), a standardized measurement of treatment dosage does not currently exist, because treatment dosage depends on several factors present in each study, including individuals' needs, risk levels, and types of interventions. Since each study has its own unique strategies and research goals, different correctional interventions require different treatment dosages (Landenberger & Lipsey, 2005; Davis et al., 2013; Evans et al., 2011). In particular, relatively little is known about whether treatment dosage should be measured by treatment duration (hours, days, and years), program completion, or other methods.

Having detailed program dosage information is essential to operationalizing treatment dosage in correctional treatment programs for offenders. This study identifies different types of treatment dosage and the definitions used in each study. It also aims to discuss whether various approaches to treatment dosage reduce the recidivism rate. Generally speaking, this study seeks to understand what treatment dosage is and how it affects recidivism. The research questions include:

1. How is program dosage defined in correctional intervention programs?
2. How is treatment dosage measured in correctional intervention programs?



3. Based on different risk-level, what is the most effective treatment dosage to reduce the risk of recidivism?

### **Theoretical Framework for the Current Research Project**

The Risk-Need-Responsivity (RNR) theory guides offender assessment and effectively identifies individuals' needs to reduce recidivism (Andrews et al., 2011). Identifying the offenders by their characteristics and risk, need, and responsivity of individuals provides a foundation of the correctional interventions and drives the selection and implementation of right correctional services (Andrews et al, 2011; Andrews et al., 1990; Latessa & Lowenkamp, 2006; Taxman & Marlowe, 2006; Ward et al, 2007).

## Chapter Two: Literature Review

Nearly 2 million people are incarcerated in the United States; 95 percent of them will reenter their communities (Alper & Durose, 2018). However, studies from the Department of Justice (DOJ) show that across 34 states, nearly 1.1 million arrests occurred in the 5-year follow-up period among the approximately 408,300 prisoners who were released in 2012. Approximately 62% of released prisoners were rearrested and back in prison within three years, and 71% returned to prison within five years (Durose & Antenangeli, 2021).

By scrutinizing the fundamental factors in correctional interventions, we can take action to reduce the recidivism rate. Moreover, providing effective interventions can solve far-reaching correctional concerns, such as the excessive populations of correction facilities and high corrections expenditures at the federal, state, and local levels. One way to reduce recidivism is to offer appropriate correctional programs for incarcerated inmates: academic programs, cognitive behavioral therapy, and substance abuse treatment programs (Duwe, 2017). These correctional treatment programs can help offenders avoid future criminal behavior and successfully assimilate back into society without recommitting crimes.

### **What is recidivism?**

Recidivism is generally defined as when a released offender returns to criminal behavior (Cotter, 2020). There are multiple measures of recidivism, including rearrest, reconviction, and/or reincarceration (Alper & Durose, 2018; Cotter, 2020; Hunt et al., 2019; Kyckelhahn & Cooper, 2017). Rearrest is when an offender is arrested for a new crime after being released. This also includes arrests for violations of supervised releases, probation, or state parole (Hunt et al., 2019; Kyckelhahn & Cooper, 2017). Reconviction is when a new arrest after release results in a subsequent court conviction (Hunt et al., 2019; Kyckelhahn & Cooper, 2017). Violations of

supervised releases, probation, or state parole are not considered reconviction due to the absence of formal prosecution. Finally, reincarceration is when an individual is resentenced to either jail or prison (Hunt et al., 2019; Kyckelhahn & Cooper, 2017).

Measuring recidivism can be difficult and each measure has limitations. Not all crimes are discovered by police, and not all crimes result in arrest. Furthermore, some people are arrested but then subsequently acquitted. Consequently, it can be challenging to determine the actual rate of recidivism (Calley, 2012; Peters et al., 2001; Stewart et al., 2014; Turner et al., 2000). Rearrest is often used to measure recidivism, because the data is easier to collect than data related to reconviction and reincarceration (Kyckelhahn & Cooper, 2017).

### **Recidivism trends**

As previously stated, recidivism is a significant problem in the United States. The Bureau of Justice Statistics (BJS) 2018 research update shows that prisoners in their first year after release showed the highest arrest rate: about four in nine (44%). By the ninth year, the rate is about one in four (24%) (Alper et al, 2018). For 401,288 prisoners released in 2005, around 1,994,000 arrests were recorded during the first nine years post-release. Moreover, about 82% of prisoners were arrested within the first three years (Alper et al, 2018). This data helps us understand the trend of recidivism. The rate of prisoners being rearrested increased during each of the nine years, from 2005 to 2014. 68 percent were arrested within three years, and 83 percent were arrested within nine years. Therefore, to be succinct, the longer the release period, the higher the rate of rearrest among individuals released from prison.

### **Risk-Need-Responsivity model:**

Before researchers carry out correctional research, they should identify individuals' characteristics, needs, and correctional treatments to determine whether such factors could bring

out the answers to their research questions. Particularly for examining the effectiveness of interventions, understanding the risk levels and needs of participants could provide more accurate outcomes. The Risk-Need-Responsivity (RNR) model is widely regarded as a useful tool for offender assessment and treatment and offers guidance for how offenders' criminological behavior should be implicated in the selection and implementation of correctional interventions (Andrews et al., 2011; Seewald et al., 2018; Taxman & Marlowe, 2006; Ward et al., 2016). The RNR model consists of a number of principles that guide interventions including the risk principle, need principle, and responsivity principle (Andrews et al., 2011; Duwe, 2018; Latessa & Lowenkamp, 2006; Seewald et al., 2018; Taxman & Marlowe, 2006; Ward et al., 2016).

These three principles offer important implications for correctional intervention: who should be treated (risk), what should be treated (need), and how the treatment should be carried out (responsivity) (Andrews et al., 2011; Duwe, 2018; Latessa & Lowenkamp, 2006). These principles have been linked to the ability of treatment to reduce recidivism; programs that fail to adhere to these principles have been found to be less effective (Andrews et al., 2011; Bourgon & Armstrong, 2005).

The risk principle states that a correctional program should match the level of service to the risk level of the offender. For instance, it suggests that high-risk offenders will benefit the most from high-intensity treatment or treatment with longer duration, while lower-risk offenders should receive minimal, shorter, or no intervention (Andrews et al., 2011; Ward et al., 2016). Sperber et al. (2013) found evidence to support the risk principle's effectiveness on recidivism. They conducted a study on the relationship between risk and dosage, concluding that higher-risk offenders benefit from higher levels of treatment. Mailloux et al. (2003)'s study of a high-risk group of sex offenders indicated that these offenders needed to participate in more programs than

other groups to achieve the same results. This study supports the risk principle, showing that high-risk offenders have to receive more intensive or more long-term treatment relative to lower-risk offenders. This work also suggests that low-risk groups only need a limited amount of treatment (Mailloux et al., 2003).

The need principle focuses on the criminogenic factors positively correlated with a criminal offense or behavior (Andrews et al., 2011; Latessa & Lowenkamp, 2006; Seewald et al., 2018). The RNR model divides the need principle into two different categories: criminogenic and non-criminogenic needs (Hollin, 1999). Criminogenic needs are a subset of an offender's risk level including the Central Eight risk/need factors: antisocial cognition, antisocial personality traits, substance abuse, antisocial associates, family/marital circumstances, history of antisocial attitudes, school/work, and leisure/recreation (Andrews et al., 2011; Hollin, 1999; Latessa & Lowenkamp, 2006). Non-criminogenic needs include stability factors such as housing, finances, and mental health. Although non-criminogenic needs are also essential, changes in these factors are not necessary for the probability of recidivism (Bourgon & Armstrong, 2005; Hollin, 1999).

The responsivity principle refers to a program's ability to match the style and mode of intervention to the participants for whom it was designed (Andrews et al., 2011; Ward & Brown, 2004). Andrews et al. (2011) describe two types of responsivity: general and specific. General responsivity is the use of behavioral, cognitive behavioral, and social learning approaches to influence behavior; on the other hand, specific responsivity involves modifying strategies according to the strengths, motivation, readiness to change, personality, mental status, learning ability, learning style, circumstances, and demographics of individual cases (Andrews et al., 2011).

## **Measuring risk level**

As mentioned above, the RNR theory has three core principles: risk, need, and responsibility. As noted, the risk principle has implications for intervention dosage. Based on the RNR theory, higher risk level offenders receive higher levels of interventions because more intensive treatment provides better outcomes (Andrews et al., 1990).

The methods used to measure risk levels can vary. There are several ways to measure the risk of recidivism, including the use of standardized assessments. Examples of risk assessments include the Level of Service Inventory-Revised (LSI-R) (Bechtel, 2016; Makarios et al., 2014; Sperber et al., 2013), the Automated Criminal Risk Score (ACRS) (Duncan et al., 2018), and the Spousal Assault Risk Assessment (SARA) (Stewart et al., 2014). Different assessments and jurisdictions label risk levels differently. For example, an individual's risk level can be identified as low, moderate, or high risk (Bechtel, 2016; Cohen et al., 2016; Winokur et al., 2002), but some assessments may also include low-moderate and moderate-high risk categories (Cohen et al., 2016; Makarios et al., 2014).

## **Understanding, defining, and measuring dosage**

Although research indicates that program dosage should match risk level, clear requirements for defining and measuring risk do not currently exist. Researchers and programs use different measures depending on the program, the risk assessment instrument, and other program practices. Identifying a consistent measure of treatment dosage will help researchers assess the link between dosage and program outcomes. Therefore, it is essential to figure out the most appropriate program dosage for offenders of different risk levels. Having a standardized definition and rate of program dosage will help develop new interventions with a high rate of positive outcomes.

This study aims to examine how treatment dosage is measured and how dosage affects the correctional interventions to reduce recidivism. The academic literature addressing program dosage and the criminal justice system is broad and varied. According to the risk principles mentioned above, it is not yet clear how to match treatment dosages to different offender risk levels. Therefore, this study focuses on identifying the most effective ways of defining and measuring treatment dosage.

### **Treatment duration**

Several studies have conceptualized dosage as the duration and intensity of interventions delivered with the risk-need-responsivity (RNR) model to determine the most effective dosage for participants of different risk levels (Bourgon & Armstrong, 2005; Landenberger & Lipsey, 2005; Lipsey et al., 2007; Makarios et al., 2014; Mailloux et al., 2003; Sperber & Lowenkamp, 2017). Treatment dosage is defined as how long participants participated in the program, while treatment intensity refers to how frequently they participated within a certain period.

In a study conducted by Keeling et al. (2006), the special needs program cognitive-behavioral treatment lasted for 12 months, with moderate-risk offenders taking part for eight months and high-risk offenders taking part for ten months. During those months, they usually attended four days per week, which means they received the same number of programs but with a different duration. In this study, treatment dosage was mainly referred to as duration, and the offenders were involved in treatment for 12 months. Participants who completed the program showed significant changes in their attitude, with positive effects on sexual behavior, victim empathy, and self-control (Keeling et al., 2006).

Moreover, Makarios, Sperber, and Latessa (2014) described the relationship between treatment dosage and recidivism by the different risk levels of offenders according to the Level of

Service Inventory-Revised by Andrews and Bonta (1995, cited in Makarios et al., 2014). The number of hours that individuals participated was considered to be the dosage, with 50-hour increments from 100 to 299 hours: 100-149, 150-199, 200-249, 240-299, and more than 300 hours. The impact of the refined dosage based on different risk levels was clearly illustrated in this study. Low- and moderate-risk offenders showed that receiving 100-149 hours of treatment led to the lowest recidivism rate, while high-risk offenders needed 150-199 hours. High- and moderate-risk offenders showed a decrease in recidivism as the dosage increased. Comparing the effects of different dosages revealed that participating for more than 300 hours decreased the rate of recidivism by 38% to 74% compared with participating for 150-199 hours

Sperber and Lowenkamp (2017) have reported the importance of a cognitive-behavioral program and the appropriate amount of treatment to be served. Treatment dosage was measured as the hours: 0-99 hours, 100-199 hours, and more than 200 hours. This study showed that the recidivism rate of medium-risk offenders decreased when they achieved 100-199 hours of treatment, while high-risk offenders should take 200 hours or more to see the reduction in rate.

### **Treatment intensity**

Mailloux et al. (2003) analyzed Mailloux and Serin's (2001) study that emphasized the importance of applying different treatment intensities to different risk level groups of offenders. Because high-intensity groups have more risk factors, they should receive a higher number of treatments than moderate and low-intensity groups. Therefore, dosage was defined as the number of sessions completed or the intensity of intervention that different groups received to test their hypotheses. As the risk level increases, treatment hours or the number of treatment sessions increase; for example, in Mailloux et al.'s (2003) study, low-risk offenders received treatment for two months, while the high-risk group received treatment for six to eight months. After treatment,



the low-intensity group had significantly lower conviction rates than both the moderate- and high-intensity groups, even though the latter groups participated in more programs for a more extended period of time.

Sperber and Lowenkamp's (2017) research considered the duration and intensity of treatment. Treatment intensity was measured as the number of treatments per week: none, one per week, two per week, and more than three per week. A higher number of sessions per week and participation in treatment involving role-playing were significantly related to participants' recidivism rates after prison release.

Bourgon and Armstrong (2005) conducted a study comparing treatments of differing lengths (5 weeks, 10 weeks, or 15 weeks) with similar levels of intensity. Treatment took place five days per week, in two sessions approximately 2 to 2.5 hours long per day (Bourgon & Armstrong, 2005). In this study, the treatment significantly reduced the recidivism rate for the treated group by 10%; the one-year recidivism rate for the treated group was 31%, compared to 41.3% for the untreated control group.

Landenberger and Lipsey (2005) conducted a study to determine the effect of cognitive behavioral therapy (CBT) on offenders' recidivism based on the amount of treatment completed. The amount of treatment was measured by the number of treatment sessions per week. This study recommended that the number of sessions per week has a stronger impact on program effectiveness and recidivism rates than the number of hours.

Although treatment dosage is crucial for effective programs, the term dosage is often defined and measured inconsistently in the correctional intervention (Rowbotham et al., 2019) or not applied at all. Therefore, despite several studies on treatment dosage, there is no agreed upon most appropriate definition and measurement of this term. However, treatment duration and

intensity were identified as the most frequently used treatment dosage in the correctional intervention to reduce recidivism. As mentioned above, the different studies used different definitions of dosage, and two defining aspects of dosage were considered: program duration and intensity. While these two factors could not yet be considered a generalized standard definition of dosage, they were able to provide insight into how dosage should be measured.

### **Chapter Three: Methodology**

Before analyzing data for this systematic review, a search strategy was identified to increase the study's validity and reliability by presenting eligible criteria: inclusion/ exclusion factors, collecting appropriate data using different databases based on the research questions and hypotheses of the study.

#### **Research question:**

RQ1: How is program dosage defined in correctional intervention research?

RQ2: How is program dosage measured in correctional intervention research?

#### **Research design:**

This thesis is a systematic review, a specific approach that identifies, evaluates, and summarizes all relevant studies collected. To do so, inclusion and exclusion criteria were identified to select more relevant studies for this study's topic, program dosage.

#### **Article Selection Search Strategy:**

##### ***Sources of literature***

The following databases were searched for both published and unpublished studies in the English language between 1998 and 2019: Criminal Justice Abstract, Criminology Collection, Dissertations & Theses Global, SCOPUS, SocINDEX, and Social Sciences Full Text. This study also carried out an internet search using Google Scholar and ResearchGate to search for grey literature and additional literature.

##### ***Eligible criteria***

This research included a study based on the following criteria: (1) the study evaluated a correctional intervention/treatment program, (2) the study include a measure of treatment dosage, (3) the study include a risk-level of participants, (4) the study used either program completion or

recidivism as study outcomes, (5) primary studies from any country, (6) the study published in English from any country, and (7) the study that was published or unpublished between 1998 and 2019.

### *Search strategy*

The following search terms were used to search for studies that met all 7 criteria mentioned above across all databases: (dosage\*) AND (recidivism) AND (risk-level) AND (correction or correctional or correctional treatment or correctional intervention) OR (duration) OR (completion).

### *Coding:*

This study aims to identify and analyze both published and unpublished studies on how dosage is defined and its relationship to recidivism. To answer the research question, specific information was required, such as a type of sample, correctional interventions, risk level, and recidivism rate. Moreover, detailed information is described how those factors were identified and coded in this study:

**Table 1**

#### *Code Sheet*

Description	Code/values
Intervention setting	0 = institutional and community 1 = institutional-based 2 = community-based
Treatment dosage	1 = intensity 2 = duration
Recidivism	0 = multiple 1 = rearrest 2 = reconviction 3 = reincarceration
Age (in year)	Mean number of year old they were at the time of treatment participation

Gender	0 = female and male 1 = female 2 = male
Ethnicity	0 = yes 1 = no
Criminal history	0 = multiple or any 1 = violent crime 2 = property offense 3 = drug-related offense

### *Study characteristics*

Correctional interventions with two different setting, both institutional and community based (0 = *institutional and community*), institutional-based (1 = *institutional-based*) or community-based (2 = *community-based*), was used to see if there are any patters of how dosage was defined in studies in different settings. In this systemic review, dosage was used to refer to both duration and intensity. The treatment dosage was coded as to whether it was defined as either intensity (1 = *intensity*), or only duration (2 = *duration*).

Recidivism is a fundamental concept with no exact measurement, so it was defined by three different meanings. Each study used different definitions, which is appropriate to reach their goal, and it was coded as rearrest (1 = *rearrest*), reconviction (2 = *reconviction*), reincarceration (3 = *reincarceration*), or more than one definition (0 = *more than one*). Moreover, recidivism was calculated as the number of rearrest, reconviction, or reincarceration rate of offenders who participated in the program by percentage.

### *Sample Characteristics*

The age of the sample was defined as the mean age at the time of treatment participation. Participants' gender was defined as Female and Male (0 = *Female and Male*), Female (1 = *Female*), and Male (2 = *Male*). Ethnicity was not mentioned in every study; therefore, this variable was coded to indicate whether race was identified in each study by Yes (0 = *Yes*) or No (1 = *No*).

In the case of criminal records and risk levels measurement, coding is impossible because each program did not use a unified measurement. Followed by, in terms of the unit of measurement for each study such as the number of months, weeks, or hours were also presented differently. Therefore, such variables will be mentioned in detail in Chapter Four which discusses the findings.

### **Data analysis**

This thesis seeks to understand the definition and measurement of treatment dosage and its effectiveness in reducing the recidivism rate in incarcerated individuals of all risk levels. To answer this research question, this study expands on prior research by identifying studies that defined treatment dosage in their research. Next, it examines how each study measured treatment dosage – by treatment duration or intensity. Finally, to identify the most commonly used definition and measurement of treatment dosage, it examines how each study applied different specifications of treatment duration (hours and weeks) and intensity (number of program sessions) and recidivism for different risk levels to reach study outcomes.

### **Summary**

To understand the impact and definition of the treatment dosage to reduce recidivism, different data were collected: definition of dosage, treatment type, treatment setting, the recidivism rate of the assigned follow-up period, risk level, criminal history of participants was collected from seven different pieces of research. As discussed above, those six researches were extracted based on research strategies and the criteria mentioned. Data from organized studies were used to assess each of the two research questions in the findings chapter. The following chapter will discuss the detailed results of the current study and analyze the research question.

## Chapter Four: Findings

By identifying who benefits the most in correctional interventions with different treatment dosages, we can learn how to allocate our resources and get the best outcomes from individuals most in need of intervention. Therefore, this study contributes to the research on the impact of treatment dosage on reducing recidivism and helping figure out consistent treatment dosage.

To begin with, there are six studies provided in this research to answer research questions: how to define dosage and applied to individuals with different risk levels. Before analyzing these studies, it will discuss how studies were reviewed and extracted.

### **Data extraction**

Data were extracted based on characteristics of interest for the research questions. Each study was coded for: population type, type of correctional interventions, setting of correctional interventions, measurement of dosage, the definition of dosage, outcome measures, different risk-level, and criminal history of the population. Moreover, in Figure 1, a PRISMA model is provided to illustrate how six studies were extracted.

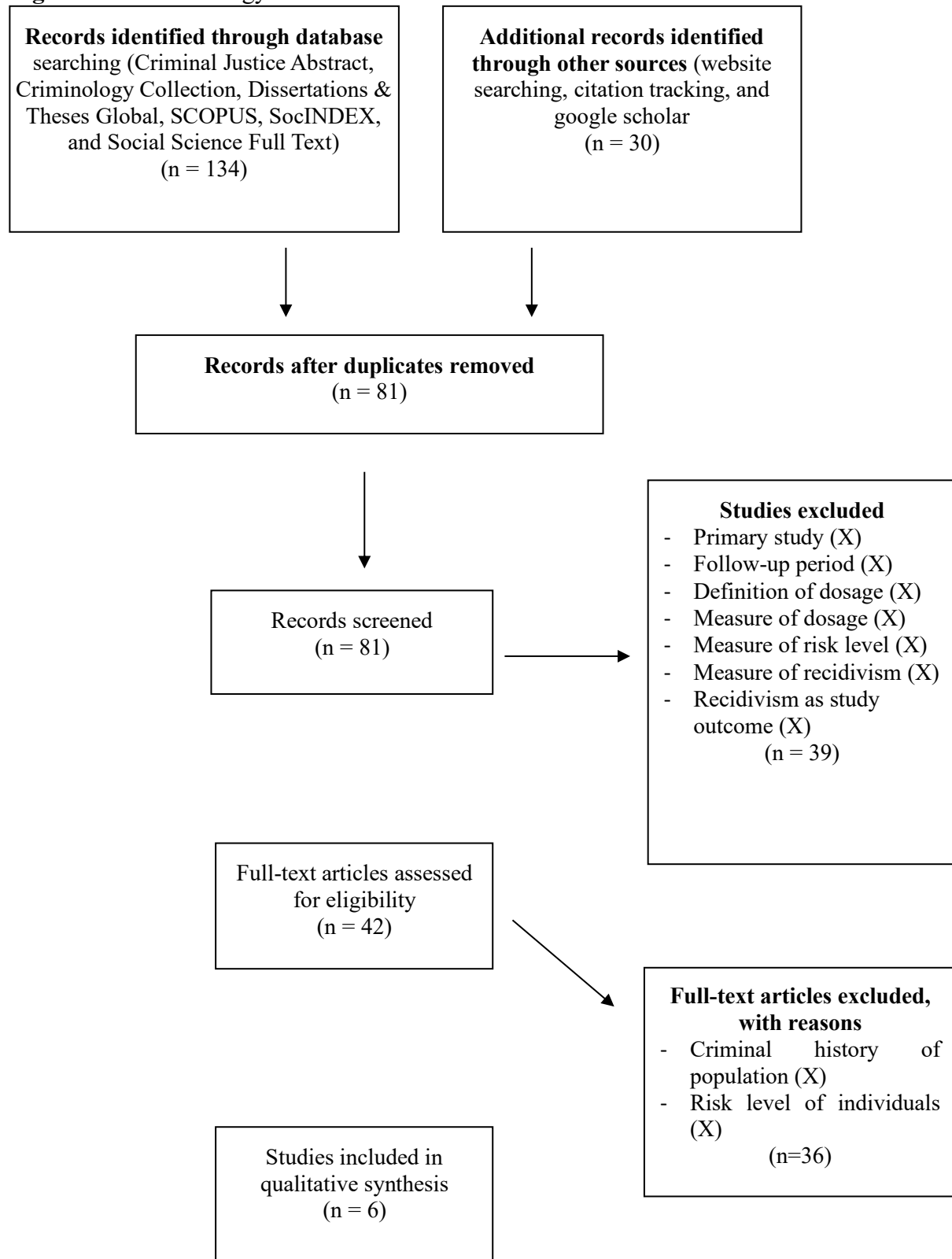
**Figure 1:** Search strategy based on the PRISMA model



Table.1 shows studies that have been included after the search, considering all the eligible criteria and search strategies. Based on these studies, this chapter will identify how six studies defined treatment dosage and its implementation for different risk levels.

**Table 1: Research articles included in study**

Author, year	Correctional Intervention	Intervention setting	Participants	Dosage measurement (Duration/Intensity)
Bechtel, 2016	Community-based correctional facilities (CCF) programs	Institutional-based	3281 male and female with a criminal history of sexual offense	Duration
Bourgon and Armstrong, 2005	Cognitive-behavioral program	Institutional-based	620 incarcerated male offenders who served for at least one violent offense	Duration
Makarios et al., 2014	Cognitive-behavioral treatment	Community-based	903 male with the criminal history of felony charge without mandatory prison time	Duration
Sperber et al., 2013	Cognitive-behavioral treatment	Community based	689 adult male offenders with a criminal history of a felony that does not carry a mandatory prison sentence	Duration
Sperber et al., 2018	Cognitive-behavioral treatment	Community-based	257 adult males with a criminal history of a felony but did not require a mandatory prison term	Duration
Stewart et al., 2014	Family violence prevention program	Institutional-based	572 male offenders have at least one incident of assault of both an intimate partner and others in their personal history.	Intensity

### **Treatment duration:**

Treatment duration is how long participants participated in the program, while treatment intensity is how frequently they participated within a certain period. Five out of six studies defined treatment dosage as treatment duration. Treatment duration was measured in three different ways in these studies: hours, weeks, and months. Table 2 presented below shows the specific duration that each study assigned to participants. However, as it shows, while these five studies used treatment duration as dosage, they all had different ranges of treatment duration. For example, the

treatment duration of Makarios et al.'s (2014) research increased in increments of 50 hours, while treatment duration in the study of Sperber et al. (2013) increased in increments of 100 hours.

**Table 2: Study characteristics**

Author, year	Definition of recidivism	Dosage measurement	Follow-up period	Duration
Bourgon and Armstrong, 2005	Any incarceration as a result of a new conviction or supervision related breach during the follow-up period.	The number of weeks of group treatment each participant received.	12 months	- 5 weeks - 10 weeks - 15 weeks
Bechtel, 2016	Any arrest, incarceration, or technical violation offenses	- Number of months - Number of hours	12 months	Number of months: - 1 to 3 months - 4 to 6 months - 7 or more months Number of hours: - 0-99 hours - 100-199 hours - 200+ hours
Makarios et al., 2014	The measure of recidivism used is being sent to prison during the follow-up period	Number of hours participated	Minimum of 18 months, average of 42 months	- 100 to 149 hours - 150 to 199 hours - 200 to 249 hours - 250 to 299 hours - More than 300 hours
Sperber et al., 2013	Measure of recidivism if return to prison	Number of hours participated	Minimum of 12 months, average of 19 months	- 0 to 99 hours - 100 to 199 hours - 200 or more hours
Sperber et al., 2018	Defined as being sent to prison during the follow-up period	Number of hours participated	Average of 46 months	- 0 to 99 hours - 100 to 199 hours - 200 or more hours

### ***Bourgon and Armstrong, 2005***

Bourgon and Armstrong (2005) studied whether prison-based treatment affects recidivism reduction and found that treatment dosage plays an essential role. The study focused on 620 incarcerated male adult individuals, with a mean age of 32.1 years, serving sentences of no more than two years between September 1997 and December 1999. Comprehensive structured cognitive behavioral programs were provided to participants to change negative attitudes and behaviors and increase prosocial thinking.

To begin with, Bourgon and Armstrong (2005) defined recidivism as any incarceration resulting from a new conviction or supervision-related violation during the one-year follow-up period. In this study, treatment dosage was examined based on duration and measured in five-week increments. The number of weeks of group treatment each participant received was based on individual risk level. The program was a cognitive behavioral program that assisted in changing participants' negative attitudes and behaviors to build new skills and gain responsibility (Bourgon & Armstrong, 2005). The duration of this program allowed appropriate application of the principles of effective correctional treatment -- the 5-week program delivered approximately 100 hours, the 10-week program delivered approximately 200 hours, and the 15-week program delivered approximately 300 hours of treatment (Bourgon & Armstrong, 2005)..

Each participant's risk level was measured using Level of Service Inventory-Ontario Revision (LSI-OR) scores gathered from file information and interviews (Bourgon & Armstrong, 2005). The study does not provide specific risk level categories, but it describes participants who attended a 5-week program as "moderate risk" and 10- and 15-week program participants as "high risk." Participants were assigned to treatment programs based on these risk levels. A total of 83 individuals with an average LSI-OR score of 17.1 were assigned to a 5-week program. In comparison, 107 individuals with an average LSI-OR score of 22.6 were assigned to participate in a 10-week program, and 47 individuals with an average LSI-OR score of 25.1 were assigned to a 15-week program (Bourgon & Armstrong, 2005).

Overall, the study shows a significant relationship between the length of treatment and a reduction in recidivism. Incarcerated participants who completed the 5-week program showed a 12% recidivism rate, while the untreated comparison group showed 28 percent. Moreover, for the 10-week program, the recidivism rate was 29.9%, compared to 43.8% for the untreated comparison

group. Finally, the 15-week group had a 38.3% recidivism rate, while the untreated comparison group's rate was 59.1%. As these results indicate, all of the treated individuals, regardless of treatment duration, showed significantly lower recidivism rates than those individuals who were recommended to participate in treatment but did not complete it (Bourgon & Armstrong, 2005).

**Table 3: Rate of recidivism by different dosage and risk level of treated and untreated group**

Treatment duration	Treated group		Untreated group	
	LSI-OR score (risk level)	Recidivism (%)	LSI-OR score (risk level)	Recidivism (%)
5-week	17.1 (moderate)	12.0	18.3 (moderate)	28.0
10-week	22.6 (high)	29.9	22.5 (high)	43.8
15-week	25.1 (high)	38.3	26.8 (high)	59.1

**Bourgon and Armstrong, 2005**

***Makarios et al., 2014***

Makarios et al. (2014) carried out a study to identify the effectiveness of cognitive behavioral treatment in reducing the likelihood of recidivism. The study used a sample of 903 adult male non-sex offenders successfully discharged from a community-based correctional facility in Ohio. The measure of recidivism used in Makarios et al.'s study was being sent to prison during an average follow-up period of 45 months. Treatment dosage was defined as the number of hours of group treatment and cognitive behavioral treatment activities.

Consistent with research by Sperber et al. (2013), each offender received treatment in 50-hour increments, with the exception of those in the minimum dosage category, who received between 0 and 99 hours of treatment (Makarios et al., 2014). Moreover, the risk level of each individual was assessed using the Level of Service Inventory-Revised (LSI-R); based on these risk scores, participants were categorized into five risk level groups: low risk, low-medium risk,

medium risk, medium-high risk, and high risk. However, this study only examines low-medium risk, medium, risk, and medium-high risk categories, due to a lack of data for the other groups.

Treatment dosage was categorized into six groups: minimum (0–99 hours), low (100–149 hours), low-medium (150–199 hours), medium-high (200–249 hours), high (250–299 hours), and maximum (300+ hours) dosage. Each individual's number of treatment hours was selected based on risk level. Although there was no specific cut point in their implementation, Makarios et al. attempted to increase programming and dosage for higher-risk cases and provide less dosage for lower-risk cases (Makarios et al., 2014). After this method was carried out, the study examined the impact of treatment dosage on recidivism for different risk categories and the relationship between other specifications of the number of treatment hours and recidivism by risk level (Makarios et al., 2014).

The study's outcome shows a significant relationship between treatment dosage, risk level, and recidivism rate. In the low-medium risk group, 14% of participants recidivated with 100-149 hours of treatment, while 30% recidivated with 150-199 hours of treatment. The moderate risk group showed 40% incarcerated with 100-149 hours, 37% with 200-249 hours, 38% with 250-299 hours, and 52% with more than 300 hours of treatment. Finally, unlike other risk level groups, the high-moderate risk group shows a stark difference between specific dosage hours. This group reached a 74% recidivism rate with 150-199 hours of treatment, which is relatively high among all dosage categories and risk levels. Other rates for the high-moderate group included 47% with 200-249 hours, 40% with 250-299 hours, and 38% with more than 300 hours of treatment. Makarios et al.'s results indicated that a high treatment dosage does not always lead to a low recidivism rate, and that it is important to match treatment dosage to the individual's risk level.

**Table 4: Rate of recidivism by different dosage and risk level**

Dosage categories (hours)	Recidivism rate (%)		
	Low-medium risk	Medium risk	Medium-high risk
100-149	14	40	-
150-199	30	37	74
200-249	-	38	47
250-299	-	52	40
300+	-	-	38

**Makarios et al., 2014**

***Sperber et al., 2013 and Sperber et al., 2018***

Sperber et al. carried out studies in 2013 and 2018 to identify the relationship between risk level and treatment dosage. There are many similarities between these two studies, though there are some key differences, including targeted population and outcomes.

Beforehand, both Sperber et al., 2013 and 2018 research were held in community-based correctional facility (CBCF) in Ohio with different participants and time-period. Sperber et al.'s 2013 study followed 689 adult male offenders who were successfully discharged from a CBCF for a three-year period. The purpose of the study was to identify what treatment duration is necessary to reduce recidivism in incarcerated participants placed in a CBCF. On the other hand, Sperber et al.'s (2018) study followed 257 adult males convicted of felonies that did not require mandatory prison terms, who were successfully discharged from a CBCF for a four-year period.

Both studies defined recidivism as being sent to prison during the follow-up period. Treatment dosage was the number of hours of group treatment offenders received, in 100-hour increments: 0-99 hours, 100-199 hours, and 200 or more hours of treatment. The risk level of individuals was measured by the Level of Service Inventory-Revised (LSI-R) and categorized as

low risk, moderate risk, and high-risk level (Sperber et al., 2013) and low-medium risk, medium risk, and medium-high risk level (Sperber et al., 2018).

In their 2013 study, Sperber et al. applied the treatment dosage based on the individual's risk level; low-risk participants received lower dosage treatment. Based on this implementation, 39% of low-risk individuals in the group that received 0-99 hours of treatment returned to prison, while 26% of those who received 100-199 hours returned to prison. For the moderate risk group, 52% returned to prison following 0-99 hours of treatment, 45% returned following 100-199 hours of treatment, and 43% returned following more than 200 hours of treatment. For the high-risk group, which shows the most significant differences, 81% of participants who received 100-199 hours of treatment returned to prison, while only 57% of participants who received more than 200 hours of treatment returned (Sperber et al., 2013).

**Table 5: Rate of recidivism by different dosage and risk level**

Dosage categories (hours)	Recidivism rate (%)		
	Low-medium risk	Medium risk	Medium-high risk
0-99	39	52	-
100-199	26	45	81
200+	-	43	57

**Sperber et al., 2013**

Sperber et al.'s 2018 study also applied treatment dosage based on an individual's risk level, but this study shows a fairly different rate of recidivism during the follow-up period. 30% of low-medium risk individuals who received 0-99 hours of treatment returned to prison, while 15% who received 100-199 hours of treatment returned. For the medium-risk group, 54% who received 0-99 hours of treatment returned to prison, 42% who received 100-199 hours of treatment returned, and 40% who received more than 200 hours of treatment returned. For the medium-high risk group, which shows the most considerable differences, 85% of participants who received 100-

199 hours of treatment returned to prison, while only 45% of participants who received more than 200 hours of treatment returned.

**Table 6: Rate of recidivism by different dosage and risk level**

Dosage categories (hours)	Recidivism rate (%)		
	Low-medium risk	Medium risk	Medium-high risk
0-99	39	52	-
100-199	26	45	81
200+	-	43	57

**Sperber et al., 2018**

***Bechtel, 2016***

**Table 7: Study characteristics of Bechtel, 2016**

Author, year	Definition of recidivism	Dosage measurement	Follow-up period	duration
Bechtel, 2016	any arrest, incarceration, or technical violation offenses	- Number of months - Number of hours	12 months	Number of months: - 1 to 3 months - 4 to 6 months - 7 or more months Number of hours: - 0-99 hours - 100-199 hours - 200+ hours

**Bechtel, 2016**

Bechtel (2016) defined recidivism as an offender experiencing any new arrest, incarceration, or technical violation offense during twelve months of follow-up after release. In this study, unlike other four studies mentioned above, program duration was examined in two different ways as it was identified in Table 7: the number of months and number of hours participants participated in the program. Each duration was categorized into three groups. The number of months was categorized as 1-3 months, 4-6 months, or 7 or more months. The number of hours was categorized as 0-99 hours, 100-199 hours, or 200 or more hours (Bechtel, 2016).

Individual risk level was assessed using the Level of Service Inventory-Revised (LSI-R). This assessment tool indicated three risk levels: low, moderate, and high (Bechtel, 2016). However,



unlike in the aforementioned studies, the numbers of months and hours were not applied based on the risk levels of participants. The results were then compared to determine the most effective dosage. For example, the low-risk group was divided into three groups and assigned to 1-3 months, 4-6 months, and 7 or more months and to 0-99 hours, 100-199 hours, or 200 hours or more of program duration.

Based on the results, the total of group hours has a statistically significant relationship with technical violation, incarceration, and any type of recidivism (Bechtel, 2016). Specifically, the low-risk group showed the lowest recidivism rate when they received 0-99 hours of treatment. For the moderate-risk group, 0-99 hours of treatment duration was effective in reducing all crime types. The high-risk level group showed the lowest rate of recidivism after 100-199 hours of treatment. Although each risk level group showed a different recidivism rate based on their criminal history and treatment duration, each group displayed the same pattern with 200 or more hours of treatment, which increased the likelihood of recidivism rather than reducing it (Bechtel, 2016).

The study also showed multiple statistically significant relationships between the number of program months and recidivism of any kind. For the low-risk group, 1-3 months of treatment showed the highest overall recidivism rate compared to the other dosage groups. The most significant decrease in recidivism rate for all types of crime was found in those who participated in 7 or more months of programming. The moderate-risk group showed a low rate of overall recidivism among participants who participated in an average of 4-6 months of treatment, while the high-risk level group showed a low recidivism rate with an average of 7 or more months of treatment (Bechtel, 2016).

### Treatment intensity:

#### *Stewart et al., 2014*

Only one out of six studies defined treatment dosage as treatment intensity rather than as treatment duration. Treatment intensity is defined as how frequently participants participated in the program. In their 2014 study, Stewart et al. defined it as the number of program sessions: either 25 sessions or 78 sessions.

Stewart et al. (2014) evaluated a family violence prevention program for 572 male offenders, ranging from 20 to 69 years, with an average age of 37 years. These men were incarcerated at various federal institutions across Canada between 1999 and 2003. The study included untreated groups to help identify the significant effects of treatment on reducing recidivism rates for each risk level group and type of crime.

**Table 8: Characteristics of Stewart et al., 2014**

Author, year	Definition of recidivism	Dosage measurement	Follow-up period	Intensity
Stewart et al., 2014	Rearrest, another charge, and reconviction	Number of session	6 months	- 25-session program - 78-session program

Stewart et al. (2014) measured recidivism as any rearrest, recharge, or reconviction due to domestic violence during the six-month follow-up period. As mentioned above, in this study, treatment dosage was defined as the number of program sessions. Two programs were provided: a 25-session program identified as “moderate intensity,” and a 78-session program identified as “high intensity.” The number of sessions was assigned based on each participant’s risk level. The risk level was measured using SARA, a structured risk assessment tool that assesses the risk for domestic violence to guide monitoring and intervention (Stewart et al., 2014).

Based on the risk assessment tool, moderate and high-risk groups of participants were identified. The program assigned moderate-risk participants to attend the moderate-intensity

program, while high-risk individuals were assigned to the high-intensity program (Stewart et al., 2014). Of the 246 total incarcerated participants, 127 individuals were assigned to the moderate-intensity program, with 76 treated and 51 untreated; meanwhile, 119 were assigned to the high-intensity program, with 84 treated and 35 untreated. The study compared the recidivism rate of each treated and untreated group of people in both intensity programs based on three different crime categories: spousal violence, any violence, and any infraction (Stewart et al., 2014). Spousal violence was defined as any actual, attempted, or threatened violence towards a past or current intimate partner, any violence was defined as violence toward spouses and others, and any infraction referred to all criminal behavior and conditional release violations, regardless of whether they resulted in arrest (Stewart et al., 2014).

The study's outcome shows a correlation between treatment intensity, risk level, and recidivism rate. For the moderate-intensity group, 4% of the treated group committed a spousal violence offense, while 14% did in the untreated group; this is a 71% reduction in spousal assault recidivism. For both violence and infraction offenses, the study shows the same trends of recidivism, but the differences are not statistically significant (Stewart et al., 2014). The high-intensity group also showed a significant difference between the treated and untreated groups for spousal violence and any violent offenses: 4% of the treated group committed spousal violence offenses, while 14% of the untreated group did. 11% of the treated group were indicted for committing any violence, while 26% of the untreated group were indicted. Furthermore, 11% of the treated group and 26% of the untreated group committed new violent offenses; this means that violent recidivism was reduced by nearly 60% (Stewart et al., 2014).

**Table 9: Recidivism rates for treated and untreated group**

	Moderate intensity group	High intensity group
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	Treated	Untreated	Treated	Untreated
Spousal violence	4%	12%	4%	14%
Any violence	9%	14%	24%	37%
Any infraction	24%	26%	24%	37%

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**Stewart et al., 2014**

## **Chapter Five: Discussion**

This systemic review seeks to examine the definition and measurement of treatment dosage and its effect on recidivism at different risk levels. It was designed to broaden our understanding of how treatment dosage has been applied to correctional intervention research. To date, there is no generalized standard definition and measurement of treatment dosage. For this reason, each study presents different treatment dosages for each individual intervention. Therefore, six studies were gathered and examined to provide an idea of the most commonly used treatment dosages in correctional interventions to reduce the recidivism rate.

### **Definition of treatment dosage**

Treatment dosage is measured in a variety of ways. However, two main factors are often used to define treatment dosage: treatment duration (Bourgon & Armstrong, 2005; Bechtel, 2016; Makarios et al., 2014; Sperber et al., 2013; Sperber et al., 2018) and treatment intensity (Stewart et al., 2014). Treatment duration is how long participants participated in a program; it can be measured in hours, weeks, or months. On the other hand, treatment intensity is how frequently participants participated within a certain period of time; it is usually measured by the number of program sessions.

Six studies were extracted based on the criteria for the current study. Although different measurements were used in each, five out of the six studies defined treatment dosage as treatment duration. Based on these findings, we can conclude that treatment duration the preferred definition of treatment dosage for reducing recidivism in criminal interventions. Treatment duration was not simply used more often in these studies to define treatment dosage than treatment intensity; it also proved to produce statistically significant reductions in recidivism rates of participants during their follow-up periods.

### **Measurement of treatment dosage**

Treatment dosage has no generalized standard for its measurement. While five of the studies examined in this thesis used the same definition of treatment dosage (treatment duration), each study measured it differently, with different units of measurement.

To begin with, the studies did not use a fixed number of hours; however, three general measurements of treatment duration were identified: the number of months (Bechtel, 2016), number of weeks (Bourgon & Armstrong, 2005), and number of hours (Makarios et al., 2014; Sperber et al., 2013; Sperber et al., 2018) each participant spent in a program. The units of measurement for the number of months were categorized into three groups: 1-3 months, 4-6 months, and 7 or more months. The units of measurement for the number of weeks was also categorized into three groups: 5-week, 10-week, and 15-week programs (Bourgon & Armstrong, 2005). Unlike the units of measurement of months and weeks, two different sets of units are presented for the number of program hours. The first set of units for the number of hours is 0-99 hours, 100-199 hours, and 200 or more hours (Sperber et al., 2013; Sperber et al., 2018); the second set is 100-149 hours, 150-199 hours, 200-249 hours, 250-299 hours, and 300 or more hours (Makarios et al., 2014).

Treatment intensity was measured by the number of sessions each participant participated in during a certain period. There is no fixed number of sessions; however, Stewart et al. (2014) presented the units of measurement for treatment intensity as a 25-session program and a 78-session program over a 4-year period.

### **Relationship between treatment dosage and risk level on recidivism rate**

All six studies presented in Chapter Four showed that applying treatment dosage appropriately to the different risk levels of participants effectively lowers the recidivism rate.

However, since these studies were all conducted under different conditions, it is difficult to determine which treatment dosage was most effective and develop a standard for the future. Moreover, it is hard to identify which intervention was most effective among all six studies, because the meaning of treatment dosage and all other factors were approached differently for each study.

However, putting aside other factors such as criminal types, ages, treatment types, and so on, a simple pattern can be observed in relation to which treatment dosage most effectively reduces the recidivism rate of participants. Looking at the most frequently used measurement, hours, and its relationship with the recidivism rate for different risk levels, one can see that moderate-risk groups were less likely to recidivate when they received 150-200 hours of treatment. In comparison, high-risk groups showed the lowest recidivism rate when they participated in more than 200 hours of the treatment.

When all experiments are conducted under the same conditions, comparison is relatively easy, and it is thus easy to find the most effective method. In this case, however, it is challenging, because all variables other than the definition and measurement of treatment dosage differ in each study. There are differences in quality of experiment conducted, definition of recidivism rate, type of correctional intervention, intervention setting, follow-up period, and measurement used to identify risk level. Moreover, one of the most critical variables, the target population, differs among the studies in terms of age range, gender, criminal history, ethnicity, and serving time. If these factors were the same, it might have been possible to find the most effective way to apply treatment dosage in a correctional intervention to reduce recidivism and solve the most fundamental problems by providing a general standardized definition and measurement of treatment dosage.

### **Recommendation for future study**

Although the six studies reviewed in this thesis have shown that treatment dosage lowers the recidivism rate for different risk levels, there is no one clear answer as to how treatment dosage should be defined or measured. However, if I were to recommend a new correctional intervention for future studies, I would suggest defining treatment dosage as treatment duration. In this study alone, this measurement was used by five out of six papers.

Unlike the definition of treatment dosage, the ideal measurement of treatment dosage cannot be determined based on the frequency of usage. Therefore, using more than one measurement, as in Bechtel (2016) study, will be very helpful in enhancing research literacy. Additionally, I would choose the same measurement as Bechtel (2016): the number of months and hours. To be more specific, I would choose ranges of 1-3 months, 4-6 months, and 7 or more months, along with ranges of 0-99 hours, 100-199 hours, and 200 or more hours. The results of this paper show that this approach successfully lowered the recidivism rate; the relationship between treatment dosage, individual risk levels, and recidivism rates was also very well-illustrated when these measurements were used.

### **Limitation of this study**

The main limitation of this study is a lack of resource availability -- it has too few references and too little information to fully answer the research questions. This is because data search was limited to six databases, which brought only published research to answer the research questions while inclusion criteria includes unpublished literature as well. Since this is the case, although there is limited information in this field, more data must be searched and identified for further study. It would be beneficial to expand the scope of thesis research and expand the



databases to find the grey literature and unpublished literature, which contain insights that may not be found in published work.

Moreover, the intervention settings of the studies were too limited; only institutional-based and community-based interventions were considered. To identify the appropriate implementation of treatment dosage for successfully reducing recidivism, a wider variety of intervention settings should be considered (e.g., residential-based intervention). Additionally, treatment targets in this thesis included only adults; juveniles were excluded entirely. Therefore, the outcome of this thesis cannot be applied to other studies.

## **Conclusion**

Although treatment dosage plays an essential role in successfully reducing recidivism rates, it has no generalized standard measurement. This thesis examined six studies and determined that treatment duration was often used to define treatment dosage and showed statically significant outcomes – participants of different risk levels who participated in correctional intervention after their release from prison showed reduced recidivism rates when this approach was taken. Based on the findings of the six studies, treatment duration appears to be the preferable definition of treatment dosage. However, due to a lack of resources and unified data, this thesis cannot completely confirm that treatment duration is the best dosage to apply. Regardless of participants' risk levels, other variables such as type of criminal history, length of follow-up period, and unit of treatment dosage must be the same across studies in order to determine whether treatment duration is the most appropriate definition to implement. A wider variety of intervention types and settings, treatment targets, and other variables could also provide a more accurate picture of which treatment dosage definitions and measurements are most appropriate for incarcerated individuals with different risk levels.

## Key Terms

**Follow-up period:** period commencing immediately after the release from the prison

**Recidivism:** rearrest, reconviction, or reincarceration during the follow up period

**Risk level:** offender's risk of recidivism which often labeled as low-risk, moderate-risk, and high-risk level

**Treatment duration:** how long participants participated in the program

**Treatment intensity:** how frequently they participated within a certain period

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