Time Out of Mind: Temporal Perspective in Adults With ADHD

Journal of Attention Disorders
XX(X) 1–7

DOI: 10.1177/1087054711398861
http://jad.sagepub.com
SAGE

Maria G. Carelli[1] and Britt Wiberg[1]

Abstract

Objective: ADHD is often associated with difficulties in planning and time management. In this study, the authors examined the hypothesis that these functional problems in ADHD reflect systematic biases in temporal orientation. **Method:** To test this hypothesis, adults with ADHD (n = 30) and healthy controls (n = 60) completed the Swedish version of the Zimbardo Time Perspective Inventory (S-ZTPI). **Results:** Although a majority of the ADHD participants were tested under stimulant medication, they showed significant differences in all the six subscales of the S-ZTPI. Logistic regression analysis, with age, education, depression, and response inhibition as covariates, showed that the Future Positive Scale was the primary predictor of ADHD status. **Conclusion:** These findings suggest that ADHD is associated with systematic biases in habitual time orientation and that these differences may contribute to functional problems in ADHD. (*J. of Att. Dis. 2011; XX(X) 1-XX*)

Keywords

ADHD, time perspective, response inhibition, depression

ADHD comprises a constellation of symptoms, including inattention, hyperactivity, and impulsivity. Related to these diagnostic symptoms, ADHD is also associated with a variety of functional problems, including deficits in planning, organization, and time perspective. Consistent with these observations, experimental studies involving children and adults suggest that time perception is compromised in ADHD (e.g., Barkley, Koplowitz, Anderson, & McMurray, 1997; Kerns, McInerney, & Wilde, 2001; Meaux & Chelonis, 2003; see also Toplak, Dockstader, & Tannock, 2006, for a review). For example, Barkley et al. (1997) asked school-aged children with ADHD to reproduce varying durations. Specifically, participants first observed a red light for some seconds and then reproduced its duration by means of a flashlight. Barkley et al. observed that children with ADHD reproduced stimulus durations less accurately and more variably than healthy children.

Although past research suggests that time perception is impaired in ADHD, these effects are not clear. Toplak et al. (2006) reviewed research on temporal information processing in ADHD. Collapsing across methodological differences, they found that significant group differences have been observed in a majority of studies involving duration discrimination and duration reproduction but not in verbal estimation and anticipation tasks. Furthermore, as noted by Toplak et al., these selective effects were also mediated by task characteristics, ADHD subtype, comorbidity, and medication effects.

Another limitation of past research is that most studies on temporal information processing in ADHD have involved psychophysically oriented timing tasks with discrete stimuli and brief stimulus durations. This work has provided important insights into temporal information processing in ADHD and related disorders. However, group differences in, for example, time reproduction may not necessarily reflect ADHD-related functional problems, including difficulties in planning and time management in everyday contexts. Specifically, most experimental studies are consistent with clinical observations suggesting that frontal-lobe patients and individuals with ADHD have marked difficulties in timekeeping in everyday activities (e.g., Maté, 1999; see also Davidson, 2008). However, it should be noted that such observations and anecdotes refer to very different time frames and contexts than those involved in psychophysical methods of interval timing.

As time and temporal information processing are complex and content multilevel constructs, it is reasonable to assume that ADHD-related difficulties in planning and timekeeping do not only reflect impairments in motor

[1]Umeå University, Umeå, Sweden

Corresponding Author:
Maria G. Carelli, Department of Psychology, Umeå University, SE 901 87 Umeå, Sweden
Email: grazia.carelli@psy.umu.se

timing and duration judgments; instead, differences and biases in how the individual views his or her past experiences and future challenges might also contribute to functional problems in ADHD. In other words, the primary symptoms of ADHD might have systematic biases on the individual's perceptions of past experiences, current situations, and future expectations. These differences in temporal perspective (TP; Zimbardo & Boyd, 1999; see also Lewin, 1951; Nuttin, 1964) might contribute to functional problems in ADHD by affecting everyday judgments and actions.

The concept of TP has a long and controversial history among philosophers and psychologists. For example, Kant (1781/1965) argued that time perspective "richly colored" the way people experience the world, and later existential philosophers and psychologists expounded on his notion of time (Heidegger, 1927; Husserl, 1964; see also James, 1890/1950). The Gestalt psychologist Lewin (1942) considered the influence of both the past and the future on behavior. According to Lewin (1951), time perspective is part of the individual's orientation of psychological past and future existing at a given time, and he defined time perspective as "the totality of the individual's views of his psychological future and his psychological past existing at a given time" (p. 75). Nuttin (1985) extended Lewin's conception of time-filled life space and asserted that "future and past events have an impact on present behavior to extent that they are actually present on the cognitive level of behavioral functioning" (p. 45). Both Lewin and Nuttin considered time perspective as a dynamic concept in that people can select the perspective that best meets present objectives. Furthermore, distinctive time perspectives are expected to be shaped by contextual factors.

Although temporal information processing has been extensively studied in past research, our knowledge of ADHD-related changes in temporal orientation is virtually nonexistent, possibly because of methodological limitations in its assessment (Carelli & Wiberg, 2009). In spite of its intuitive appeal and relatively long history, most past tests of TP were associated with low reliability and questionable validity. To reduce these measurement problems, Zimbardo and Boyd (1999) developed a test instrument, referred to as the Zimbardo Time Perspective Inventory (ZTPI) that has served an important role in integrating research on TP. The ZTPI overcomes several past limitations, including the possibility to *simultaneously* investigate the past, present, and future time frames. The ZTPI comprises five factorially distinct subscales, each of which captures a coherent time-perspective dimension (see also the Method section).

Following reasoning outlined above, ADHD-related problems in everyday planning and time management alone might not reflect difficulties in time perception and duration judgments; instead, inattention, impulsivity, and hyperactivity (and related symptoms in ADHD) also might affect perceptions of the past, present, and future, and these differences in TP might have systematic effects on goal-directed behavior in everyday activities.

Both Barkley's (1997) model and Sonuga-Barke's (2003, 2005) dual-pathway model of ADHD would be consistent with the hypothesis that ADHD is associated with systematic biases in TP. Specifically, it would be reasonable to assume that ADHD-related difficulties in executive control functions or inappropriate functioning of the reward system (or a combination of these factors) contributes to a more spontaneous and present-oriented, and less reflective and future-oriented approach in goal-directed behavior. To test this hypothesis, adults with ADHD and healthy controls completed the Swedish version of the ZTPI (S-ZTPI Carelli, Wiberg & Wiberg, in press).

Method

Participants

Ninety adults between 19 and 54 years of age participated in the study. The ADHD group consisted of 30 adults between 19 and 50 years, and the non-ADHD control group comprised 60 adults between 20 and 54 years (see also Table 1). To recruit ADHD participants, we first contacted the clinic head of each outpatient clinic in Northern Sweden. After approval, each clinic informed their patients about participation in the study and booked time for testing those individuals who were interested. The remaining 9 ADHD participants were recruited through professional contacts with a national ADHD association and local clinics. The ADHD patients who participated in the study were earlier diagnosed by the health professionals of each clinic. Following the clinical practice, these evaluations were based on the diagnostic criteria for assessing ADHD according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association [APA], 1994). Furthermore, to reduce comorbidity effects, each clinic was instructed to exclude patients with other neuropsychiatric disorders. Because of clinical and practical restrictions, it was not possible to prevent medication during the test period. Consequently, 23 of the ADHD participants were tested under their ordinary medication, and all but one of these ADHD participants were under methylphenidate (MPH) medication. It should also be noted that the participants of the ADHD group provided a rather representative sample of (Swedish) ADHD adult patients as they were recruited from six different outpatient clinics. A majority of the adult patients had attention deficits, but because of the restrictions of the clinics, we could not calculate the exact percentage of each ADHD subtype

Table 1. Participant Characteristics (With Standard Deviations in Parenthesis)

	ADHD	Control	Statistic
n (male/female)	30 (13/17)	61 (30/31)	
Age	30.80 (12.79)	29.89 (10.55)	0.53
Education	11.65 (2.27)	12.97 (2.43)	2.47*
BDI-II	11.03 (10.81)	5.97 (6.98)	2.69**
Stroop	368 (215)	261 (125)	2.95**

Note: BDI-II = Beck Depression Inventory–II.
*$p < .05$. **$p < .01$, based on independent t tests ($df = 89$).

(*DSM-IV*; APA, 1994). Participants of the control group were recruited through informal contacts with different workplaces. When recruiting these individuals, we attempted to match their demographic background (including age, gender, level of education, and living arrangements) with that of the ADHD group. Furthermore, half of the controls were matched with the ADHD group in that they were recruited from the same city and they had similar living conditions and demographic background as the ADHD subgroup. The remaining controls were recruited from different workplaces around the campus area, with a large proportion of university students as participants. None of the controls had any obvious health problems, including psychiatric symptoms. To obtain additional information about demographic background and health status, each participant was interviewed before the test session. Furthermore, to assess individual differences in executive functioning and depression, both groups completed the color Stroop task (see the following sections for details) and the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). Table 1 summarizes the background characteristics of both groups. As expected, there were significant group differences in education, depression, and response inhibition, respectively.

Tasks Characteristics

To examine ADHD-related differences in temporal orientation, we used the S-ZTPI (Zimbardo & Boyd, 1999) and healthy controls completed the Swedish version of the ZTPI (S-ZTPI, Carelli, Wiberg & Wiberg, in press). The S-ZTPI contains 64 items that measure six subscales: Past Negative (PN), Past Positive (PP), Present Hedonistic (PH), Present Fatalistic (PF), Future Negative (FN), and Future Positive (FP). This latter scale is an extension of the ZTPI, which only includes one future dimension. The S-ZTPI was recently validated by using a large population-based sample of adults (see Carelli, Wiberg, & Wiberg, in press, for details). As in the original ZTPI (Zimbardo & Boyd, 1999), participants were asked to read each item and to determine "How characteristic or true is this of you?" They responded to questions by using a 5-point scale, with 1 = *very uncharacteristic* and 5 = *very characteristic*.

To assess group differences in response inhibition, participants completed the Stroop task (Stroop, 1935). In this task, a series of 96 word triples was presented on the computer screen (see also Carelli, Forman, & Mäntylä, 2008; Del Missier, Mäntylä, & Bruine de Bruin, 2010; Mäntylä, Carelli, & Forman, 2007). The central word of the triple (stimulus word) was printed in color (blue, green, yellow, or red) at the center of the screen. In half of the trials, the color of the printed word was congruent with the stimulus word (e.g., the word "red" was printed in red), whereas in the other half, it was incongruent (e.g., the word "red" was printed in blue). The two adjacent words also referred to color names (blue, green, yellow, red) but were always printed in black. Participants were asked to identify the color in which the central word was printed by pressing one of the two keys to respond. The first key was on the right side of the computer keyboard and marked with a right arrow, whereas the second, on the left side of the keyboard, was marked with a left arrow. Participants were instructed to press the right arrow to indicate that the color of the central word corresponded to the word presented in the right side of the screen, whereas pressing the left arrow meant that the color of the central word was designated by the black word presented in the left side of the screen. We asked participants to be fast and accurate, and they underwent a short series of training trials before starting the test. We used two dependent measures: (a) mean difference in response time between incongruent and congruent items and (b) a more stringent measure that combined speed and accuracy. Specifically, each error corresponded to a 10-ms increment in response time (i.e., Stroop 1 + 10 ms × Number of errors). As the two measures showed virtually identical group differences, only the data based on the stringent scoring are reported here (see Table 1).

Procedure

Participants were tested in quiet rooms under similar conditions at the outpatient clinics or at the university. Participants were informed that the aim of the study was to examine individual differences in planning and time management and that they would be asked to complete two questionnaires and a computerized task. The Stroop task was completed by using a laptop computer with a 14-inch display. Some participants completed additional cognitive tasks, but these data are not reported here. The whole test session took about 45 min to complete, including a background interview and short breaks.

Table 2. Pearson Correlations for S-ZTPI, BDI-II, and Stroop

	BDI-II			Stroop		
S-ZTPI	ADHD (*n* = 29)	Control (*n* = 61)	Total (*N* = 89)	ADHD (*n* = 29)	Control (*n* = 59)	Total (*N* = 88)
Past Negative	.34	.19	.34**	.01	−.01	.11
Past Positive	−.48**	−.12	−.40**	−.29	.24	−.20
Present Hedonistic	.05	.23	.22*	.23	.01	.18
Present Fatalistic	.49**	.25*	.43**	.20	.02	.19
Future Negative	.28	.31*	.35**	.01	−.18	−.01
Future Positive	−.23	.18	−.15	−.31	−.08	−.29**

Note: S-ZTPI = Swedish version of the Zimbardo Time Perspective Inventory; BDI-II = Beck Depression Inventory–II.
*$p < .05$. **$p < .01$.

Results

The S-ZTPI data were obtained by calculating mean scores for each of the subscales (see also Carelli et al., in press). One participant in the control condition provided incomplete responses and these data were not included in the analysis.

Table 2 shows bivariate correlations for the TP data in relation to response inhibition and depression. These data suggest significant correlations between TP and depression in that participants with high BDI scores were more past negative and less past positive than participants with lower BDI scores, and these effects were accentuated in the ADHD group. Similarly, depression was associated with the PF and FN orientations, respectively. The PF orientation showed a highly positive correlation with BDI in the ADHD group.

Individual differences in response inhibition, as measured by the color Stroop task, were not associated with TP, except for the FP scale. Specifically, participants with more efficient response inhibition were more future positive in their orientation than participants with less efficient executive control functions. Although only marginally significant, this correlation was accentuated in the ADHD group.

Table 3 summarizes the S-ZTPI data as a function of group. These data suggest group differences in all six subscales of S-ZTPI. Specifically, compared with the control group, the ADHD group showed higher mean ratings in the PN scale and lower ratings in the PP scale. Furthermore, the ADHD group was more present oriented than the controls, measured in both PH scale and PF scale. Finally, the ADHD showed somewhat higher ratings in the FN scale and lower mean ratings in the FP scale.

The TP data were submitted to a MANOVA with group (ADHD vs. control) as a between-subjects factor and the six scores as dependent variables. The MANOVA yielded a significant main effect for group, Wilks's $\lambda = 0.545$, $F(6, 87) = 12, 11$, $p < .01$. Separate tests of between-subjects effects yielded significant main effects in all six scales (see Table 2 for the F values).

Table 3. The S-ZTPI Data as a Function of Group (With Standard Deviations in Parenthesis)

S-ZTPI	ADHD	Control	Statistic	Effect size
Past Negative	3.27 (0.77)	2.63 (0.63)	17.31**	.16
Past Positive	2.85 (0.73)	3.77 (0.51)	49.17**	.36
Present Hedonistic	3.72 (0.58)	3.41 (0.44)	7.62**	.08
Present Fatalistic	2.89 (0.70)	2.44 (0.50)	12.20**	.12
Future Negative	2.93 (0.72)	2.58 (0.59)	5.74*	.06
Future Positive	2.67 (0.65)	3.41 (0.69)	23.74**	.24

Note: S-ZTPI = Swedish version of the Zimbardo Time Perspective Inventory. Effect size = partial η^2.
*$p < .05$. **$p < .01$, based on separate one-way ANOVAs ($df = 1, 89$).

It should be noted that the effect sizes were low for the significant groups differences in Present concerning specifically the significant difference between PH and FN scales, respectively.

To examine the relative power of the six TP measures to predict ADHD status, we completed a logistic regression analysis, with age, education, BDI-II, and Stroop as covariates. In this analysis, the six S-ZTPI scores were entered as a separate block in the final equation. Table 4 summarizes the outcome of these analyses. As can be seen, the PP and FP measures were the only significant predictor of ADHD status. It should also be noted that the PF scale was a marginally significant ($p < .08$) predictor of ADHD status.

Discussion

The study examined temporal orientation in adults with ADHD. We reasoned that ADHD-related difficulties in

Table 4. Summary of Logistic Regression Analysis Predicting ADHD Status

Variable	*B*	*SE*	Wald
Age	–0.03	0.04	0.80
Education	0.14	0.16	0.78
BDI-II	–0.07	0.06	1.44
Stroop	–0.01	0.01	0.89
Past Negative	–0.71	0.80	0.79
Past Positive	1.57	0.79	3.93*
Present Hedonistic	–1.76	1.03	2.91
Present Fatalistic	2.08	1.27	2.70
Future Negative	–1.10	0.69	2.50
Future Positive	2.55	0.95	7.25**

Note: BDI-II = Beck Depression Inventory–II.
*$p < .05$. **$p < .01$.

planning and temporal coordination might not only reflect impairments in motor timing and duration judgments, such as duration discrimination and duration reproduction, but that systematic biases in TP might also contribute to functional problems in ADHD.

The results of this study suggested clear ADHD-related differences in temporal orientation, as measured by the S-ZTPI. The two groups showed a different pattern of past orientation in that the mean of the ADHD group was greater than that of the control group for the PN items (e.g., I think about the bad things that had happened to me in the past) and lower than that of the PP items (e.g., It gives me pleasure to think about my past). It should be noted that the effect size was larger in the PP scale than in the PN scale. Furthermore, the ADHD group was more present oriented than the control group, both in terms of PH items (e.g., I do things impulsively; I make decisions at the spur of the moment) and PF items (e.g., Fate determines much in my life; As whatever will be will be, it does not really matter what I do)- with rather small effect sizes in both scales. Furthermore, the ADHD group showed a more negative view of the future than the control group (e.g., I often think that I do not have time for everything I have planned to do in a day). Finally, logistic regression analysis suggested that the PP and FP scales were the primary predictors of ADHD status while differences in education, depression, and response inhibition were taken into consideration.

Taken together, the present findings suggest that ADHD-related disorders are associated with a distinct pattern of temporal orientation in that adults with ADHD are more present oriented and that their view of the past is more negative and less positive than that of the controls. Similarly, their future perspective was more negative than that of the participants in the control group with the lowest agreement with the future-oriented ("positive") statements that involve planning, organization, and timekeeping (e.g., I make lists of things to do; I believe that a person's day should be planned ahead each morning).

The present findings are consistent with the hypothesis that ADHD is associated with a present-oriented, rather than future-oriented, TP, possibly because of difficulties in higher cognitive control functions and reward regulation. Supporting this line of reasoning, our findings also suggest that participants with less spontaneous cognitive style (i.e., more efficient response inhibition) were more future oriented than participants with more efficient impulse control.

Another central finding of this study was that individual and pathological differences in depression were systematically related to TP. Toplak et al. (2006) noted that few studies have examined the influence of subtype and comorbidity on temporal information processing in ADHD. The presence of comorbid disorders on temporal information has been examined by Barkley, Edwards, Laneri, Fletcher, and Metevia (2001), and Barkley, Murphy, and Bush (2001), and they reported that oppositional defiant disorder and depression symptomology did not affect time-perception performance but that level of anxiety made an additional contribution to ADHD symptoms.

These findings are consistent with our unpublished studies involving participants with a variety of symptoms. Specifically, we have observed a systematic pattern between psychopathology and TP in that persons with anxiety problems have difficulties in their present orientation and are focused on the future (compare. worry) as measured by the S-ZTPI (Carelli & Wiberg, 2009). By contrast, persons with depression are primarily past oriented and they also have temporal distortions in which negative effects are "colouring" both the past (PN) and the future (FN) scales of the S-ZTPI (Wiberg & Carelli, 2009).

Although our findings extend previous research on temporal information processing in ADHD, several limitations of the study should be acknowledged. First, due to practical restrictions, each clinic was responsible for both the recruitment and diagnosis of ADHD participants. Because of the small sample size and clinical restrictions, it was not possible to relate differences in TP to ADHD subtypes. Another limitation of the study was that a majority of the ADHD participants were tested under stimulant medication. However, it should be noted that these effects should have worked against our hypotheses by reducing ADHD-related effects in TP and higher cognitive functions.

One can also raise the question whether the administration of stimulant medication may influence the capacity to accurately reproduce time intervals? There are few available studies addressing whether temporal information processing in ADHD is influenced by stimulant medication (e.g., Abikoff et al., 2009; Baldwin et al., 2004; Barkley, 1997; see also Toplak et al., 2006). However, the observed effects of stimulant medication are rather limited. For example, Abikoff et al. (2009) reported that MPH reduced children's problems in organization and time management (as measured by parental and teacher ratings), whereas Baldwin et al. (2004) did not observe any effect of MPH on time-production performance in ADHD children.

An important avenue for future work would be to examine the relationship among TP, duration judgment, and executive functioning in a variety of psychopathologies. We believe that the TP construct, combined with valid and reliable measurement tools, may have important practical importance, including clinical assessment and helping individuals with ADHD to increase their awareness of systematic biases in habitual time orientation.

Acknowledgments

The authors wish to thank Stina Gullberg and Johanna Still for their assistance in data collection.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

Financial Disclosure/Funding

The author(s) disclosed the receipt of the following financial support for the research and/or authorship of this article: This study was financed by the Swedish Research Council, research project 220037 100 VR.

References

Abikoff, H., Nissley-Tsiopinis, J., Gallagher, R., Zambenedetti, M., Seyffert, M., Boorady, R., & McCarty, J. (2009). Effects of MPH-OROS on the organizational, time management, and planning behaviors of children with ADHD. *Journal of the American Academy of Child & Adolescents Psychiatry, 48*, 166-175.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Baldwin, R. L., Chelonis, J. J., Flake, R. A., Edwards, M. C., Feild, C. R., Meaux, J. B., & Paule, M. G. (2004). Effect of methylphenidate on time perception in children with attention-deficit/hyperactivity disorder. *Experimental and Clinical Psychopharmacology, 12*, 57-64.

Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin, 121*, 65-94.

Barkley, R. A., Edwards, G., Laneri, M., Fletcher, K., & Metevia, L. (2001). Executive functioning, temporal discounting, and sense of time in adolescents with attention deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD). *Journal of Abnormal Child Psychology, 29*, 541-556.

Barkley, R. A., Koplowitz, S., Anderson, T., & McMurray, M. B. (1997). Sense of time in children with ADHD: Effects of duration, distraction, and stimulant medication. *Journal of International Neuropsychological Society, 3*, 359-369.

Barkley, R. A., Murphy, K. A., & Bush, T. (2001). Time perception and reproduction in young adults with attention deficit hyperactivity disorder. *Neuropsychology, 15*, 351-360.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory–II* (2nd ed.). San Antonio, TX: The Psychological Corporation.

Carelli, M. G., Forman, H., & Mäntylä, T. (2008). Sense of time and executive functioning in children and adults. *Child Neuropsychology, 14*, 372-386.

Carelli, M. G., & Wiberg, B. (2009). *Future time perspective as a predictor of anxiety.* Unpublished manuscript, Department of Psychology, Umeå University, Sweden.

Carelli, M. G., Wiberg, B., & Wiberg, M. (in press). Development and construct validation of the Swedish Zimbardo Time Perspective Inventory (S-ZTPI). *European Journal of Psychological Assessment*.

Davidson, M. A. (2008). ADHD in adults: A review of the literature. *Journal of Attention Disorders, 11*, 628-641.

Del Missier, F., Mäntylä, T., & Bruine de Bruin, W. B. (2010). Executive functions in decision making: An individual differences approach. *Thinking & Reasoning, 16*, 69-97.

Heidegger, M. (1927). *Being and time.* Halle, Germany: Niemeyer.

Husserl, E. (1964). *Phenomenology of internal time consciousness* (J. Churchill, Trans.). Bloomington: Indiana University Press.

James, W. (1950). *The principles of psychology* (Vol. 1). New York, NY: Dover. (Original work published 1890)

Kant, I. (1965). *Critique of pure reason* (N. Smith, Trans.). New York, NY: St. Martin's. (Original work published 1781)

Kerns, K. A., McInerney, R. J., & Wilde, N. J. (2001). Time reproduction, working memory, and behavioral inhibition in children with ADHD. *Child Neuropsychology, 7*, 21-31.

Lewin, K. (1942). Time perspective and morale. In G. Lewin (Ed.), *Resolving social conflicts* (pp. 103-124). New York, NY: Harper.

Lewin, K. (1951). *Field theory in the social sciences: Selected theoretical papers*. New York, NY: Harper.

Mäntylä, T., Carelli, M. G., & Forman, H. (2007). Time monitoring and executive functioning in children and adults. *Journal of Experimental Child Psychology, 96*, 1-19.

Maté, G. (1999). *Scattered minds: A new look at the origins and healing of attention deficit disorder.* Toronto, Canada: A. A. Knopf.

Meaux, J., & Chelonis, J. (2003). Time perception differences in children with and without ADHD. *Journal of Pediatric Health Care, 17*, 64-71.

Nuttin, J. R. (1964). The future time perspective in human motivation and learning. *Acta Psychologica, 23*, 60-83.

Nuttin, J. R. (1985). *Future time perspective and motivation: Theory and research method*. Hillsdale, NJ: Erlbaum.

Sonuga-Barke, E. J. S. (2003). The dual pathway model of AD/HD: An elaboration of neuro-developmental characteristics. *Neuroscience & Biobehavioral Reviews, 27*, 593-604.

Sonuga-Barke, E. J. S. (2005). Causal models of attention-deficit/hyperactivity disorder: From common simple deficits to multiple developmental pathways. *Biological Psychiatry, 57*, 1231-1238.

Stroop, J. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18*, 643-662.

Toplak, M. E., Dockstader, C., & Tannock, R. (2006). Temporal information processing in ADHD: Findings to date and new methods. *Journal of Neuroscience Methods, 151*, 15-29.

Wiberg, B., & Carelli, M. G. (2009). *Depressed affect and time perspective: Clinical implications*. Unpublished manuscript, Department of Psychology, Umeå University, Sweden.

Zimbardo, P., & Boyd, J. N. (1999). Putting time in perspective: A valid, reliable individual-differences metric. *Journal of Personality and Social Psychology, 77*, 1271-1288.

Bios

Maria G. Carelli, PhD, is an associate professor at the Department of Psychology, University of Umeå, Sweden. Her current research interests are within the field of developmental psychology and clinical psychology. She heads two research projects regarding the role of adult's and children's time perspective in personality, psychopathology, and cultural contexts. Both projects are funded by the Swedish Research Council.

Britt Wiberg, PhD, is a university lecturer and director of the psychology clinic at the Department of Psychology, Umeå University, Sweden. She is a licensed clinical psychologist and psychotherapist, and supervisor of psychotherapy. Her clinical and research interests are in time perspective, psychopathology, attachment, and the outcome and processes in psychotherapy.