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Cognitive and Behavioral Practice 23 (2016) 341-355

Cognitive and Behavioral Practice

www.elsevier.com/locate/cabp

A Transdiagnostic Intervention for Youth Sleep and Circadian Problems

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Sleep disturbance is an important contributor to, and maybe even cause of, vicious cycles of escalating vulnerability and increased risk among youth as they prepare to, and transition into, adulthood. The aim of this paper is to describe the scientific derivation of, and components of, the Youth version of the Transdiagnostic Sleep and Circadian Intervention (TranS-C-Youth) to improve sleep. TranS-C-Youth draws from sources that are informed by basic sleep/circadian principles and aims to help clinicians address the broad range of sleep disturbances that are often experienced during adolescence and the transition to adulthood years. The advantages of developing a transdiagnostic treatment are outlined and include that this approach may reduce the "too many empirically supported treatments problem" (Weisz, Ng, & Bearman, 2014, p. 68). TranS-C-Youth is comprised of both core and optional modules and thus promotes maximum flexibility as well as efficiency.

There are multiple junctures over the course of development associated with heightened risk. Particularly significant, but understudied, are the unique set of challenges faced by youth as they prepare to, and transition into, adulthood. This transition period involves multiple domains of change, including: (a) physical and psychological individuation as parental guidance and monitoring diminish while the expectation of autonomy increases; (b) establishing and maintaining new relationships, and new types of relationships, extending beyond family relationships; (c) changes in major social roles such as transitioning to college, vocational training, or becoming a full-time worker for the first time; (d) increased challenges created by the opportunities to access a wide range of risky activities, such as increased availability and use of substances and alcohol, engaging in risky and unprotected sex, and driving at high speed or while intoxicated; and (e) facing life decisions across multiple domains that have a long-term impact on future functioning, including educational/career decisions and decisions relating to marriage and starting a family (Arnett, 2000; Bachman, Johnston, O'Malley, & Schulenberg, 1996; Boles, 1999; Jessor, Donovan, & Costa, 1991).

We have been interested in whether interventions aimed at adolescence and this transitional period, a time just before embarking on adult social roles, may be a particularly effective time for stabilizing and establishing better self-regulatory capacities. During this age it may be possible to take advantage of any remaining degree of structure and/or parental monitoring/scaffolding, allowing the intervention to help the young person to establish better skills and habits before facing the next level of challenges, thereby reducing risk and building resilience.

Keywords: transdiagnostic treatment; sleep; youth; adolescents

Why Is Sleep Important in Adolescence and the Transition to Adulthood?

Sleep disturbance is an important contributor to, and maybe even cause of, vicious cycles of escalating vulnerability and increased risk among youth. A biological shift in the circadian system at puberty in the direction of a delayed sleep phase (Carskadon, Acebo, & Jenni, 2004; Lee, Hummer, Jechura, & Mahoney, 2004) is compounded by social changes such as less parental control, increased access to stimulating social activities (music, Internet, text messaging, etc.), and increased use of alcohol and substances that contribute to sleep disruption. Together, the social influences interact with the biological tendencies toward phase delay, and can spiral quickly into a pattern of very delayed bedtimes (Carskadon, 2011). Yet, school/work usually requires a fixed early wake-up time (Hansen, Janssen, Schiff, Zee, & Dubocovich, 2005). Hence, these biopsychosocial and behavioral forces converge to constrain time available for sleep, resulting in very high rates of youth obtaining insufficient sleep (Carskadon, 2002; Carskadon, Mindell, & Drake, 2006; Hansen et al., 2005). Compounding this vicious cycle, most attempts to "catch-up" on sleep occur on weekends on a phase-delayed schedule (Crowley, Acebo, & Carskadon, 2007; Sivertsen, Harvey, Lundervold, & Hysing, 2013a). This is a problem because the jet lag literature documents that it is easier to adapt to westward travel (involving delaying bedtimes)

relative to eastward travel (involving advancing bedtimes) (Lowden & Åkerstedt, 1999; Waterhouse, Reilly, Atkinson, & Edwards, 2007). This finding is highly relevant because teenagers will easily adapt to late-night bedtimes and wake times on weekends and will then have more difficulty establishing earlier sleep schedules starting on Sunday night and on weekdays. Thus, many youth are struggling with the burdens of sleep deprivation and the consequences of repeated circadian shifts (Carskadon, 1990).

While the basic biological shift toward eveningness during this phase may be difficult to modify, the psychosocial and behavioral contributors can be modified. Moreover, modifying the psychosocial and behavioral contributors may well eliminate key factors that exacerbate the biological shift. Hence, the aim of this paper is to describe the scientific derivation of, and components of, the youth version of the Transdiagnostic Sleep and Circadian Intervention (TranS-C-Youth) to improve sleep. TranS-C-Youth draws from sources that are informed by basic sleep/circadian principles.

The hope is that youth in the later teen years and the transition to adulthood years can obtain as close to 9 hours of sleep per night as possible (Carskadon et al., 1980; Wolfson & Carskadon, 1998), to facilitate the rapid body and brain development that continues well into the early 20's (Casey, Jones, & Somerville, 2011; Giedd, 2004). Also, it is important to emphasize that one aim of TranS-C-Youth is to equip the client with tools and methods to help them go on treating themselves and continuing to improve once therapy is over.

Basic Sleep and Circadian Principles

TranS-C-Youth was derived from several sources, which will be described in the section that follows. The relevance of these sources will be more apparent following a brief description of the two processes that govern the sleep–wake cycle (Borbely & Wirz-Justice, 1982).

The first is the circadian process, which arises from the endogenous pacemaker in the suprachiasmatic nuclei (SCN) (Reppert & Weaver, 2002). At the molecular level, intrinsically rhythmic cells within the SCN generate rhythmicity via an autoregulatory transcription-translation feedback loop regulating the expression of circadian genes. The process by which the pacemaker is set to a 24-hour period and kept in appropriate phase with seasonally shifting day length is called entrainment, which occurs via zeitgebers. The primary zeitgeber is the daily alteration of light and dark (Roennebert & Foster, 1997). The light-entrainable SCN synchronizes networks of subordinate circadian oscillators controlling fluctuations in other brain regions and, in particular, in neural circuitry supporting reward seeking (centered on ventral striatum) (Venkatraman, Chuah, Huettel, & Chee, 2007) and emotion processing (centered on amygdala and orbitomedial prefrontal cortex) (Yoo, Gujar, Hu, Jolesz, & Walker, 2007), two circuits highly relevant to risk taking among teens and that continue developing well into the teenage years (Blakemore, Burnett, & Dahl, 2010; Giedd et al., 1999). Hence, TranS-C-Youth incorporates timed light exposure. The SCN is also responsive to nonphotic cues such as arousal/locomotor activity, social cues, feeding, sleep deprivation, and temperature (Mistlberger, Antle, Glass, & Miller, 2000). Hence, TranS-C-Youth takes advantage of powerful nonphotic cues such as meal times and exercise.

The second process governing the sleep-wake cycle is the homeostatic process that regulates the duration and structure of sleep based on prior sleep and wakefulness; sleep pressure increases during wake and dissipates during sleep (Jenni, Achermann, & Carskadon, 2005; Taylor, Jenni, Acebo, & Carskadon, 2005). TranS-C-Youth includes methods for increasing homeostatic drive to sleep. When we talk about this second process with clients it has been helpful to refer to it as the "hunger" or "appetite" for sleep. Together, these basic sleep principles informed the sources for deriving TranS-C-Youth.

Sources for the TranS-C-Youth

Principles from three evidence-based interventions were the source of TranS-C-Youth. These were combined to optimize sleep functioning and interaction between the circadian and homeostatic processes outlined in the prior section.

Source 1: Cognitive Behavior Therapy for Insomnia (CBT-I)

There is robust evidence from multiple meta-analyses (Irwin, Cole, & Nicassio, 2006; Morin, Culbert, & Schwartz, 1994; Murtagh & Greenwood, 1995; Smith et al., 2002) and a systematic review for CBT-I in adults (Morin et al., 2006). The evidence for CBT-I among adolescents is small but promising (Bootzin & Stevens, 2005; de Bruin, Oort, Bögels, & Meijer, 2014; Gradisar, Dohnt, Gardner, Paine, Starkey, Menne, and Trenowden, 2011a; Gradisar, Gardner, and Dohnt, 2011b; Paine & Gradisar, 2011; Schlarb, Liddle, & Hautzinger, 2010). The studies conducted amoung youth to date reflect the diversity of choices facing clinicans, including combining CBT-I components with mindfulness (Bootzin & Stevens, 2005) or bright light (Gradisar, Dohnt, et al., 2011a), delivering CBT-I over the Internet or in a group (de Bruin et al., 2014) or in a classroom setting (Cassoff, Knäuper, Michaelsen, & Gruber, 2013), involving parents in the treatment (Schlarb et al., 2010) and including an emphasis on motivational interviewing (Cassoff, et al., 2013). Although much more treatment research is needed, with larger samples, randomization, and control groups, this emerging literature justified including a focus on CBT-I in TranS-C. In particular, TranS-C-Youth draws on the CBT-I components that increase homeostatic pressure to sleep

(stimulus control and sleep restriction) and reduce arousal (cognitive therapy).

Source 2: Delayed Sleep Phase Type (DSPT)

The broader spectrum of eveningness, rather than the extreme end represented by the disorder DSPT, is very common in teens. So this has been our focus. TranS–C-Youth has been informed by the small treatment literature on DSPT in youth (Gradisar, Dohnt, et al., 2011; Gradisar, Smits, & Bjorvatn, 2014; Okawa, Uchiyama, Ozaki, Shibui, & Ichikawa, 1998; Regestein & Monk, 1995), as well as practice parameters (Sack et al., 2007) that indicate evidence for timed light exposure (with a light box) and planned and regular sleep schedules (chronotherapy) in adults. TranS-C-Youth includes the latter two interventions, with adaptations. First, many people are not motivated to use a light box; hence, TranS-C-Youth aims to help clients develop habits of exposing themselves to natural morning light and evening dim light with youth-selected electronic curfews. Second, traditional chronotherapy involving progressively delaying bedtimes and wake times until reaching the desired alignment can be highly disruptive to family and work schedules. Third, in a study of 1,285 high school students in Norway, the majority of students with delayed sleep phase (8.4%) reported considerable difficulty advancing bedtimes (Saxvig, Pallesen, Wilhelmsen-Langeland, Molde, & Bjorvatn, 2012). As such, in TranS-C-Youth we tend to adopt a planned sleep modification protocol involving moving bedtimes earlier by 20 to 30 minutes per week. We select this slow change approach on the basis of our clinical experience, which is mainly with teens who have a severe mental illness or who are "at risk" in one or more domains of their lives. With these youth we have found this schedule to be achievable and we capitalize on the youth's feeling a sense of accomplishment, which further increases motivation for change. However, it should be noted that it is possible that the schedule we are currently using in TranS-C might maintain a disrupted lifestyle among youth given that the process of changing times once per week could take 5 weeks to complete. Research to determine the ideal sleep modification for the various groups of youth, and that balances circadian and motivational processes, is needed.

Source 3: Interpersonal and Social Rhythms Therapy (IPSRT)

IPSRT is a treatment approach that is designed to maintain stability in social rhythms. The evidence base for stabilizing circadian rhythms with IPSRT in bipolar disorder and depression is growing, including in adolescence (Hlastala & Frank, 2006; Hlastala, Kotler, McClellan, & McCauley, 2010; Miklowitz et al., 2007).

Teens tend to have irregular sleep/wake cycles and social and personal schedules. In particular, waking early on weekdays for school, college, or work and then sleeping in on weekends (Hysing, Pallesen, Stormark, Lundervold, & Sivertsen, 2013) can result in a chronically jet-lagged state to which the human circadian system cannot adjust. Accordingly, TranS-C-Youth includes aspects of IPSRT deigned to stabilize bed and wake rhythms, as well as other social rhythms (e.g., meal times, socializing, exercise, etc.), drawing from the treatment manual developed by Frank et al. (2005). This is because the sleep and circadian systems are surprisingly sensitive to nonphotic cues, including physical activity and social interaction. Hence, stabilizing these daily rhythms helps stabilize the sleep-wake schedule.

Why Develop a Transdiagnostic and Modular Treatment?

One relatively new approach is to target research and treatment at a transdiagnostic process. A transdiagnostic process is defined as a process that is in common across more than one mental illness. The advantages of taking a transdiagnostic approach are at least threefold. First, if a transdiagnostic process contributes to the maintenance of symptoms across multiple disorders, then one powerful approach would be to focus treatment on that process rather than on the large number of discrete disorders currently listed in the DSM (Barlow, Allen, & Choate, 2004; Fairburn, Cooper, & Shafran, 2003; Harvey, Watkins, Mansell, & Shafran, 2004; Mansell, Harvey, Watkins, & Shafran, 2009). Second, comorbidity is the norm (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kessler, Merikangas, & Wang, 2007). Hence, a significant clinical dilemma is which disorder/s to prioritize for treatment. Treating transdiagnostic processes provides one path forward (Mansell et al., 2009). Third, a transdiagnostic approach may reduce the heavy burden on clinicians, who must learn multiple disorder-focused protocols, with common theoretical underpinnings and interventions (Harvey et al., 2004; Mansell et al., 2009). Indeed, this approach may solve the "too many empirically supported treatments problem" (p. 68) that impedes the dissemination and uptake of treatments (Weisz et al., 2014).

Promising progress has been made toward developing transdiagnostic treatments that target transdiagnostic processes across the anxiety disorders and depression (Barlow et al., 2004; Craske et al., 2011; Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010; Farchione et al., 2012; McManus, Shafran, & Cooper, 2010; Norton, 2008, 2012; Norton & Philipp, 2008; Shafran, McManus, & Lee, 2008; Titov et al., 2011), eating disorders (Fairburn et al., 2009; Fairburn, et al., 2003), schizophrenia (Bentall et al.,

2009), bipolar disorder (Ellard, Deckersbach, Sylvia, Nierenberg, & Barlow, 2012), and across anxiety, depression, and conduct problems in youth (Bilek & Ehrenreich-May, 2012; Fraire & Ollendick, 2013; Weisz et al., 2012). Also, treatments targeting transdiagnostic processes, such as rumination (Nolen-Hoeksema & Watkins, 2011) and perfectionism (Egan, Wade, & Shafran, 2011), have been effective (Riley, Lee, Cooper, Fairburn, & Shafran, 2007; Watkins et al., 2011).

Our team was an early contributor to discussions on transdiagnostic approaches (Harvey, et al., 2004). In particular, we highlighted sleep and circadian dysfunction as a biologically (Harvey, Murray, Chandler, & Soehner, 2011) and theoretically (Harvey, 2008) plausible transdiagnostic contributor to risk and vulnerability and we proposed an early version of this treatment (Harvey, 2009). The need for a transdiagnostic approach is particularly important among youth and young adults transitioning into adulthood. This is because insomnia is a common sleep problem during this developmental period (Buysse et al., 2008; Gradisar, Gardner, & Dohnt, 2011). Additionally, features of insomnia very often overlap with other sleep problems commonly experienced by youth such as hypersomnia, difficulty waking up/getting out of bed in the morning, daytime sleepiness, inadequate opportunity to sleep, irregular sleep-wake schedules and worry/rumination about social concerns (e.g., popularity, accomplishment in sports and academics) and not sleeping. For example, in a study of 10,000 adolescents in Norway, half of the adolescents with delay sleep phase problems also had insomnia (Sivertsen, Harvey, Lundervold, and Hysing, 2013a; Sivertsen, Pallesen, Stormark, Bøe, Lundervold, and Hysing, 2013b). Accordingly, we adopt a transdiagnostic perspective so as to address this broad range of "sleep disturbance" more effectively and efficiently. TranS-C is also transdiagnostic in the sense that with appropriate developmental adaptations, it can be used to treat sleep disturbance across the age range and across mental and physical illnesses. In these ways, the approach takes seriously contributing to solving the "too many empirically supported treatments problem" (p. 68) (Weisz, et al. 2014).

Given strong results from other groups (Weisz et al., 2012), advice from dissemination experts (Chorpita, Daleiden, & Weisz, 2005; Weisz et al., 2012) and knowing that not all youth experience all types of sleep problems, the transdiagnostic treatment described here is modular (Chorpita et al., 2005; Kilbourne, Neumann, Pincus, Bauer, & Stall, 2007).

TranS-C-Youth

TranS-C-Youth is delivered after a careful evaluation to exclude the possible influence of other disorders for which a different treatment approach is needed, particularly sleep apnea and periodic limb movement disorder (see Harvey & Spielman, 2011, for a description of the evaluation process). As summarized in Table 1, TranS–C-Youth includes 4 "cross-cutting" modules that are introduced in the first session and are typically featured in every session thereafter, 4 core modules that apply to the vast majority of clients and 4 optional modules used less commonly, depending on the presentation. Four to ten 50- to 60-minute sessions are typically sufficient, depending on the complexity of the presentation and the number of modules that need to be delivered. Before describing each of the elements of TranS-C-Youth, I want to emphasize the importance of asking your client to keep a sleep diary as well as offer some guidance on the potential to conduct experiments, the ordering of the treatment modules and the structure of the therapy session.

Sleep Diary

Maintaining a daily sleep diary is an essential requirement and this should be made very clear during the first therapy session. The rationale for why it is important to keep a daily diary is that it will help you and your client (a) document the nature and severity of the initial sleep problem, (b) assess night-to-night variations in sleep patterns and identify factors that contribute to improved or worsened sleep (for this purpose we ask our clients to make notes of these factors on the back of their diary or on a separate self-monitoring form), (c) monitor treatment progress, and (d) evaluate progress with treatment procedures.

It is difficult to run an effective therapy session when a client does not monitor his/her sleep or forgets to bring in his/her diary. Note that there is no need for the client to constantly watch the clock in order to provide accurate times on their sleep diary. Instead, ask your client to base their sleep estimates in their diary on their best guess or their "felt sense." Estimates are all that are needed. It is not so much the absolute accuracy, which is impossible, but its daily recording that is important. It helps to identify a time (breakfast) and location (kitchen) for filling in the diary, distinguish time into bed from time intending to go to sleep, distinguish last awakening from arising time and make sure to get the total amount of time awake after sleep onset. We highly recommend Carney et al.'s (2012) sleep diaries that are embedded within an excellent discussion of the use of the sleep diary in the assessment of sleep problems.

Behavioral Experiments

We suggest setting up experiments across the course of treatment. Very often, conducting a behavioral experiment brings about profound disconfirmation of

Table 1
Summary of TranS-C

Module	Module Type	Session Number	Purpose
Functional analysis	Cross-Cutting	1 & interwoven thereafter	Derive treatment targets. Introduce the rationale for treatment
Sleep and circadian education	Cross-Cutting	1 & interwoven thereafter	Provides the rationale for the treatment modules and home projects
Motivational interviewing	Cross-Cutting	1 & interwoven thereafter	Heightens motivation to modify behavior
Goal setting	Cross-Cutting	1 or 2 then as needed	Setting realistic, achievable and measurable goals for the night and the day guides treatment
Irregular sleep-wake times	Core Module 1	2-8	Regularize bed and wake times across the week
Difficulty winding down	Core Module 1	2-8	Supports regularizing bedtimes
Difficulty waking up	Core Module 1	2-8	Activity scheduling and goal setting to reinforce getting out of bed and help regularize wake up time
Daytime impairment	Core Module 2	3-8	Develop skills to cope the day following a night of poor sleep
Unhelpful beliefs about sleep	Core Module 3	4-8	Correct unhelpful beliefs
Poor sleep-efficiency *	Optional Module 1	2-8	Associate the bed with sleep
Too much time in bed *	Optional Module 2	2-8	Helps clients who sleep too much get out of bed and more fully engage with their daytime activities
Delayed phase *	Optional Module 3	2-8	To help clients go to bed early enough to ensure sufficient sleep prior to wake-up time
Sleep-related worry	Optional Module 4	5-8	To reduce anxiety and pre-sleep arousal as these are antithetical to sleep
Maintenance of behavior change	Core Module 4	6-8	Relapse prevention and preparing for setbacks

* Decision to use is based on the sleep diary data.

unhelpful beliefs or stunning demonstrations that certain behaviors or thoughts are important contributors to the sleep problem. They are so much more powerful for facilitating change, relative to verbal discussion of the same topic (Tang & Harvey, 2004). Behavioral experiments can also provide deep experiential learning that new thoughts/beliefs/behaviors can reduce distress/anxiety and improve sleep. Indeed, in TranS-C-Youth we consider youth to be "budding sleep scientists." This approach also encourages a curiosity and sense of adventure. This often generates a willingness to try suggestions "just once." Quite often trying a new behavior just once is enough to kick-start the building blocks of a new, healthier habit.

As discussed in the "bible" for behavioral experiments (Bennett-Levy et al., 2004), these provide an approach to challenging unhelpful beliefs about sleep and developing/testing new (and helpful) beliefs about sleep—and they provide a powerful approach to facilitating awareness of perpetuating cognitive and behavioral processes and bringing about change in these processes. Bennet-Levy et al. define behavioral experiments as "planned experiential activities, based on experimentation or observation, which are undertaken by clients in or between ... therapy sessions. Their design is derived directly from a ... formulation of the problem, and their primary purpose is to obtain new information which ... [includes] ... contributing to the development and verification of the ... formulation" (p. 5). Behavioral experiments encourage clients to become scientists who make judgments in their lives based on data they collect, rather than based solely on their subjective feelings. The six steps to completing a behavioral experiment are provided in Table 2.

Several behavioral experiments for sleep problems have already been described (Ree & Harvey, 2004) but there are endless possibilities!

Table 2
Steps for Setting up Behavioral Experiments

1. Precisely identify the belief/thought/process the experiment will target
2. Collaborate with your client to brainstorm ideas for an experiment; be as specific as you can
3. Write predictions about the outcome and devise a method to record the outcome
4. Anticipate problems and brainstorm solutions
5. Conduct the experiment
6. Review the experiment and draw conclusions
7. Identify follow-up experiments if needed.

Note. Adapted from Bennett-Levy et al. (2004).

Ordering of Treatment Materials

Clients tend to move through the different modules of treatment at different rates. Accordingly, in this paper the treatment components that need to be covered are discussed without always specifying the order in which they should be completed. While the ordering of the treatment components described below is broadly suggestive of the order of completion, it is important to be sensitive to differences between clients as to which processes are maintaining their distress and to address those processes at an earlier stage of treatment.

Session Structure

As for CBT generally, every session begins by setting an agenda. That is, say what you'd like to do, check if your agenda is okay with your client and ask if your client would like to add anything. Typically the agenda will be as follows:

1. Briefly review and comment on the weekly sleep diary.
2. Ask for feedback on the previous session— *How did you find our last session? What did we talk about last session that you thought was important? Did we do anything or did I say anything that was unhelpful?*
3. Review of home project from last session (did your client complete the home project? what did they learn?).
4. Main problems to be worked on (i.e., the main body of the session) incorporating frequent analytic summaries using simple language, use of white board when relevant, use of in-session and between–session behavioral experiments, and brief written summaries for your client to take home.
5. Setting home project for the next week—write a copy for your client. Make clear how the activity relates to the client's goals for therapy. Begin the activity in session by practicing the skills, anticipating the difficulties, asking the client, *What things might prevent you from doing this?* Reinforce the value of the home project by asking, *Did you know these things before you did this home project?* and *Any thoughts about how you might use this information?* Ask, *Can you think of anything that will prevent you from doing it?* and then, *How could you answer that thought at the time?* and *What could we plan now that might overcome that problem?*
6. Ask the client to summarize the session/main point he/she has learned. Help the client by filling in the gaps.
7. Check whether there was anything in the session that was unsatisfactory or unhelpful. Ask for feedback about how it went, for example, *Did we cover anything that particularly stood out to you this session?*

Cross-Cutting Modules

The four modules described in this section are introduced in the first session and are typically featured in every session thereafter.

Functional Analysis

Sleep-related behaviors and consequences are assessed before bed (e.g., bedtime routine), during the night (e.g., television left on), on waking (e.g., sleepiness, lethargy), and during the day (e.g., caffeine use). The data collected are useful for determining which optional modules are needed. This style of functional analysis is described more fully elsewhere (Harvey, 2006) and follows the method developed in the anxiety disorders (Clark & Wells, 1995; Ehlers & Clark, 2000). Consider starting the functional analysis with a rationale along the lines of the following:

> "It will help us a lot in planning our sessions together if we could begin by getting a very detailed picture of what your experience of sleep is like. The way we do this is for us to identify together a recent typical night. . . . I'll ask you lots of questions about this night so that I can get a sense of the kind of things that are going on. This will help us plan our sessions together. This treatment is like a fingerprint — everyone is a bit different so the treatment needs to be a bit different. Does that sound OK to you?"

The next step is to work with your client to choose a *very specific* recent example of a *typical* night of sleep during which the problem was evident. A very specific episode is a situation that happened on one particular day (e.g., last Monday) and at a particular time (e.g., while trying to get to sleep). Choosing a recent example is a good idea as the client is more likely to remember the details, and this will make the process much easier. Examples of some very specific recent episodes are: "Last Tuesday night I was on an internet chat room until 3 A.M. and then I couldn't get to sleep" and "On Monday I had a terrible day, I was worried about money and getting a job. I couldn't get to sleep and I woke up hundreds of times across the night."

We then use the "Things I Do, Things I Think, Things I Feel" form (see Figure 1) to elicit sleep-related behaviors, thoughts, feelings, and consequences at bedtime (e.g., on an Internet chatroom late into the night), during the night (e.g., television left on), on waking (e.g., sleepiness, lethargy), and during the day (e.g., caffeine use). We use Socratic questioning and guided discovery to fill in the blanks on the form. This process will usually uncover

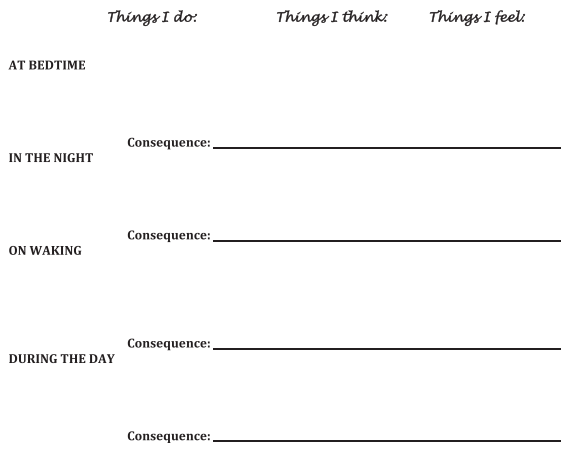

Figure 1. Things I do, things I think, things I feel.

several modifiable behaviors and thoughts that will be targeted by TranS-C-Youth.

We then use the completed form to introduce the cognitive behavioral model. For example, say something like, "OK, this has been very helpful … so this is so similar to what we very often find … these kinds of thoughts [*name some*] and these kinds of behaviors [*name some*] seem to lead to these kinds of feelings. And together, the behaviors, thoughts, and feelings make it difficult to sleep/wake up [*point to the "consequences" parts of the form*]. On top of that, these kinds of thoughts [*name some*] and feelings [*name some*] can put us into a state of vigilance."

Then we brainstorm the points that we can target in treatment. For example, we say something like, "Can you think where we should target in the sessions we have together, to cut into and reverse these vicious cycles?" If clients are not able to come up with ways to intervene (which is common), the therapist should help them by saying something like, "I suggest that one of our targets be these thoughts … if we can change them we will also be changing these feelings. This alone will be very helpful for getting back to sleep. CBT involves some very effective skills for tackling unwanted thoughts." So we are giving a sense of hope that these are all modifiable variables that we can target during treatment to facilitate better sleep.

Although this functional analysis is completed in Session 1, further functional analyses may be completed in subsequent sessions, as needed. For example, in a future session, if you can't make sense of why a client had a really bad night's sleep, consider going through everything that happened step-by-step. For example, one client came to the session very concerned about one night that she had slept badly. She expressed a great deal of concern about this one night because "it was completely inexplicable" and this added to the growing sense she had lost control over her sleep. So we went through, step-by-step, in a very detailed way, exactly what she had been doing that day and that evening. We mapped out the steps as we progressed on a blank sheet of paper in front of us. We discovered that she was settling into her first job after graduating from high school and the day was long (8:00 A.M.–6:30 P.M.) and stressful. At 6:30 P.M. she arrived home (she shared a house with two friends). She found that her housemates had asked a bunch of her friends over and they were all sitting around the living room. The client really wanted a bit of space so she went downstairs to do her laundry, but she happened to notice that there were lots of messages on her phone and she felt stressed that she didn't have the opportunity to return the calls. At 10:30 P.M. all of her friends relocated to a café, and she went along too. At 11:50 P.M. she returned home and went straight to bed thinking, "I must get to sleep quickly so I can cope at work tomorrow." This close analysis gave us clear clues as to why the client had a poor night of sleep: not enough time to herself, overwhelmed with people and things to do, no time to wind down before getting into bed, and putting pressure on herself to fall asleep quickly. These insights increased the control felt by the client.

Goal Setting

Another important aspect of this phase of treatment is goal setting. We set goals for the night and goals for the day. Feel free to start education about sleep as part of this phase, if it is pertinent to the goals. An example of a goal for the night is "Get into bed by 10:00 P.M. so I will fall asleep by about 10:30 P.M." rather than "I want more sleep," which is too vague. An example of a goal for the day is "Wake up at a more similar time every day, including on the weekend and feel more energetic," rather than "Feel better in the day," which, again, is too vague.

Selecting goals that are acceptable to your client is important, but these goals must be realistic. For example, if a person wishes to fall asleep within 5 minutes, the therapist may need to negotiate a more realistic objective. The therapist can let the client know that the process of falling asleep is more like a dimmer than a light switch. It takes time. In fact, taking *more than* 30 minutes to fall asleep on 3 or more nights a week is the typical cutoff value to determine whether a person has sleep-onset insomnia. However, this recommendation is based on modal practice and in adults (Buysse, Ancoli-Israel, Edinger, Lichstein, & Morin, 2005). Therapy goals are set in the first session but they may need to be reevaluated and readjusted periodically as the intervention unfolds. Often the therapist will add questions to the daily diary to enable tracking of the goals that are set.

Motivational Interviewing (MI)

MI should be a core feature interwoven into all sessions. Core values within MI are accepting the client as an individual, avoiding argumentation or confrontation, and avoiding giving lectures or ultimatums. MI also involves eliciting and shaping client language in favor of change (i.e., change talk). When a behavior change idea is being discussed, the MI approach is to discuss it in a nonjudgmental, empathic, and collaborative manner. The idea is that an open discussion and additional reinforcement concerning sleep deprivation and its repercussions on different life areas could heighten the client's awareness of the importance to modify behavior, now or in the future, and lead to successful behavior change (Hettema, Steele, & Miller, 2005b; Miller & Rollnick, 2002). Multiple meta-analyses (Burke, Arkowitz, & Menchola, 2003; Hettema, Steele, & Miller, 2005a), including a recent analysis of studies conducted in youth (Gayes & Steele, 2014), show the effectiveness of MI.

MI was chosen as a cross-cutting module because it helps build intrinsic motivation, and includes promotion of autonomy, a key developmental task for the transition to adulthood group. It is designed to capitalize on the youth's experience and the potential benefits of developing/adapting sleep-friendly habits by asking your client their thoughts on the pros and cons of change. The latter helps individuals recognize their ambivalence about change and enhance their intrinsic motivation for change.

Within the context of MI, the sleep treatment is provided in a nonprescriptive manner. The therapist first elicits the teen's current knowledge about the importance and health effects of increasing and/or maintaining sleep-friendly behaviors. The therapist then offers recommendations in a nonconfrontational manner that supports and respects the youth's autonomous decision-making. The youth's reactions are then elicited. And together therapist and youth evaluate the pros and cons of change, and the therapist nonjudgmentally hears and empathizes with these. In other words, in this approach the client is not a passive recipient of information, but he/she is an active collaborator in the change process.

MI is typically being delivered in a context where youth find that getting into bed is aversive, boring, and a waste of precious hours during which parents and school are not bothering them. It can be helpful to use Socratic questioning to unpack and seek to understand your client's perspective and to raise their awareness about the science of the adverse consequences of insufficient sleep. We try to find a connection between the interests and motivation of the young person and sleep. This often includes domains such as improving athletic performance, personal attractiveness, and improving grades for college. We also try adding sources of daytime impairment to the sleep diary as sometimes a clear link between sleep and daytime functioning emerges.

Sleep and Circadian Education

The process of teaching your client the basic building blocks that underpin sleep and circadian functioning is important because this forms the rationale for the delivery of the interventions. This module, which starts in Session 1 and unfolds across all sessions, includes environmental influences (e.g., light), circadian and social rhythms (following IPSRT), the tendency for the sleep-wake cycle to delay, if left unchecked by regular bed times, and the importance of sleep for mood regulation and cognitive functioning.

Core Modules

Behavioral Components

Irregular Sleep-Wake Times

IPSRT (Frank et al., 2005; Frank, Swartz, & Kupfer, 2000) and stimulus control (Bootzin, 1972) are utilized to regularize sleep and wake times across the weekdays and weekends and avoid naps. In particular, we focus on regularizing bed and wake times from weekday and weekends. More broadly, the steps in stimulus control are to collaboratively work with your client to go to bed only when they are tired—and to develop prebedtime habits to ensure he/she is tired at an appropriate and desired time of the day—to limit activities in bed to sleep, to get out of bed at the same time every morning, and when sleep-onset does not occur within 15 to 20 minutes, to get up and go to another room or another place in the bedroom. We also suggest not napping as this discharges the homeostatic pressure to sleep, which makes it difficult to get to sleep that night. The rationale underlying this treatment is that sleep problems arise, at least in part, as a result of maladaptive conditioning between the environment (bed/bedroom) and sleep-incompatible behaviors (e.g., worry/frustration at not being able to sleep) (Bootzin, 1972). The stimulus control intervention aims to reverse this association by limiting the sleep-incompatible behaviors engaged in within the bedroom environment. These techniques promote consistent sleepiness in the evening. Together, they ensure that both the circadian and homeostatic processes described earlier are aligned and set to promote sleep around the optimal time of the day. We also aim to assist our client to regularize their daily social rhythms (e.g., timing of meals, exercise, socializing), which help build upon and scaffold the stimulus control intervention.

Difficulty Winding Down

To support regular bedtimes, we co-create a highly individualized "wind-down" of 30 to 60 minutes. The hope is to establish habits of relaxing and sleep-enhancing

activities that are conducted in dim light conditions. This facilitates the circadian phase advance among participants who are evening-types, and maintains entrainment (Wyatt, Stepanski, & Kirkby, 2006). Many older youth are evening-types such that they feel active and alert later in the day. A central issue is the use of interactive electronic media (Internet, cell phones, MP3 players). MI and individualized experiments (Ree & Harvey, 2004) are used to facilitate voluntarily choosing an electronic curfew. See Table 3 for a fuller discussion of electronics and sleep. Although we have a strong clinical intuition that technology use is a major player in teen sleep problems, clinical intuition is not always correct. Indeed, in an elegant study involving tests of pre-sleep alertness, sleep (sleep diary and polysomnography), and morning functioning in 16 adolescents, 1 hour of screenlight before bedtime was not harmful to sleep (Heath et al., 2014). This early study awaits replication and it certainly remains possible that technology negatively impacts sleep via mechanisms other than light, such as arousal or difficulty disengaging from technology to get into bed by the target bedtime. This accords with a *Sleep Medicine Review* paper showing that video gaming, phone, computer and Internet use, and evening light related to delayed bedtimes in youth (Bartel, Gradisar, & Williamson, 2014).

Table 3
Technology Use

Be curious. For many youth it's hard to imagine a period of their free time that doesn't involve technology. We try to engage in a conversation about times they didn't have technology and what they did instead and what that was like. For example, have they ever been camping or on an airplane? We suggest considering alternatives with clients such as comic books, art, or reading a book. We point out that it's not just the source of bright light but that most technology is also very stimulating. And if there are commercials there might be even more stimulation. Try talking about short-term rewards (gaming, porn etc.) versus longer-term rewards (being able to sleep, doing well at school or work, getting into college, etc.). Consider asking the teen to take a video or picture of their bedroom. This might help with turning down bright lights and changing the placement of technology. For young people who are text messaging their friends into the night, we try to facilitate addressing this with their friends and perhaps considering to switching off technology, as a peer group, at a certain time. Alternatively, explore any fears your client might have about refraining from texting friends earlier in the evening. Discuss the pros and cons of increasing reducing technology use, write them down together. Perhaps suggest doing experiments like compare just 15 minutes of videos each night versus 24 minutes of *Seinfeld* versus a 1.5-hour movie. We try to be flexible. For example, one teen found reading books to be a challenge—he couldn't put them down for 1 to 2 hours. For him, one episode of *Seinfeld* was better. There are some teens who will not give up technology. For them, we try to move them in the right direction, taking a harm-reduction approach.

Difficulty Waking up

Drawing on IPSRT principles, one of our team members, Dr. Kate Kaplan, developed the RISE-UP routine, which aims to help clients who experience extended sleep inertia. Sleep inertia is the transitional state of lowered arousal and impaired performance following sleep. For most people this is a period of 5 to 20 minutes of grogginess, heavy eyes, sore shoulders, and a feeling of wanting to go back to sleep, etc., that resolves relatively quickly. For others, a longer period of sleep inertia up to several hours can be experienced (Kanady & Harvey, 2015). Hence, it is very helpful to normalize the unpleasant feelings on waking and point out that these are not good data on which to make judgments about staying in bed and snoozing some more versus getting up. Instead, it's usually better to get up and get moving.

In both cases an individualized version of the RISE-UP routine, as depicted in Table 4, can be very helpful. The goal of the RISE-UP is to use activity scheduling and goal setting to reinforce getting out of bed. Allow room for creativity. For example, one older teen rigged up a set of string pulleys so that all the bedroom lights could go on at once with the pull of a string, which was right near his bed. This helped motivate him to get out of bed. Another teen created a wake-up playlist on his iPod.

Note

A major focus when establishing wind-down and wake-up routines is to emphasize appropriate exposure to dark/light, given the central role of light as an entraining stimulus for the circadian timing system. Strategies such as light box use and traditional chronotherapy (progressive delays of bedtimes and wake times until reaching the desired alignment) can be disruptive and unacceptable to clients (Czeisler et al., 1981; Thorpy, Korman, Spielman, & Glovinsky, 1988; Weitzman et al., 1981). Hence, TranS-C-Youth aims to help youth establish habits that make use of natural morning light and evening dim light with client-selected electronic curfews.

Table 4
RISE-UP Routine

· Refrain from snoozing
· Increase activity
· Shower or wash face and hands
· Expose yourself to sunlight
· Upbeat music
· Phone a friend

Daytime Impairment

The rationale for including this module is twofold. First, nighttime and daytime impairment can be at least partly functionally independent (Lichstein, Durrence, Riedel, & Bayen, 2001; Neitzert Semler & Harvey, 2005). Second, we all need to develop skills to cope the day following a night of poor sleep that we will all have now and then. For example, an unhelpful but commonly held belief is that "the only way one can feel less tired in the day is to sleep more." We have developed an experiment to help the client to experience the energy-generating effects of activity (Ree & Harvey, 2004). We begin this module by reviewing a diary in which sleep and energy during the day have been tracked daily for about a week. In examining the diary together, we point out examples where there is a discrepancy between the night and the day (i.e., when nighttime sleep was good but energy levels in the day were poor *and* when nighttime sleep was poor but energy levels during the day were good). Often this allows us to introduce the following idea: "Well that's really interesting. So if sleep isn't the full account of how you feel during the day then there must be other things that can account for it." Together, we brainstorm possibilities and write them down (e.g., the work I had to do that day was boring or stressful, I had a fight with my girlfriend).

We then devise and complete the generating energy vs. conserving energy experiment. We try to devise the experiment collaboratively and to target the following beliefs: "Energy is increased only by rest or sleep" and "I don't have much energy, so I need to take care to conserve it." We hope to use the experiment to illustrate that "There may be factors other than sleep that influence energy levels." The energy-generating experiment typically looks something like this (but adapt/individualize for your client). Specific target belief: *"The only way I can get my home project done is to nap when I get home."* Youth prediction about what might happen in the experiment: *"After a nap I am better able to do my home project and the nap has nothing to do with my nighttime sleep."* The experiment itself can take various forms but one option would be to compare 2 days of doing as you usually do (i.e., nap) versus 2 days do the opposite (and brainstorm exactly what that would be: exercise, sunlight, visit with a friend, etc.). We devise a way to collect data on your client's observations. For example, we often ask teens to text their therapist a rating from 1 to 10 of how they felt after the nap, how their home project went, and we carefully examine the sleep diary that night. The client typically gets to learn that there are many factors that influence their energy levels during the day. In particular, we usually end up concluding that daytime energy levels are like elastic: they can be stretched quite easily. This is in contrast to the original view that energy levels progressively deplete throughout the day. We are then well positioned to start to develop a list of energy-generating and energy–sapping activities to better manage daytime tiredness.

Unhelpful Beliefs About Sleep

There is data in adults showing that altering unhelpful beliefs about sleep is important for outcome (e.g., Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001). Holding unhelpful beliefs is common and include the following: "The TV helps me fall asleep," "There is no point going to bed earlier because I won't be able to fall asleep," "Sleep is a waste of time," and "I can train myself to get less sleep." We use guided discovery and individualized experiments to test the validity and utility of the beliefs (Harvey, Sharpley, Ree, Stinson, & Clark, 2007; Ree & Harvey, 2004).

Maintenance of Behavior Change

The goal is to consolidate gains and prepare for setbacks using an individualized summary of learning and achievements. In the second to last session of the course of treatment we start to prepare for creating a summary video of the "top 5 tips." This might be in the form a commercial for other teens or in the form of a mock interview with a journalist. We record the movie in the last session as a way to consolidate learning and treatment gains. The movie is just for the teen—no one else will see it unless the teen decides to share it. If your client doesn't want to make a commercial, he/she might consider drawing a comic strip or writing a song—any activity that will help consolidate learning. Feel free to be creative! Our thinking is that linking the summary of all of the learning gleaned across TranS-C to a novel and fun task will create a stronger learning experience and promote better memory for treatment (Harvey, Lee, et al., 2014).

Optional Modules

If Average Sleep Efficiency Is Less Than 85% on 7 Days of Sleep Diary

Sleep efficiency is calculated by the following formulae: Total Sleep Time/Time in Bed × 100. If sleep efficiency is less than 85% across a 7-day sleep dairy, we follow stimulus control (Bootzin, 1972) and sleep restriction (Spielman, Saskin, & Thorpy, 1987) procedures to limit time in bed to the time slept, and then to gradually increase back to an optimal sleep time. Basic stimulus control instructions (e.g., "only go to bed when sleepy") are occasionally modified to reduce risk of goal-seeking and/or rewarding behaviors that reduce sleep opportunity. As these strategies can cause some short-term sleep deprivation, it is important that they be delivered with wisdom. For example, when delivering sleep restriction it is very important to not

recommend an amount of sleep that would be risky to youth who are driving or operating tools at work. This is an optional module because we find that many of our youth clients exhibit acceptable sleep efficiency as calculated with the daily sleep diary.

If Average Time in Bed Is Too Long

Spending too much time in bed often contributes to depression, low self-esteem, unemployment, and disrupted social networks. Hence, the goal of this intervention is to reduce time in bed to a reasonable amount of time given the developmental stage of the client. To achieve this, we set goals for the night and goals for each day. In terms of the goals for the night, we slowly reduce time in bed week by week, usually in 30- to 60-minute increments to allow for a sense of mastery. We set goals for the day because "having nothing to get up for" seems to be a key contributor to spending too much time in bed. Then one small step toward these goals is set for the coming week and possible obstacles are identified and problems encountered are solved.

If Bedtime Is Later Than Preferred

When clients have a later bedtime than they prefer, we work collaboratively with our client to progressively move their bedtime earlier by 20 to 30 minutes per week. The circadian system can tolerate larger shifts but, as described earlier, we tend adopt 20 to 30 minutes as it is small enough that the circadian system can adapt and to ensure the youth can experience mastery. To support the earlier bedtimes we review the importance of regularity in wake up *and* bedtime, referring back to their sleep diary to check regularity/variability, we note that the homeostatic sleep drive helps us to feel sleepy at night and can be discharged by late afternoon or evening naps. We also create a plan of action on paper with the teen to achieve this. Then we review strategies to enhance success with advancing the bedtime: (a) ask if your client would like to consider setting *themselves* an electronic curfew and earlier bedtime (e.g., setting cell phone alarm); (b) would they like to secure support from family and friends; (c) would they like to use an alarm clock to maintain regular wake time; (d) brainstorm alternate strategies to daytime napping or caffeine use; and (e) emphasize key points about the circadian rhythm with a focus on delayed phase, such as that we keep our biology in alignment by encouraging light exposure at around the same time each morning and that the circadian system is the conductor of the orchestra of biological clocks—it helps to keep bedtime and rise times consistent to keep the orchestra "in tune."

If Client Excessively Worries About Sleep

As anxiety is antithetical to sleep (Espie, 2002), we offer a menu of options to help youth who report that it's difficult to sleep because of worry, rumination, or experiencing vigilance including diary writing, a scheduled "worry period" and imagery. Where these simple offerings are not helpful, we introduce formal cognitive therapy. The cognitive therapy "bibles" are so helpful (Beck, Rush, Shaw, & Emery, 1979; J. Beck, 2005) and their application in the context of sleep problems has also been described (Harvey, 2005a, 2005b; Harvey, Bélanger, et al., 2014).

We also introduce the adverse consequences of thought suppression. For example, as soon as a client mentions a thought like "I try to suppress my thoughts" or "Then I try to clear my mind," we do the white bear experiment to illustrate the paradoxical effects of thought suppression. The white bear experiment involves asking your client to find a comfortable seating position with eyes closed. Then the individual spends several minutes trying to suppress all thought, particularly thoughts of big white fluffy polar bears (or something that you know your client really likes, be it cars, football teams, cats, etc.). Do this thought exercise along with your client. After a few minutes, stop and discuss the result. Then explore this experience by asking, "How was that?" and "What do you conclude about the link between suppressing a thought and experiencing a thought?" We use these responses, and share our own experience, to educate youth about the paradoxical effects of thought suppression. Note, in the spirit of the behavioral experiment approach, whereever possible we set up an experience to demonstrate a point by doing rather than just talking about it—*doing* is much more powerful!

Also watch out for clients who punish themselves for not being able to control their thoughts. Unwanted thoughts are normal—normalize them with the aim of reducing some of the distress associated with them. The message to give is to be gentle and kind to yourself. We also consider introducing a self-compassion exercise.

A Note on Parents

During the older teen years and transition to adulthood years, parents have less influence over their son/daughter's sleep, although they may still hold some potential to scaffold and influence their daughter/son's sleep if they all live together. While in general we find it is better not to bring parents of older youth into the session as we would a younger client, with the client's permission we often place phone calls to Mom/Dad between sessions, with the client's permission, to explain our progress and perhaps facilitate change in any parent behaviors that are causing problems for our client's sleep (e.g., making noise in the house).

Conclusion

The rationale for, and scientific basis of, TranS–C-Youth has been described, as have the various modules that comprise TranS-C-Youth. We have aimed to specify the modules in ways that are useful across the age range, although knowing that there will need to be some developmental adaptations for each stage of the lifespan. The overall focus of this effort is to try to produce one protocol that is useful, and adaptable, to many clients who have various sleep problems, across various mental and physical disorders, and across various age ranges so as to contribute to reducing the "too many empirically supported treatments problem" (p. 68) that impedes the dissemination and uptake of treatments (Weisz et al., 2014). Of course, modules may need to be added to respond to different settings and new findings. For example, on the basis of a meta-analysis by Bartel et al. (2014), showing that physical activity is associated with earlier bedtimes and that a negative family environment increases sleep problems in youth, we will consider adding treatment modules to TranS-C to increase physical activity and reduce negative family environment.

While the TranS-C approach described has been derived based on basic science sleep and circadian science, we await the results from a randomized controlled trial (RCT) of the TranS-C approach before we know the extent to which it is an empirically supported treatment. Two RCTs are currently in progress, one for high-risk youth and one for adults with a severe mental illness.

An important question for future research is when to deliver TranS-C-Youth for the many clients who have comorbid mental disorders. We have taken an "interwoven approach" to treating comorbid depression and insomnia—making progress on both disorders in each session—and this was helpful for improving sleep and depression in depressed youth (Clarke et al., 2015). While this approach contrasts with the typical approach of sequentially treating the two disorders (delivering the depression treatment and then the treatment for sleep problems or visa versa), the interwoven approach seems warranted given the evidence that depression and insomnia are mutually maintaining (Sivertsen et al., 2012). Research is also needed to determine *how* to interweave the two treatments. One approach would be to divide session time up, spending 20 to 25 minutes on the comorbid disorder and then 20 to 25 minutes on insomnia. This was the approach we took in Clarke et al. (2015). Another approach would be to target the transdiagnostic processes that maintain *both* disorders. More specifically, there is robust evidence that biases in attention, thought (e.g., worry and rumination), behavior (e.g., avoidance and safety behaviors), memory, and reasoning are common to many mental disorders, including sleep problems (Harvey, Watkins, Mansell, & Shafran, 2004). As such, it may be possible to derive a transdiagnostic treatment for comorbid depression and sleep problems that specifically targets these common processes (Harvey et al., 2004).

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I wish to express gratitude for NIH support (RO1HD071065, RO1MH079188 and R34MH082034) and to the talented clinicians who have influenced this approach, including David M. Clark, Melissa J. Ree, Daniel J. Buysee, Greg Clarke, Charles M. Morin, Ron Dahl, Dana L. McMakin, Rita Smith, Monique Thompson, and Kate Kaplan.

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Received: September 5, 2014
Accepted: June 8 2015
Available online 30 July 2015