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Change over time: the use of seclusion in secure residential youth care in The Netherlands

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ABSTRACT
Seclusion can be harmful for children and adolescents. Hence, all locations for secure residential youth care in the Netherlands are committed to reduce its use by implementing monitoring and feedback as a seclusion reduction intervention. This study examined change over time in the use of seclusion in secure residential youth care in the Netherlands using a broad conceptualization of seclusion and by analyzing four variables (frequency, duration, room, reason). During two six months periods, seclusions were registered in 19 locations. Every month, all locations received feedback on the use of seclusion. Negative binomial mixed model analyses were used to investigate change over time in frequency and duration of seclusion. Logistic mixed model analyses were used to identify change over time in reason for use and type of room used for seclusion. Results showed that seclusion frequency significantly decreased (RR = 0.92, p < .001). Further, duration of placement in a seclusion room significantly increased (RR = 1.04, p < .001). This change was only significant in seclusion in response to aggression (RR = 1.06, p < .001). The results emphasize the need for future studies to examine reduction using a broad conceptualization of seclusion.

KEYWORDS
Seclusion; residential youth care; reduction; intervention

Practice Implications
- Consider using a broad conceptualization of seclusion when studying its use in practice.
- Staff members can use insights in the use of different types of seclusion as starting points to reduce seclusion.

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- Consider active and continuous investment of time and effort in implementing a multi-tiered intervention strategy to reduce seclusion.
- Learning by means of monitoring, open discussion, and reflection should be a central theme in seclusion reduction.

**Introduction**

In the Netherlands, children and adolescents aged 10–18 years with complex and multiple problem behaviors, posing a risk to themselves (e.g., self-harm) or their environment (e.g., physical harm of others), can be placed in secure residential youth care (Dresen et al., 2017; Jeugdzorg Nederland, 2021). These children and adolescents often grow up facing multiple problems in life, such as poverty, domestic violence, and mental disorders (Tausendfreund et al., 2014; Verhagen et al., 2018). The placement in secure residential youth care is involuntary and coercive measures can be used. These measures range from small (e.g., rules for internet use) to more drastic and harmful measures, such as the use of seclusion. Seclusion is perceived as one of the most detrimental coercive measures that should only be used as a last resort strategy (National Association of State Mental Health Program Directors [NASMHPD], 1999). This is due to potential adverse physical and psychological consequences for both patients and staff (Haugom et al., 2019; LeBel et al., 2010; Valenkamp et al., 2014). More specifically, seclusion is potentially traumatizing (Bryson et al., 2017) and might be retraumatizing for children and adolescents who have experienced serious traumatic events earlier in life (Hammer et al., 2011; Timbo et al., 2016), which is often the case for children and adolescents in secure residential youth care (Dresen et al., 2017). In addition, seclusion can contribute to negative interactions between patients and staff (Fraser et al., 2016). This is undesirable, because the relationship between patients and staff is considered essential to achieve positive treatment outcomes (Karver et al., 2006). In sum, evidence demonstrates that prevention of seclusion in secure residential youth care is of major concern.

Worldwide, the realization that seclusion can be harmful for both patients and staff has led to the development and implementation of seclusion reduction interventions, such as collaborative problem solving, trauma-informed approaches, and the six core strategies (Black et al., 2020; Boel-Studt, 2017; National Association of State Mental Health Program Directors [NASMHPD], 2008). In those interventions, the emphasis has mainly lied on reducing the frequency of seclusion, although it also has been shown that such interventions can improve various therapeutic outcomes (e.g., self-harm, thinking problems, school functioning) and can decrease length of treatment (Boel-Studt, 2017; Pollastri et al., 2016). Another – more indirect – way to reduce the use of seclusion may be found in improving the social climate (Roy et al., 2020). Literature has shown that the implementation of a seclusion reduction
intervention successfully leads to a reduction in most cases (Roy et al., 2021; Valenkamp et al., 2014). For instance, the implementation of the six core strategies – organizational change, use of data to inform practice (i.e., monitoring and feedback), workforce development, use of prevention tools, increasing consumer roles, and debriefing (National Association of State Mental Health Program Directors [NASMHPD], 2008) – in three mental health-care facilities for children led to a seclusion reduction rate between 62% and 85% (Wisdom et al., 2015). In another study, the implementation of collaborative problem solving in a residential facility for youth led to a seclusion reduction rate of 95% in five years’ time (Pollastri et al., 2016). In addition, some studies have shown that the implementation of a seclusion reduction intervention can also lead to a reduction in seclusion duration. For example, one study on an inpatient child and adolescent behavioral health unit found that the mean duration of seclusion decreased from 69 to 49 minutes after the implementation of a seclusion reduction intervention (Eblin, 2019). A systematic review (De Hert et al., 2011) found a duration reduction of 32.4% after the implementation of a seclusion reduction intervention. Thus, literature has shown that seclusion reduction interventions can successfully decrease the frequency and duration of seclusion.

However, since seclusion comes in many shapes and forms, one should not only investigate the frequency rates and duration after the implementation of a seclusion reduction intervention. Recent studies (Matte-Landry & Collin-Vézina, 2020; Roy et al., 2021; Van Dorp et al., 2021) have conceptualized seclusion as a broad spectrum ranging from less restrictive (e.g., the child or adolescent is placed in their own bedroom and not allowed to leave even though the door is open) to more restrictive (e.g., placement in a locked seclusion room) types that are used in practice. This broad conceptualization enables distinguishing between different types of seclusion. For instance, staff members of organizations for secure residential youth care have pointed out differences between the types of rooms used for seclusion. Seclusion of children or adolescents in their own bedroom is considered less restrictive than seclusion in a specifically designed seclusion room (Van Dorp et al., 2021). Further, recent research has shown that seclusion is used for a large variety of reasons, ranging from an incident or emergency situation to a consequence of undesirable behavior (Engström et al., 2020; De Valk et al., 2019; Van Dorp et al., 2021). To date, this broad conceptualization of seclusion has never been taken into account when studying seclusion reduction. This shortcoming hampers investigating the reduction of different types of seclusion. Such insights are of interest, because it can raise awareness among professionals of the use of different types of seclusion in practice. These insights can be used as starting points on how to (further) reduce different types of seclusion used in practice. Hence, it is warranted to use a broad conceptualization of seclusion when investigating the reduction of its use.
In 2018, all locations for secure residential youth care in the Netherlands jointly decided to reduce the use of seclusion (Jeugdzorg Nederland, 2018). To this end, a national research project was launched examining under which conditions a reduction of seclusion in secure residential youth care in the Netherlands could be reached. At that moment, all locations still defined and registered seclusion differently. There was no uniform definition and registration system, and since locations for secure residential youth care were not obligated to publish their seclusion data, it was unknown how often seclusion was used in secure residential youth care the Netherlands. Thus, the first step in this project was to develop and implement a shared definition of seclusion supported by both youth and professionals. This led to the following broad definition of seclusion: “an involuntary placement in a room or area the child or adolescent is not allowed or able to leave” (Van Dorp et al., 2021). Next, a uniform registration system was created and implemented in all locations. This enabled monitoring and feedback of the use of different types of seclusion at a national level.

The aim of this study was to investigate change over time in the use of seclusion in secure residential youth care in the Netherlands by implementing monitoring and feedback as a seclusion reduction intervention. This was done using a broad conceptualization of seclusion and by analyzing four elements: frequency, duration, room used for seclusion, and reason for the use of seclusion. In general, monitoring and feedback are a widely used strategy to induce behavioral change in professional practice (Ivers et al., 2012). For example, learning from the registration of seclusion by means of monitoring and feedback is one of the six core strategies to reduce seclusion (National Association of State Mental Health Program Directors [NASMHPD], 2008). This strategy can contribute to a reduced duration and frequency of seclusion (e.g., Azeem et al., 2011; Caldwell et al., 2014; Wisdom et al., 2015). Therefore, it was expected that the implementation of monitoring and feedback as a seclusion reduction intervention may contribute to a reduced frequency and duration of seclusion. Changes in the type of room used for seclusion and reason for the use of seclusion were examined, since the use of a broad conceptualization of seclusion was novel and there has not been any research about change in these elements after the implementation of monitoring and feedback as a seclusion reduction intervention so far.

**Methods**

**Seclusion reduction intervention**

This study used monitoring and feedback as a seclusion reduction intervention. The first step in implementing this intervention was to develop a uniform registration system that enabled monitoring the use of seclusion at a national
level. At the start of the research project, all locations for secure residential youth care in the Netherlands used their own electronic health record system to register seclusion. These systems differed from each other, which hindered monitoring change in the use of seclusion at a national level. Therefore, a uniform registration system for seclusion was developed and implemented in all locations for secure residential youth care in the Netherlands. Staff members that worked on the treatment groups of locations for secure residential youth care in the Netherlands registered the seclusions that occurred in practice in the uniform registration system. The definition of seclusion developed by Van Dorp et al. (2021) was followed for this purpose. Further, all locations were contacted and asked to nominate at least one professional within their location as a contact person for the data collection of this research project within their location. The contact persons were responsible for the collection of both the registered seclusions and data about the average amount of children and adolescents in care within their location. Contact persons of each participating location completely anonymized the data (registered seclusions and the average amount of children and adolescents in care) and sent it in a secure way to the researchers on a monthly basis. This process allowed the researchers to monitor and provide feedback on the use of seclusion at both national and location levels in a uniform way.

During the research project, feedback was provided in two ways: at national level and at location level. The use of seclusion at a national level was presented at a meeting that took place every six weeks during the course of the research project. In those meetings, all ambassadors of all locations for secure residential youth care in the Netherlands were present (every location had to nominate one professional that was responsible for the implementation of the research project within their location). Feedback on the use of seclusion at location level was sent out to the specific locations. All locations for secure residential youth care received a monthly report of the use of seclusion within their location. Ambassadors and contact persons of each location were responsible for distributing the monthly reports within their location. Researchers encouraged ambassadors and contact persons to share the monthly reports in staff meetings and to display them within the treatment groups. In addition, the researchers visited each location once during the course of the research project to present the use of seclusion in that specific location so far.

**Data collection and participants**

Institutional Review Board approval for this research project was obtained through the Amsterdam University Medical Center (reference number: 2020.148). All locations for secure residential youth care in the Netherlands participated in the data collection. Data were collected during two periods that both lasted six months. Period 1 lasted from October 1, 2019 to March 31,
2020. Period 2 lasted from September 1, 2020 to February 28, 2021. The time between these two periods was used to evaluate the implementation of monitoring and feedback as a seclusion reduction intervention. During this evaluation period, locations were encouraged to continue monitoring and provide feedback to themselves. Period 2 was then used to restimulate all locations to continuously use monitoring and feedback as a seclusion reduction intervention.

A total of 1,356 children and adolescents were placed in secure residential youth care in the Netherlands during period 1 and period 2. Most of these children and adolescents were between 15 and 16 years of age (51.3%). Most of them were boys (61.0%). The average length of stay was six months. Children and adolescents were aware of data collection. At the start of treatment, all children, adolescents, and their parents or caretakers were informed about the fact that clinical data of children and adolescents could be used for research purposes. Children, adolescents, and their parents or caretakers had the possibility to object to data collection for research purposes. If they objected, they communicated this to the location the child or adolescent received treatment. The location took notice of this fact and ensured that clinical data of that specific child or adolescent was not used for research purposes.

The number of children and adolescents included in this study and their characteristics (gender, age, length of stay) mentioned above is an estimation. Due to the European General Data Protection Regulation (General Data Protection Regulation, 2016), locations for secure residential youth care were only able to provide completely anonymized data of persons who did not object to the use of their clinical data for research purposes. The researchers were not informed about how many children and adolescents objected to data collection for research purposes. Therefore, the number of children and adolescents included in this study could have been lower than the 1,356 mentioned above. Also, it is not exactly clear if and how many children and adolescents were placed in secure residential youth care during both period 1 and period 2. It is expected that there might have been some overlap between children and adolescents placed in secure residential youth care during period 1 and period 2, because the average length of stay in secure residential youth care was six months and the time period between period 1 and period 2 was six months.

Variables

Based on the aim of the present study, the following variables from the uniform registration system were selected for closer examination: frequency (amount of seclusions per location per month), duration (time in minutes), room used for seclusion, and reason for the use of seclusion. Duration of seclusion was calculated using the variables start and end date, and start and end time from the uniform registration system. Room used for seclusion was
divided into three categories, which can be used in an ascending order. From least to most invasive, these were: bedroom of the child or adolescent, other type of room (a room or area that is specifically designed to remove the child or adolescent from a situation and allow the child or adolescent the opportunity to regain control, such as a time-out room or chill-out room), and seclusion room (an austere room where most outside stimuli is eliminated). Reason for the use of seclusion was divided into six categories: aggression (threatening with or acting aggressive or violent (either verbally or physically) toward others or others’ belongings); disrupting order or not abiding the rules (e.g., possession of contraband, absence during the daily program, (attempt to) running away); self-injurious behavior (threatening with or attempting to harm oneself or commit suicide); limited capacity of staff (e.g., due to one-on-one guidance of another child or adolescent, staff offering support at a crisis situation at another treatment group), time-out (an interruption of a situation to allow the child or adolescent the opportunity to regain control); and other (e.g., disrespectful behavior toward others, sexually transgressive behavior). Because the latter three categories of reason for the use of seclusion (i.e., limited capacity of staff, time-out, and other) were seldom used, these were not taken into account in this study.

Statistical analyses

Negative binomial mixed model analyses were used to investigate change in frequency and duration of seclusion. This approach was chosen because (1) the negative binomial model accounts for a unique distribution of the count data (i.e., with overdispersion) and (2) the mixed model takes into account the dependency of the repeated observations within the different locations. Since the frequency of seclusion could be influenced by the average amount of children and adolescents in care per location per month, this was controlled for in the analyses. Further, mixed model analysis controls for a categorical variable with many categories (i.e., site) by adding a random intercept to the model. The random intercept included the variance in outcome between the sites. Rate ratios (RRs) and 95% confidence intervals (CIs) were reported. Next, logistic mixed model analyses were used to investigate change in the type of room used for seclusion and the reason for the use of seclusion. Logistic regression analyses were chosen over the use of a multinomial regression analysis because of three reasons: (1) the dichotomous nature of the dependent variables, (2) multinomial logistic multilevel analyses often do not converge, and (3) results obtained from a multinomial regression analysis are comparable to results obtained from multiple logistic regression analyses performed on the same data, which allows for interchangeable use of both methods. Odds ratios (ORs) and 95% CIs were reported. Statistical significance was set at ≤.05. The analyses were performed using Stata (version 15).
The analyses were run to investigate change over time in two ways: (1) change in consecutive months, and (2) difference between the two time periods (period 1 and period 2). The two approaches are complementary. The first approach was in line with providing all locations feedback on a monthly basis. The change in consecutive months is estimated by analyzing the linear relationship between the particular outcome and month of measurement. Because data were available for two periods of six months (October 1, 2019 to March 31, 2020 and September 1, 2020 to February 28, 2021), the data included month 1 (October, 2019) to 6 (March, 2020) and month 12 (September 2020) to 17 (February, 2021). Month 7 (April, 2020) to 11 (August, 2020) are considered missing. Regarding the difference between period 1 and period 2, two analyses were performed: (1) an analysis comparing the “average” value of period 1 with the “average” value of period 2, and (2) an analysis comparing the change over time (i.e., the slope) in period 1 with the change over time (i.e., the slope) in period 2. For the latter, an interaction between month and period was added to the regression model.

**Data management**

It is important to note that the analyses were performed over all registered seclusions in all locations for secure residential youth care combined. During data collection, two locations for secure residential youth care were closed. At the start of period 1, all 19 locations for secure residential youth care in the Netherlands participated in the data collection. After three months, one location was closed. Due to closure of this location, 18 locations participated in the data collection at the start of period 2. During period 2, another location was closed after four months of participating in the data collection. Data collected in these two locations were retained in the analyses, because all registered seclusions in all locations – whether these locations were closed at some point in time or not – provided information about the use of seclusion in practice and were therefore valuable. The analyses used make it possible to retain all locations at both time periods, because mixed model analyses are able to handle missing data. In this case, the location missing during period 2 was missing data.

**Results**

**Change in consecutive months**

**Frequency of seclusion**

A total of 6,188 seclusions were registered during this study. Due to technical issues, some of the locations were not always able to register how many children and adolescents were involved in the seclusions registered. This concerned a total of 475 seclusions. In the remaining 5,713 seclusions, 1,194 children and adolescents were involved. This means that during this study,
1,194 children and adolescents were secluded once or more often (range: 1–85, M = 4.78). The frequency of seclusion significantly decreased with a factor of 0.92 in every consecutive month (RR = 0.92, p < .001, 95% CI [0.90, 0.94]).

Duration of seclusion
During this study, duration of seclusion ranged from 1 to 1,439 minutes with a mean duration of 137 minutes (SD = 236, Median = 30). Analyzing all registered seclusions (i.e., regardless of the room used for seclusion or reason for the use of seclusion), the results of the negative binomial mixed model analysis indicated that seclusion duration did not change significantly (RR = 0.99; p = .231, 95% CI [0.98, 1.00]). This means that in every consecutive month, there was no significant change in the duration of seclusion.

Room Used for seclusion
How often a seclusion room (OR = 1.00, p = .654, 95% CI [0.99, 1.02]) or other type of room (OR = 0.99, p = .182, 95% CI [0.97, 1.01]) was used for seclusion compared to the use of the bedroom of the child or adolescent did not change significantly. However, in every consecutive month, a significant increase was found in the use of a seclusion room compared to other type of room (OR = 1.05, p = .002, 95% CI [1.02, 1.09]). Closer examination of the use of a seclusion room specifically showed that duration of seclusion in a seclusion room significantly increased with a factor of 1.04 in every consecutive month (RR = 1.04, p < .001, 95% CI [1.02, 1.06]).

Reason for the use of seclusion
Duration of seclusion in response to self-injurious behavior significantly decreased with a factor of 0.95 in every consecutive month (RR = 0.95, p = .001, 95% CI [0.92, 0.98]). There were no significant changes in duration of seclusion in response to aggression (RR = 1.00, p = .451, 95% CI [0.99, 1.02]) or disrupting order or not abiding the rules (RR = 1.00, p = .933, 95% CI [0.99, 1.01]). Closer examination of the use of a seclusion room specifically, showed that duration of seclusion in response to aggression significantly increased with a factor of 1.06 in every consecutive month (RR = 1.06, p < .001, 95% CI [1.04, 1.08]). There were no significant changes in duration of seclusion in a seclusion room in response to self-injurious behavior (RR = 0.97, p = .272, 95% CI [0.93, 1.02]) or disrupting order or not abiding the rules (RR = 0.98, p = .388, 95% CI [0.94, 1.03]).

Difference between two time periods
Frequency of seclusion
In period 1, 19 locations registered a total of 4,575 seclusions. In period 2, 18 locations registered a total of 1,613 seclusions. Controlling for the average amount of children and adolescents in care per location per month, this equals
a decrease of 60.93% between period 1 and 2. Compared to period 1, the frequency of seclusion was significantly lower in period 2 (RR = 0.38, *p* < .001, 95% CI [0.30, 0.47]). The slope of the decrease in seclusion frequency was not significantly different for period 1 and 2 (*p* = .752).

**Duration of seclusion**

In period 1, duration of seclusion ranged from 1 to 1,439 minutes with a mean duration of 131 minutes (SD = 232, Median = 30). In period 2, duration of seclusion ranged from 5 to 1,439 minutes with a mean duration of 149 minutes (SD = 242, Median = 45). Compared to period 1, duration of seclusion significantly decreased with a factor of 0.91 in period 2 (RR = 0.91, *p* = .046, 95% CI [0.85, 0.99]). The slope of the decrease in duration was not significantly different for period 1 and 2 (*p* = .323).

**Room Used for seclusion**

The ratio between the use of the bedroom of the child or adolescent and other type of room (OR = 0.96, *p* = .722, 95% CI [0.76, 1.21]), and the ratio between the use of the bedroom of the child or adolescent and a seclusion room (OR = 1.00, *p* = .975, 95% CI [0.81, 1.24]) did not differ significantly between period 1 and 2. However, the ratio between the use of a seclusion room and other type of room did differ significantly between period 1 and 2 (OR = 1.55, *p* = .027, 95% CI [1.05, 2.28]). The slope of this change was not significantly different between period 1 and 2 (*p* = .157). Moreover, comparing period 1 and 2, duration of seclusion in a seclusion room in period 2 was 1.34 times that of period 1 (*p* = .009, 95% CI [1.07, 1.67]). The slope of the increase in duration in this type of room did not significantly differ between period 1 and 2 (*p* = .083).

**Reason for the use of seclusion**

The results of the logistic regression analyses indicated that duration of seclusion in response to aggression (*p* = .192) or disrupting order or not abiding the rules (*p* = .281) did not differ significantly between period 1 and 2. However, duration of seclusion in response to self-injurious behavior in period 2 was 0.51 times that of period 1 (*p* < .001, 95% CI [0.37, 0.71]). Closer examination of the use of a seclusion room in relation to the reason for the use of seclusion specifically, led to the following results. When children or adolescents were placed in a seclusion room in response to aggression, this seclusion lasted significantly longer in period 2 than in period 1 (RR = 1.93, *p* < .001, 95% CI [1.45, 2.56]). Duration of seclusion in a seclusion room in response to disrupting order or not abiding the rules (*p* = .107) or self-injurious behavior (*p* = .252) did not differ significantly between period 1 and 2.
Discussion

This study set out with the aim of assessing change over time in the use of seclusion in secure residential youth care in the Netherlands by implementing monitoring and feedback as a seclusion reduction intervention. The results demonstrate a significant decrease in the frequency of seclusion over time, both when analyzing change in consecutive months and when analyzing the difference between the two time periods. This seems consistent with previous findings that implementation of continuous monitoring and feedback might contribute to a decrease in seclusion frequency (Altrows & Alberts, 1990; Azeem et al., 2011; Caldwell et al., 2014; National Association of State Mental Health Program Directors [NASMHPD], 2008). Other studies that have implemented monitoring and feedback as one of multiple strategies to reduce seclusion have reached a seclusion reduction rate between 62% and 85% (Caldwell et al., 2014; Wisdom et al., 2015). In this study, the seclusion reduction rate of 60.93% was on the lower end of that spectrum. However, no overall change in the duration of seclusion was found when analyzing change in consecutive months. This outcome is contrary to that of earlier research in which the implementation of a seclusion reduction intervention led to a decrease in the duration of seclusion (Eblin, 2019; De Hert et al., 2011). Duration of seclusion did significantly decrease when analyzing the difference between the two time periods, yet this result just reached statistical significance.

A possible explanation for the results regarding the frequency and duration of seclusion may be the focus of the research project on the implementation of only one of multiple strategies that are known to reduce the use of seclusion. In this study, all locations for secure residential youth care were explicitly asked to implement one of the six core strategies: use of data (i.e., monitoring and feedback) to inform practice (National Association of State Mental Health Program Directors [NASMHPD], 2008). However, some locations decided to implement additional strategies to reduce seclusion. This occurred on their own initiative and was not the case in all locations. Studies with a higher seclusion reduction rate implemented multiple or all six core strategies (Azeem et al., 2011; Caldwell et al., 2014; Wisdom et al., 2015). In addition, the study by Eblin (2019) showed that the use of a multi-tiered intervention strategy led to a successful reduction in the duration of seclusion. Thus, it is expected that the implementation of multiple seclusion reduction strategies would have led to a higher reduction rate in both the frequency and duration of seclusion in this research project. As such, another possible explanation may lie in the variation per location. In this study, 19 locations for secure residential youth care in the Netherlands participated. Although all locations collectively used the same broad conceptualization of seclusion and way to register its use, there also were differences between locations. For example,
locations differed in how much (continuous) effort was put into the implementation of monitoring and feedback and implemented or started implementing some of the other six core strategies to reduce seclusion (e.g., organizational change, workforce development, use of prevention tools) during the research project. In addition, the evaluation period between period 1 and period 2 could have impacted the results as well. Although locations were encouraged to continue the monitoring and feedback-process themselves, not all locations might have done so. Indeed, some locations had to put in more effort than other locations to start monitoring and feedback again in period 2. Therefore, variety between locations on these aspects may have led to a variety in reduction rates between locations, which in turn could have influenced the overall reduction rates.

To our knowledge, this was the first study to use a broad conceptualization of seclusion to investigate seclusion reduction. Using a broad conceptualization of seclusion has the advantage that it enables investigating reduction in different types of seclusion. This led to two clinically relevant findings, both when analyzing change in consecutive months and when analyzing the difference between the two time periods. First, the results showed a decreased duration in seclusion in response to self-injurious behavior over time. A possible explanation for this result may be that locations for secure residential youth care became more successful in offering adequate support in case of self-injurious behavior over time. Self-injurious behavior might still lead to seclusion, but by offering adequate support during seclusion, the child or adolescent might need less time to return to a calm state. This could have led to a shorter duration of such seclusions. Another possible explanation lies in the fact that, during this research project, new research projects have been initiated that aimed at a reduction of suicide and self-injurious behavior in secure residential youth care. Attention for this topic through other research projects could have encouraged locations to prevent suicide and self-injurious behavior, and to provide better care in case of seclusion (e.g., shorter duration of seclusion). A second clinically relevant finding was the increased duration of placement in a seclusion room. Duration of placement in this room increased if the reason for seclusion was aggression. An explanation for this finding could be that locations for secure residential youth care became more successful in preventing the use of seclusion in the case of mild aggressive behavior. However, in the case of severe aggression, staff might not have always been able to prevent the use of seclusion in a seclusion room. In such cases, placement in a seclusion room might have a longer duration. This might explain the increased duration of placement in a seclusion room over time.

Over the course of this study, a total of 6,188 seclusions were registered. This number deviates from what is typically seen across residential treatment centers for youth (e.g., DosReis et al., 2010; De Hert et al., 2011). In these settings, the amount of registered seclusions is lower than the amount of registered seclusions
in this study. An explanation can be found in the definition used to register seclusion. The broad conceptualization of seclusion used in this study highlights that seclusion can take many forms: from a time-out in the bedroom of the child or adolescent with an open door to a placement in a seclusion room with a closed door. In other studies, a more narrow definition of seclusion was used. As is to be expected, using a broad definition of seclusion to monitor its use more likely generates a higher number of seclusions than using a narrower definition of seclusion. On the contrary, compared to a more recent study which also used a broad definition (Matte-Landry & Collin-Vézina, 2020), the amount of seclusions registered in our study is lower. In the study by Matte-Landry and Collin-Vézina (2020), p. 4,046 seclusions and time-outs were registered over a period of 6 months among 324 children and youth. In our study, a total of 6,188 seclusions (time-outs are included in this number) were registered over a total period of 12 months among approximately 1,356 children and adolescents. Altogether, this shows that precise comparisons are difficult due to differences between residential treatment centers for children and adolescents (e.g., differences in the definition used, and in legislations and policies with regard to such centers).

**Clinical implications**

Locations for secure residential youth care in the Netherlands are well on the way to reducing the use of seclusion. Still, there is room for improvement and meaningful change is needed. All locations for secure residential youth care should actively and continuously invest time and effort in the implementation of a multi-tiered intervention strategy – such as the evidence-based six core strategies (National Association of State Mental Health Program Directors [NASMHPD], 2008) – aimed at the reduction of seclusion. As mentioned earlier, a seclusion reduction intervention that consists of multiple strategies seems to lead to a higher reduction rate in the frequency and duration of seclusion than the implementation of only one reduction intervention strategy. Additionally, learning should remain a central theme in seclusion reduction. This can be stimulated by continuous monitoring using a broad conceptualization of seclusion. Knowledge about different types of seclusion and how a multi-tiered intervention strategy to reduce seclusion influences the use of these different types in practice can enhance the learning process. For instance, locations may reflect on the following issue: are certain types of seclusion – such as seclusion in response to severe aggression – more difficult to reduce than others, and if so, how can we further prevent the use of such seclusions? Reflection on reducing the use of seclusion can be beneficial for both the location itself as for other locations within the field. It may provide insight in which reduction intervention strategies work best, how to successfully implement multi-tiered intervention strategies and what may help to prevent the use of seclusion in complicated cases. This requires locations to be vulnerable and
open about the current situation in their location, their ambition in seclusion reduction and the challenges they struggle with along the way. Therefore, open discussion and room for reflection on the use of different types of seclusion within and between locations for secure residential youth care are necessary.

**Suggestions for future research**

There is abundant room for further research on how multi-tiered intervention strategies influence the use of seclusion in secure residential youth care. In that regard, using a broad conceptualization of seclusion to monitor and provide feedback on change in seclusion reduction can be advantageous. Not only can it provide information about the frequency and duration of seclusion, it can also give insight in changes in the type of room used and reason for the use of seclusion. Such information can stimulate and enhance conversations about what can be learned from the different types of seclusion; why one type might be easier reduced than others; and which types of seclusion especially deserve attention in the next step toward realizing reduction. In practice, the use of seclusion is not straightforward, but rather a gray area. Recent literature is also starting to acknowledge seclusion as a continuum of restrictive interventions, including time-outs (Matte-Landry & Collin-Vézina, 2020) and as a restrictive intervention that is used for a large variety of reasons (Engström et al., 2020; De Valk et al., 2019). Future research should adhere to this movement and consider taking into account a broad conceptualization of seclusion when investigating the reduction of its use. For instance, further studies are needed to investigate the influence of multi-tiered intervention strategies on the reduction of seclusion. In such studies, the focus should not only lie on the frequency and duration of seclusion, but also on different types of seclusion (e.g., room used for seclusion and reason for the use of seclusion).

Next to using a broad conceptualization of seclusion, future research aimed at investigating the impact of a seclusion reduction intervention should also focus on potentially relevant confounders. Including potentially relevant factors as interaction terms in statistical models would lead to a better understanding of the influence of a seclusion reduction intervention. In this study, the focus lied on creating an overview of the change in the amount and types of seclusion used in secure residential youth care in the Netherlands due to monitoring and feedback as a reduction intervention. Confounders were not taken into account. However, research has shown that situational factors (e.g., duration of admission, periods of the day), youth characteristics (e.g., gender, age, ethnicity), and organizational factors (e.g., communication and openness, perceived team climate) can influence the use of seclusion (DosReis et al., 2010; Geoffrion et al., 2021; Matte-Landry & Collin-Vézina, 2020; Roy et al., 2021, 2020). Therefore, it is important to
include such factors in statistical models. Furthermore, it would be interesting to investigate what percentage of staff members used seclusion and how this differs between locations for secure residential youth care. This can provide valuable starting points for locations to reduce the use of seclusion by, for instance, training and informing staff members, and using debriefing techniques. Studies have shown that training staff members and using debriefing techniques can contribute to a reduction in seclusion use (Black et al., 2020; Caldwell et al., 2014; Eblin, 2019; National Association of State Mental Health Program Directors [NASMHPD], 2008).

**Limitations**

This study is subject to four main limitations. First, the validity of the data depended on the efforts of locations to implement monitoring and feedback as a seclusion reduction intervention. Although all locations for secure residential youth care embraced the use of a broad conceptualization of seclusion and monitoring its use, locations differed in how much time and effort was spent on the implementation process. For instance, some locations may have spent more time and effort informing and training staff in using the new registration format than others. This could have influenced the quality of registrations made by staff. As a result, the use of (different types of) seclusion may have been underestimated in some locations. Secondly, the internal validity of the study might be limited. Although it is expected that the observed results were mainly due to the implementation of monitoring and feedback, the influence of fluctuations over time (e.g., time and effort spent on implementation of monitoring and feedback, changes in youth across the two time periods, unclear if there was overlap in children and adolescents between period 1 and period 2) were not taken into account and could have had an impact on the results. The third limitation is the exclusion of analyses on differences in seclusion reduction between locations. Although this study controlled for the average amount of children and adolescents in care per location per month, other differences between locations (e.g., time and effort spent on the implementation process, implementation of various other seclusion reduction interventions) and a small amount of registrations in some locations (e.g., due to a low average amount of children and adolescents in care) made it impossible to execute such analyses with reliable results. It is recommended to take such aspects into consideration in future research. For instance, this could be done using an intraclass correlation coefficient or by monitoring for a longer period of time leading to a higher amount of registrations in all locations. Last, staff were able to register two reasons for the use of seclusion in period 1, whereas staff could only register one reason for the use of seclusion in period 2. In order to analyze change in this variable over time, it was decided to only retain the first reason for the use of seclusion registered by staff in period 1. Despite
these limitations, this was the only and best data available about the reduction of seclusion in secure residential youth care in the Netherlands. This data provided an important advantage, notably insights that went beyond the frequency and duration of seclusion: it also provided insight in the changes in different types of seclusion over time.

**Conclusion**

The results of this study show a significant decrease in the use of seclusion in secure residential youth care in the Netherlands over time. However, the duration of placement in a seclusion room in response to aggression has risen. This calls for immediate change in secure residential youth care. Locations for secure residential youth care should invest in the implementation of evidence based, multi-tiered intervention strategies to further reduce the use of seclusion. Moreover, there is a clear need for transparency in the use of different types of seclusion (both in practice and in international literature), and open discussion and reflection about how to (further) reduce different types of seclusion. Future research should focus on evidence-based methods to further reduce seclusion in secure residential youth care. In these studies, a broad conceptualization of seclusion and potentially relevant confounders should be taken into account when studying the impact of seclusion reduction interventions. Since both youth and staff consider some types of seclusion as more restrictive than others, it is not only the frequency rates and duration, but also the type of seclusion that counts.

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