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Original Article

"How do you sleep?" sleep in self-figure drawings of young adolescents in residential care facilities—An exploratory study

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ABSTRACT

Objective: Children and adolescents who are referred to residential care facilities (RCFs) have a history of neglect, abuse, or other familial or environmental deficiencies, all of which may contribute to a higher risk of sleep problems. The purpose of this study was to explore sleep patterns of young adolescents living in RCFs and to examine whether these patterns are reflected in their self-figure drawings and accompanying narrative descriptions.

Method: The study compared quantitative subjective (self-report) and objective (actigraphy) measurements of sleep patterns in young adolescents living in RCFs ($n = 26$) and at home ($n = 33$), and explored a quantitative indicators analysis of "self-figure drawing while sleeping" and qualitative analysis of accompanying narrative descriptions.

Results: Adolescents in RCFs went to bed at least an hour earlier and woke up at least half an hour earlier than their home-residing counterparts ($p < 0.001$). Based on actigraphy, their sleep duration and sleep latency were longer ($p < 0.01$). They frequently drew themselves in a closed boundary, viewed from above, and used monochromatic colors. Analysis of the narratives revealed themes of *exclusion*, which reflect the need to exclude oneself from threatening and anxiety-provoking experiences.

Conclusions: Adolescents in RCFs take longer to fall asleep; however, imposed early sleep schedules in RCFs enable good sleep hygiene practices that allow for longer sleep duration compared with home-residing peers and can prevent additional sleep problems. The need for protection and a sense of security emerged from the drawings and the accompanying narratives.

1. Introduction

Sleep problems are common among adolescents and are often comorbid with emotional, behavioral, and developmental issues [1-3]. Changes in sleep patterns during adolescence, including delayed sleep phase, irregular sleep patterns, and reduced sleep duration [4], have been associated with daytime functional issues such as daytime sleepiness, poor mood, and reduced behavioral and emotional control [2,3,5]. Notably, the associations between sleep and emotional regulation are considered to be bi-directional [5].

Adolescents who are removed from their homes to residential care facilities (RCFs), supervised by the Ministry of Welfare in Israel, often have a history of neglect, abuse, or other familial or environmental problems [6]. These circumstances may have a significant and lasting impact on their developmental, emotional, and behavioral state [7], all of which may contribute to the development of disturbed sleep patterns or exacerbate existing sleep difficulties [2,7].

Sleep patterns and disorders among children and adolescents in RCFs have rarely been investigated [8-10]. In a study on sleep patterns in children and adolescents in RCFs in Egypt, sleep problems were commonly reported by caregivers [8]. Results of a Canadian study showed that more than 41% of adolescents living in RCFs reported insomnia symptoms, and 21% met the diagnostic criteria for insomnia [9]. Moreover, those adolescents who experienced insomnia symptoms more frequently demonstrated depressive symptoms and negative daytime consequences [9]. However, both studies were based on subjective caregiver, parental,

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or self-reports and did not compare sleep and related measures in home-residing adolescents [8,9].

Self-figure drawings are widely used as a projective and diagnostic measurement tool [11-13]. This tool is particularly useful in children who have experienced trauma and depravity, and it provides insights into subjective experiences that are less obtainable through verbal discourse [13]. In addition to self-expression, drawings provide rich information about a child's perception of him-/herself and his/her close environment. This unique tool was used in a variety of studies investigating child abuse [13,14]. In a study that examined family drawings of children who were molested, human figures were corrupted, included fewer details, and generally showed more signs of stress and trauma, compared with drawings of normative children in the control group [14].

Studies on sleep patterns and disturbances in adolescents have largely used objective sleep measurements (eg, Refs. [15-17]), and verbal self-report surveys (eg, Refs. [18,19]). To the best of our knowledge, the use of self-drawings to diagnose sleep problems has yet to be reported. One study examined expressions of problems associated with pediatric Restless Leg Syndrome in children's drawings [20]. The study showed that drawing helped children talk about their symptoms and about how symptoms affected their feelings and daily experiences [20].

The present study introduces a novel drawing assessment tool, in which young adolescents were asked to draw themselves sleeping and to provide a narrative for the drawing. The purpose of this study was to compare well-validated subjective and objective quantitative sleep measurements as well as "self-figure while sleeping" drawings and narratives, in young adolescents living in RCFs with adolescents living at home. We hypothesized that sleep patterns are more structured yet more disturbed in adolescents in RCFs than in their home-residing counterparts.

2. Methods and materials

2.1. Study design

This cross-sectional study compared young male and female adolescents, ages 10–12 years, in RCFs (n = 26) with adolescents living at home (n = 33).

2.2. Participants

Participants were recruited by cluster sampling from a number of RCFs for the study group, and by snowball sampling for the control group. In the research group, administrators and social workers in the RCFs assisted with recruitment. After locating young adolescents who were eligible to participate based on inclusion and exclusion criteria (see below), social workers sought to obtain parental (or legal guardian) and adolescent written informed consent, based on the requirements of the ethics committees and following full disclosure of the study objectives and methods. For the control group, advertisements describing the study topic and its methods were posted on social media. Volunteers contacted the investigator by phone or email, and they were encouraged to pass on the information to friends by word of mouth. The inclusion criteria called for generally healthy, Hebrew-speaking male and female adolescents, ages 10–12 years, in the fifth and sixth grades. Participants were excluded if they had a chronic illness or were previously diagnosed with or suspected of any sleep disturbance. A diagnosis of attention-deficit/hyperactivity disorder (ADHD) was not an exclusion criterion but was included as a covariant in the statistical analysis. The study group included adolescents who had been removed from home by court order and were residing in RCFs under the supervision of the Ministry of Welfare. Since it is reasonable to expect a high rate of sleep problems during the initial transition to the RCF due to adjustment issues, adolescents residing in the RCF for less than six months were excluded from participation.

2.3. Tools

The School Sleep Habits Survey (SSHS) [19] includes demographic data, sleep patterns for weekends and weekdays, and daytime functioning scales, recorded over the previous two weeks. The questionnaire was translated and adapted for use with adolescents in Israel [18]. In the present study, we report data regarding nightly sleep patterns on weekdays and weekends, including bedtime, wake time, sleep latency, and sleep duration.

The actigraph (Ambulatory Monitoring, Inc.) is a wrist-worn watch-like accelerometry device that monitors activity and rest based on body movement. The device translates body movement to epochs of sleep and wakefulness with an accuracy of 90% compared to a polysomnographic examination of the electrophysiological recording of sleep [16]. It provides objective information about sleep patterns including sleep timing (bed- and wake times), sleep latency, sleep duration, and sleep efficiency.

Participants were also asked to draw themselves asleep ("self-figure while sleeping" drawing). Five indicators were examined in each drawing, based on a phenomenological investigational approach based on art therapists' review; the review did not include interpretation but rather determined whether these indicators existed in the drawings or not. An observation chart was constructed in which the indicators were chosen and defined based on studies in the literature suggesting their significance to understanding adolescents' experience of sleep (vide.: [21-23]). Selected indicators were scored on a dichotomous scale ("yes/no"), with the exception of "size of figure", which was scored on a continuous scale: (1) **A peaceful facial expression,** that symbolizes positive self-perception [22]; (2) **Size of figure**, measured as length times width of the character in centimeters squared, that reflects the subject's perception about his/her place and attitude towards the environment, as well as the importance and value that he/she attributes to the figure [24] (3) **Monochrome**, or the use of monochromatic (vs. polychromatic); colors. The choice of colors expresses the subject's feelings and is influenced by his/her feeling towards the image [21,25]; (4) **The presence of other people**, or whether the figure is isolated or surrounded by accessories or others, indicates the lack of personal space [26]; and (5) **Boundary**, or whether the figure is enclosed in a full and comprehensive border, symbolizes fear from which subject needs protection [27]. In addition to the quantitative indicators analysis of the "self-figure while sleeping" drawings, qualitative thematic analysis of the accompanying narratives was performed.

2.4. Procedure

Approval was obtained from the ethics committees in the Israel Ministry of Welfare and the Faculty of Social Welfare and Health Sciences at the University of Haifa (confirmation number: 157/13). Participants received an activity monitor (actigraph) and wore it on their non-dominant wrist for one full week. In the presence of the researcher (NR), who is a trained art therapist, each participant completed the SSHS questionnaire with no time limit, and afterward, was asked to draw him-/herself asleep and to describe the drawing. The narratives were written down by the researcher. The drawing sessions were held in a quiet room with one parent or a caregiver. Parents and caregivers remained present during the completion of the questionnaires, to help participants assess their bedtime schedule more accurately and to allow participants to feel

more secure and comfortable in the presence of the investigator. Although parents/caregivers remained in the room during the drawing session, they did not actively participate. Each session took between 15 and 30 min.

2.5. Statistical analyses

The study combines quantitative measurements for investigating sleep patterns and problems, a quantitative analysis of the drawings, and qualitative methods to analyze the accompanying narratives. Actigraphy data were downloaded and processed with ActionW software (Ambulatory Monitoring, Inc.). All statistical analyses employed the SPSS statistical package. Differences in the demographic variables were examined using chi-square tests of independence for the categorical variables and an independent *t*-test for the age variable. Group differences in sleep patterns were examined using multivariate analysis of covariance (MANCOVA), controlling for ADHD; group differences in the drawing analysis were examined using chi-square tests of independence. After identifying two distinct drawing indicators in the drawing analysis (see results), we conducted MANOVA to assess objective and subjective sleep measures by indicators (present/absent).

The narratives that accompanied the drawings were analyzed based on qualitative research methods using a cross-axial coding technique, in which investigators analyze quotes from all of the narratives, and identify common or distinctive themes within and between study groups. To increase the validity of the analysis, this was performed by two independent raters.

3. Results

3.1. Sample description

The sample included 59 participants, ages 10–12 years (M = 11.28, SD = 0.71), of whom 26 lived in RCFs, and 33 lived at home. The study group included 15 boys and 11 girls. The control group included 19 boys and 14 girls. No group difference was found for gender (p = 0.99). Four participants from the study group and one participant from the control group did not wear the actigraph, and thus actigraphy data included 54 participants in total. 57.7% of the study group and 30.3% of the control group (p = 0.03) were diagnosed with ADHD. 50% of the study group and 9.1% of the control group (p = 0.001) were taking medication for ADHD. Further analyses controlled for ADHD diagnosis (by entering it as a co-variant) but not for ADHD medication use, due to co-linearity between the two variables. Table 1 presents demographic characteristics.

Table 1
Comparison of demographic and clinical characteristics of the research (RCF) and control (home) groups.

Variable and values	Distribution (%)		Comparison	
	RCF (n = 26)	Home (n = 33)	Df	χ^2
Gender			1	0.001
Boys	57.7	57.6		
Girls	42.3	42.4		
ADHD			1	4.47*
Yes	57.7	30.3		
No	42.3	69.7		
ADHD Medication			1	12.31*
Yes	50	9.1		
No	50	90.9		
Age	11.42 (SD = 0.71)	11.18 (SD = 0.70)	57	*t* = 1.29

*p < 0.05.

3.2. Sleep

Based on self-report (SSHS), group differences were found for bedtime [F (1,56) = 45.74, p = 0.001], wake time [F (1,56) = 19.45, p = 0.001], and sleep duration [F (1,56) = 4.67, p = 0.03] in weekday reports, and for bedtime [F (1,56) = 25.31, p = 0.001] and wake time [F (1,56) = 14.93, p = 0.001] in weekend reports. Compared with the home-residing group, the RCF group went to bed an hour earlier on weekdays and an hour and 10 min earlier on weekends; they woke up half an hour earlier on weekdays and an hour and 20 min earlier on weekends; they slept more than half an hour longer on weekdays. No differences were found in sleep latency (Table 2). Based on actigraphy, main effects were found for bedtime [F (1,51) = 64.19, p < 0.001], wake time [F (1,51) = 22.09, p < 0.001], sleep duration [F (1,51) = 16.57, p < 0.001], and sleep latency [F (1,51) = 12.98, p < 0.001] (Table 3). Compared with young adolescents living at home, adolescents living in RCFs went to bed over an hour earlier and woke up almost 40 min earlier; they slept half an hour longer and took nearly 15 min longer to fall asleep (see examples in Fig. 1). No differences were found in sleep efficiency.

3.3. Drawing analysis

Drawing analysis demonstrated significant group differences in two indicators: closed boundary and monochrome. Compared with home-residing adolescents, young adolescents in RCFs framed their sleeping figure inside a closed boundary viewed from above more frequently (48.5% vs. 88%, respectively, p = 0.002) and were more prone to use monochromatic colors (45.5% vs. 72%, respectively, p = 0.04) (see examples in Fig. 2). No other differences were found in any of the other indicators (Table 4).

3.4. Drawing indicators and sleep measures

After identifying two drawing indicators that differed by group, we assessed whether these indicators distinguished between specific sleep characteristics, using MANOVA (Table 5). For actigraphy-based sleep measures, multivariate tests showed no main effects for boundary [F (1,42) = 1.83, n.s, Eta^2 = 0.19]. However, univariate tests showed that some sleep characteristics were found significant or close to significance: wake after sleep onset [F (1,42) = 4.10, p = 0.05, Eta^2 = 0.09], sleep duration [F (1,42) = 3.73, p = 0.06, Eta^2 = 0.08] and sleep efficiency [F (1,42) = 3.26, p = 0.08, Eta^2 = 0.07]. Young adolescents who drew themselves in a closed boundary spent more minutes awake, slept longer, and their sleep was less efficient, compared to those who drew themselves without

Table 2
Differences in self-reported sleep patterns (SSHS) between study groups (RCF, Home) by MANCOVA (with ADHD as a covariate).

	RCF (n = 26)		Home (n = 33)		F (df: 1,59)	Eta^2
	M	SD	M	SD		
Weekdays						
Bedtime (hh:mm)	20:45	0:24	21:45	0:43	45.74*	0.20
Wake time (hh:mm)	06:19	0:32	06:50	0:22	19.45*	0.26
Sleep latency (min)	19.42	14.58	17.85	14.25	0.42	0.01
Sleep duration (hrs)	9.23	0.73	8.80	0.95	4.67*	0.00
Weekends						
Bedtime (hh:mm)	22:00	1:02	23:10	1:01	25.31*	0.20
Wake time (hh:mm)	07:26	1:05	08:45	1:33	14.93*	0.10
Sleep latency (min)	17.50	12.9	14.15	15.25	1.16	0.01
Sleep duration (hrs)	9.23	0.98	9.46	1.18	0.33	0.01

*p < 0.001.

Table 3
Differences in actigraphy-based sleep patterns between study groups (RCF, Home) by MANCOVA (with ADHD as a covariate).

	RCF ($n = 22$)	Home ($n = 32$)	F (df: 1,51)	Eta^2
Bedtime (hh:mm)	21:03 (0:20)	22:16 (0:40)	64.19*	0.55
Wake time (hh:mm)	06:35 (0:35)	07:12 (0:28)	22.09*	0.30
Sleep latency (min)	33.53 (15.08)	18.86 (12.38)	12.98*	0.20
Sleep duration (hr)	9.54 (0.48)	8.96 (0.49)	16.57*	0.24
Sleep efficiency (%)	92.47 (4.49)	93.83 (3.56)	1.03	0.02

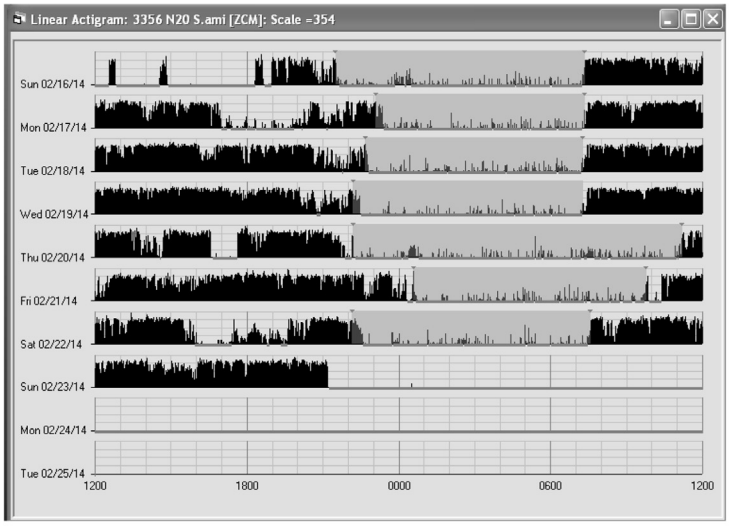
*$p < 0.001$.

a boundary. Neither multivariate nor univariate tests showed main effects for monochrome.

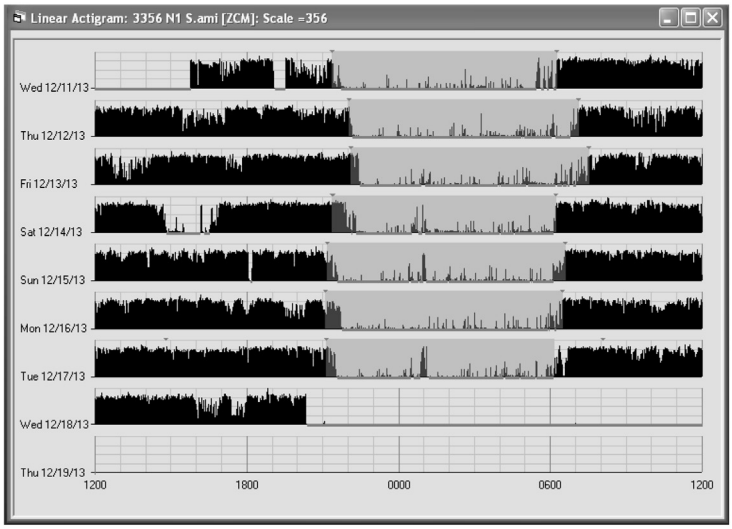
Based on the SSHS on weekday sleep measures, multivariate tests showed a main effect for monochrome [F (1,45) = 2.49, p = 0.05, $Eta^2 = 0.19$]. Univariate tests show that wake time on weekdays was close to significant [F (1,45) = 4.03, p = 0.051, $Eta^2 = 0.08$]; adolescents who drew themselves in monochrome tended to wake up earlier on weekdays. For weekend sleep measures multivariate tests showed no main effect for monochrome [F (1,45) = 1.40, p = n.s, $Eta^2 = 0.12$], but univariate tests showed significance for wake time [F (1,45) = 3.97, p = 0.05, $Eta^2 = 0.08$] and sleep duration [F (1,45) = 4.21, p = 0.04, $Eta^2 = 0.08$]. Adolescents who drew themselves in monochrome woke up earlier and slept longer on weekends. No main effects were found for boundary on weekdays [F (1,45) = 0.39, p = n.s, $Eta^2 = 0.03$] and on weekends [F (1,45) = 0.93, p = n.s, $Eta^2 = 0.08$].

3.5. Narrative analysis

A main theme emerged from the qualitative across-axial coding analysis of the narratives. Adolescents living in RCFs used the theme of *exclusion*, expressed in two ways: (1) switching between grammatical persons, that is, from first-person-singular "I" sentences to third-person-singular "he" or "she" sentences; and (2) expressions of self-aggrandizing (eg, referring to self as "the queen"). The home group used several words that referred to the first-person singular, that is, "I," "me," and "mine." For example, L. (10.5) described her drawing (Fig. 3): "*In the drawing, you can see **me** asleep and next to my bed are **my** beautiful blue shoes, and when **I** sleep **I** smile*." Participants in the RCF group often described the figure in the drawing as "he" or "the child," even though they were asked to draw themselves. Another common verbal expression in this group was switching between the first and third person (ie,



A (Home)



B (RCF)

Fig. 1. Raw nocturnal activity data of two young adolescents living at home (A) and in an RCF (B).

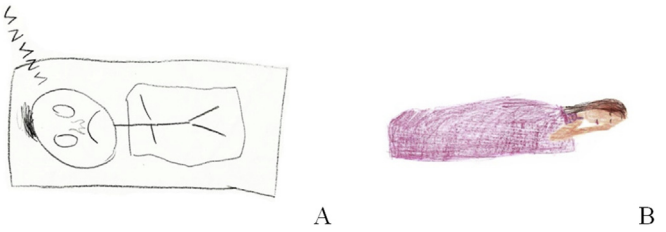


Fig. 2. (A) Self-figure while sleeping drawing of O., (age 11.5) living at an RCF. The figure is bordered in a closed boundary, and colors are monochromatic. (B) Self-figure while sleeping drawing of L., (age 12) living at home. There are no boundaries and colors are polychromatic.

Fig. 3. Self-figure while sleeping drawing of L. (10.5 years old) living at home.

from "I" sentences to "he" or "she" sentences) and between genders. In the description of her drawing, A. (female, 10.5 years) from the RCF group said: "*You can see a bed and a sleeping **boy** and the legs of the bed.*" S. (female, 11 years) from the RCF group also demonstrated switching between grammatical persons in her description: "*You can see a **girl**, blue sky, and **I** sleep in the room, and **I** cannot sleep and **I** am awake all night with my eyes open.*"

The second expression of the exclusion theme in the RCF group was self-aggrandizing. For example, Z. (male, 12 years) describes his self-figure while sleeping drawings: "*I drew myself in the upper bed because I love being up even though I'm sleeping down, this is a boy* (points to his own figure) *who has a strong body and muscles.*" This example shows both a transition between grammatical persons ("I," "boy") and grandiosity ("strong body and muscles"). Other participants from the RCF group also used self-aggrandizing adjectives that were absent in the control group, such as "the princess" and "the queen."

Table 4
Differences between groups in the prevalence (in %) of indicators: peaceful expression, monochrome, presence of others, closed boundary and size.

Variable and values	Distribution (%)		Comparison	
	RCF (n = 25)	Home (n = 33)	Df	χ^2
Peaceful facial expression			1	0.76
Yes	40	51.5		
No	60	48.5		
Monochrome			1	4.09*
Yes	72	45.5		
No	28	54.5		
Presence of others			1	0.43
Yes	48	39.4		
No	52	60.6		
Closed boundary			1	9.83**
Yes	88	48.5		
No	12	51.5		
Size (height × width)	192.28 (SD = 162.82)	135.64 (SD = 111.91)	56	t = 1.58

*p < 0.05, **p < 0.01.

Table 5
Univariate comparisons of objective (actigraphy) and subjective (SSHS) sleep measures by two indicators: monochrome and boundary.

Actigraphy	Monochrome (n = 44)		F (Eta^2)	Boundary (n = 44)		F (Eta^2)
	Yes M(SD)	No M(SD)		Yes M(SD)	No M(SD)	
	(n = 23)	(n = 21)		(n = 30)	(n = 14)	
Bedtime (hh:mm)	21:53 (1:01)	21:58 (0:36)	0.08 (0.00)	21:50 (0:50)	22:07 (0:50)	1.11 (0.03)
Wake time (hh:mm)	6:57 (0:36)	7:04 (0:36)	0.39 (0.00)	7:01 (0:38)	6:57 (0:31)	0.14 (0.00)
Sleep latency (min)	0:19 (0:11)	0:22 (0:14)	0.66 (0.01)	0:21 (0:12)	0:20 (0:14)	0.08 (0.00)
Sleep duration (hr)	9.07 (0.59)	9.16 (0.46)	0.26 (0.00)	9.22 (0.49)	8.89 (0.56)	3.73 (0.08)*
Sleep efficiency (%)	92.61 (3.83)	94.00 (3.79)	1.46 (0.03)	92.58 (4.06)	94.77 (2.87)	3.23 (0.07)*
Wake after sleep onset (min)	0:38 (0:20)	0:31 (0:20)	1.26 (0.03)	0:39 (0:21)	0:26 (0:14)	4.10 (0.09)**
SSHS						
Weekdays	(n = 24)	(n = 23)		(n = 33)	(n = 14)	
Bedtime (hh:mm)	21:23 (0:49)	21:33 (0:44)	0.46 (0.05)	21:23 (0:51)	21:41 (0:30)	1.46 (0.03)
Wake time (hh:mm)	06:32 (0:30)	06:49 (0:26)	4.03 (0.08)*	06:40 (0:31)	06:42 (0:24)	0.05 (0.00)
Sleep latency (min)	0:14 (0:12)	0:19 (0:13)	2.30 (0.04)	0:17 (0:12)	0:16 (0:15)	0.09 (0.00)
Sleep duration (hrs)	8.77 (0.93)	9.09 (0.79)	1.56 (0.03)	9.05 (0.91)	8.71 (0.75)	1.17 (0.02)
Weekends						
Bedtime (hh:mm)	22:44 (1:12)	22:58 (1:01)	0.52 (0.01)	22:57 (1:10)	22:36 (0:57)	0.98 (0.02)
Wake time (hh:mm)	07:51 (1:33)	08:44 (1:27)	3.97 (0.08)**	08:19 (1:40)	08:12 (1:16)	0.05 (0.00)
Sleep latency (min)	0:12 (0:12)	0:16 (0:15)	0.92 (0.02)	0:15 (0:13)	0:11 (0:15)	0.77 (0.02)
Sleep duration (hrs)	8.97 (1.20)	9.67 (0.98)	4.21 (0.08)**	9.19 (1.30)	9.61 (0.88)	1.15 (0.02)

*p < 0.1, **p < 0.05.

4. Discussion

The present study aimed to examine sleep patterns among young adolescents living in RCFs compared with those living at home, as expressed in subjective reports, objective measures, and in self-figure drawings of sleeping with accompanying narratives. To the best of our knowledge, this is the first study to compare adolescent sleep patterns in this unique population with those of normative, home-residing peers. Furthermore, no attempt has been made to date to identify and define sleep expressions in drawings; thus, the current study may be considered a novel, preliminary exploratory study, with a potential for developing novel assessment tools of sleep and related emotional distress in this population.

Findings regarding sleep patterns based on objective and subjective reports showed that adolescents in RCFs go to sleep and wake up earlier and have longer sleep latency (based on objective measurement only) and longer sleep duration than their home-residing counterparts. These findings are consistent with the results of a study comparing sleep patterns of infants residing in RCFs, in kibbutz dormitories, and at home [10], demonstrating that infants in RCFs went to bed earlier and slept longer than those residing at home. The authors concluded that in RCFs, the rigid sleep schedules, but not emotional issues, dictated earlier sleep timing [10].

The finding regarding longer sleep latency in RCF-residing adolescents is consistent with those of a study showing that sleep latency was greater than 20 min in two-thirds of the children in RCFs in Egypt [8] and with a Canadian study that showed high rates of insomnia symptoms, including long sleep latency [9]. Both studies compared their findings with normative population-based studies of sleep patterns in adolescents [28,29]. One possible explanation for extended sleep latency in RCF-residing adolescents concerns the emotional aspects that are associated with sleep, such as stress and anxiety. Studies from the literature have shown that background factors such as mental and physical abuse, neglect, and other stressors are associated with sleep difficulties, including extended sleep latency [30,31]. Environmental stress can also lead to hyperarousal, which can also cause difficulty in falling asleep [32].

Alternatively, long sleep latency may be a consequence of enforced early bedtime schedules that do not correspond to the intrinsic tendency towards later sleep timing in adolescents. It is likely that adolescents in RCFs are not permitted to choose their preferred bedtime, and that, consequently, they lie in their beds for long periods struggling to fall asleep. This interpretation is supported by previous studies demonstrating that discrepancies between intrinsic sleep timing and imposed early bedtimes are associated with extended sleep onset latency and increased sleep disruption [33,34].

The “self-figure while sleeping” drawings analysis revealed that RCF participants typically drew themselves asleep framed in a closed boundary viewed from above, and used monochromatic colors, whereas the home-residing group typically drew no boundaries, chose a side view, and used polychromatic colors. Based on the literature, placing a boundary between the self-figure and the environment may symbolize the presence of fears, which must be locked and closed so that they will not be exposed [13,27,35]. In the RCF group, due to their personal histories of living in an unstable environment, their drawing styles may also reflect a lack of a sense of control, feelings of insecurity, a need for protection, and marking a safe territory during sleep [27]. Furthermore, as adolescents in RCFs experience many changes in their environment and little privacy, marking the boundary of the bed may reflect a desire to claim for themselves a personal, secure, and private space.

Regarding the use of colors, drawings of adolescents in RCFs were typically monochrome, while drawings of the control group were colorful. This finding is consistent with studies showing that the use of colors expresses internal emotions [36] and that this use is modified by the attitudes and feelings of the person towards the drawing figure or subject [25]. It may be cautiously assumed that the sleep experience is perceived as threatening among adolescents in RCFs and is therefore expressed with the use of monochromes. Notably, we cannot rule out the possibility that the use of monochromes may not be specific to the sleep experience but rather may generalize to other negative life experiences.

Further scrutiny of these two indicators, ie, boundary and monochrome, suggests that they may be sensitive to specific measures of sleep continuity and timing. However, any differences found between the presence or absence of the indicators in the drawings may simply reflect group differences, as these factors were highly related. Further investigation of a large population-based pediatric sample is necessary to assess the utility of these and other drawing indicators for the development of a more nuanced assessment tool of self-perceived sleep characteristics in children and adolescents.

Analysis of the narratives revealed one central theme of *exclusion* in the RCF group but not in the controls, expressed as a transition between grammatical persons (from “I” sentence to “him/her” sentences) and as self-aggrandizing. Based on the literature, the exclusion of threatening experiences can be expressed by various indicators in the drawing, such as creating a boundary around the figure, the size of the image, and the distance from a threatening figure [13,14]. Self-aggrandizing representations are common among physically abused children, suggesting that a self-perception as grandiose may serve as a strategy for coping with or rejecting threatening parental aggression and expresses the need for protection [37]. We cautiously speculate that focusing attention on sleep may be a threatening experience that necessitates the creation of a boundary that is pronounced both in the drawings and in the exclusion themes in the narratives. Future studies may control for non-sleep situations in order to evaluate to what extent the indicators and themes are sleep-specific or generalize to the waking period. Future studies may also conduct more structured interviews targeting specific sleep problems such as difficulty falling asleep and lying in bed awake for extended periods.

5. Conclusions

Combining these distinct modes of measurements, we suggest that adolescents in RCFs have early sleep schedules and difficulties falling asleep. It is likely that the structured environment enables good sleep hygiene and helps prevent additional sleep problems. The need for protection and a sense of security are expressed in the drawings and the themes emerging from the narratives. This study offers a unique tool that may complement our understanding of adolescents' perception of their sleep.

Conflict of interest

The authors have no conflict of interest.

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: https://doi.org/10.1016/j.sleep.2019.01.028.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleep.2019.01.028.

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