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A pace of life indicator. Development and validation of a General Acceleration Scale

Jens Bergener
Department of Social Transformation and Sustainable Digitalization, Technical University of Berlin, Institute for Ecological Economy Research, Berlin, Germany

Tilman Santarius
Department of Social Transformation and Sustainable Digitalization, Technical University of Berlin, Institute for Ecological Economy Research, Einstein Centre Digital Futures, Berlin, Germany

Abstract

Ever since Georg Simmel (1895) introduced the notion into sociological accounts of modernity, scholars have tried to empirically test the claim of an increasing "speed of life" in modern society. The acceleration of speed or pace of life has been characterized as an "intensification" of our experience of time, a "time squeeze," and "hurriedness" in leisure time. However, to date, no comprehensive instrument, scale, or indicator has been developed that is grounded in solid theory and serves to empirically measure and compare the pace of life in a straightforward manner. The purpose of this research is to develop and validate a scale-based measure that reveals whether individuals pursue a fast or slow pace of life in a leisure-time context. The result is the fifteen-item General Acceleration Scale (GAS), which conceptually rests on the comprehensive theory of social acceleration by Hartmut Rosa (2013). The scale systematically tests the pace of life along four temporal strategies of speedup: performing activities faster,

Corresponding author:
Tilman Santarius, Department of Social Transformation and Sustainable Digitalization, Technical University of Berlin, Institute for Ecological Economy Research, Einstein Centre Digital Futures, Marchstraβe 23, D-10578 Berlin, Germany.
Email: santarius@tu-berlin.de

doing multitasking, replacing time-consuming by time-saving activities, and filling breaks or waiting times with productive activities. If these temporal strategies form a consistent pattern, they consequently lead to an increase in the rate, speed, or relative density of experiences and activities per unit of time and thus to an increase in the pace of life. Validation of the GAS was completed by a large sample (N = 1161) as part of a self-report online survey in Germany in 2019. We examined the convergent and discriminant validity as well as internal consistency reliability of the scale and conducted a confirmatory factor analysis via maximum likelihood estimation. Control variables and discriminant measures were included to access construct validity. Overall, we can validate the GAS as a reliable measure of time use that can be used as a straightforward pace of life indicator.

Keywords
Pace of life, social acceleration, time use, leisure time, quantitative research

Manifold studies have addressed the "speedup of life" (Garhammer, 2002; Robinson and Godbey, 1997) in modern society, which has led to a sense of "intensification" of our experience of time, feelings of "busyness" (Hassan, 2009), a "time squeeze" (Southerton and Tomlinson, 2005), and "hurriedness" in leisure time (Linder, 1970; Schor, 1991). While these studies mark important steps for the understanding of the concept, some scholars have addressed the need for more refined ways of theorizing the concept of "social acceleration" (Hassan, 2009) and the demand to connect this part of social theory with detailed empirical studies (Wajcman 2008: 59). This study intends to make a contribution to both of these issues.

Rosa's (2003, 2013, 2016) work serves as a complex and descriptive contribution to the social acceleration debate. Building on manifold previous empirical and theoretical studies, he suggests that societies in late modernity are characterized by an increased frequency of activities per unit of time and hence by an acceleration of the pace of life (Rosa, 2013). Moreover, Rosa's theory of social acceleration offers an empirically verifiable approach toward the speeding up of the pace of life and a solid conceptual foundation.

Rosa specifically describes four temporal strategies that lead to an acceleration of the pace of life (2013: 128–129). Rosa's "four ways" include (i) speeding up the pace with which activities are performed. For example, individuals can shorten the duration of eating by chewing or swallowing faster, or likewise they can increase the speed of typing a given text on a keyboard. A second strategy to accelerate the pace of life is to (ii) perform several activities simultaneously, that is, "multitasking (MT)". For example, individuals can stream videos and do household work at the same time. Third, a faster pace of life can be achieved by

(iii) reducing breaks and downtime between activities. For example, waiting times (WTs) at the doctor's or a ride on public transportation can be used to check a smartphone, read a book, or engage in other productive activities. Finally, (iv) time-consuming activities can be replaced by time-saving activities, for example, taking a plane instead of a train or car to travel a long distance.

Yet while Rosa's work is widely cited, it has been recently criticized from various epistemic and methodological positions (Gershuny and Sullivan, 2017; Sharma, 2014; Vostal, 2014; Wajcman, 2015). Moreover, qualitative and theoretical reexaminations of Rosa's theory have been produced (see, e.g. Hsu and Elliott, 2014; Torres, 2016; Vostal, 2014, 2019). Even so, the empirical evaluation of Rosa's "four ways" to accelerate the pace of life has not yet been addressed; only a few studies have tried to empirically verify certain other aspects of Rosa's theory (Lorenz-Spreen et al., 2019; Schöneck, 2018; Ulferts et al., 2013).

In the empirical literature, various measurements for the analysis of temporal dimensions are available, some of which are related to speed. However, only a few studies have developed (quantitative) indicators to account for aspects of an increasing speed of social actions. Moreover, no reliable instrument, scale, or indicator exists to empirically measure the actual pace of life in a straightforward manner. In this study, we therefore introduce a new scale-based measure–the General Acceleration Scale (GAS). We deliberately operationalize Rosa's "four ways" to represent strategies to accelerate people's pace of life. We validate the GAS and critically discuss its potentials and pitfalls vis-à-vis other existing scales that aim to account for an acceleration of the pace of life. As a contribution to time use theories, the GAS serves to empirically test and validate a significant part of Rosa's theory. As for empirical research on time use, it provides a new tool for measuring, or even a straightforward indicator of, the pace of life.

This study is structured as follows: in the second section of the study, we provide a brief review of the literature with a particular focus on empirical research on the pace of life. In the third section, we present the conceptual framework from which we develop the GAS, and we define key terms used throughout our analysis. The fourth section outlines the operationalization of our methodology and defines all measures applied. The remaining sections present our empirical results and draw conclusions from our analysis, including a discussion on limitations and future research needs.

State of literature on the acceleration of the pace of life

One of the earliest attempts to measure elements of speed in social action was the approach by Jahoda et al. (1933). As part of their research in the small town of Marienthal in 1930s Austria, they measured people's speed of walking and reported a markedly slow walking pace and frequent stopping in their tracks for unemployed men on the streets. Although offering foundational research for the

social scientific understandings of unemployment, the validity of the assumed causality of unemployment and walking speed has been criticized. Since then, measuring individual time-related attitudes or behavior toward time has been a long interest in various disciplines of social science research up to this day.

Empirically grounded and solid approaches have focused particularly on work-life contexts and individual time preferences. Questionnaires for investigating differences of time perception on the individual level include the *Temporal Personality Inventory* (Francis-Smythe and Robertson, 1999). This 43-item scale assesses the behaviors, cognitions, and emotions of five dimensions of temporal personality: awareness of free time, punctuality, planning, polychronicity, and impatience. Francis-Smythe (2006) proposes impatience as the preference for the speed at which to complete a task. High scorers on this factor are associated with controlling the speed of their interactions with other people.

At the individual level, speed has been associated with personality traits like impulsivity (Ortet et al., 2002), sensation-seeking and risk-taking (Westaby and Lowe, 2005), perpetual activation (Wright et al., 1992), and time urgency (Conte et al., 1998). Time urgency characterizes respondents concerned with the passage of time and the way in which they can most efficiently fill that time with productive activity (Landy et al., 1991). For example, the "general hurry" time urgency dimension is defined as the extent to which individuals rush when performing activities. Time urgency dimensions were also related to Type A behavior pattern (Conte et al., 2001) and health problems (Menon et al., 1996). Time urgency constructs particularly allow valuable insights into the extent to which individuals feel pressed for time when performing activities. However, they lack a body of reliability and validity data relating them to the pace of life, while they have also been criticized for their theoretical propositions (Conte, 2007). Constructs of perpetual activation are used to analyze whether individuals generally and intrinsically feel pressured to perform activities fast rather than slow. So far, they have also mainly been related to health issues too (Wright et al., 1992). The *F-A-S-T Time Orientation Test* by Alreck and Settle (2002) measures the activity level of respondents and was linked to consumer behavior as an attempt to "buy time." The just mentioned studies represent extremely nuanced and relevant directions of personality trait–driven research. However, their results have been questioned over whether their linkage to the preferences for speed affects the actual performance of tasks (Bluedorn and Jaussi, 2007: 194).

Usunier and Valette-Florence (1991, 1994, 2007) developed a scale to capture individual time orientation (the *Time Styles Scale*). The item base was drawn from interdisciplinary research on time and existing scales, like the *F-A-S-T Time Orientation Test* (Alreck and Settle, 2002) and *the Time Structure Questionnaire* of Bond and Feather (1988), and was elicited by generating items from interviews on time perception. The scale consists of four main dimensions with two subdimensions, including: the linearity and economic use of time (the preference for

organized/economic or nonorganized time), temporal orientations (projections toward the past and the future), obedience or compliance to time (time submissiveness and the perceived usefulness of time), and motivational aspects of time (tenacity and preference for a quick return). An economic value of time has been linked to people's behavior toward WTs and decision-making (Leclerc et al., 1995). In this framework, "waiting" would be coded as a loss of time if the wait exceeded some expected waiting time. While these scale dimensions offer important insight into various individual preferences toward time, none addressed actual behavior toward speeding up tasks. Gevers et al. (2013) introduced a scale-based instrument to capture how individuals pace themselves before a deadline. Gevers et al. suggest three different pacing styles: deadline (completing work in a short time period just before the due date), steady (spreading task activities evenly over time), and U-shaped action styles (investing most of the effort at the start and finish of a task, with a break in between).

Few studies have developed an (quantitative) indicator to account for the actual pace of life. Levine (1988) studied the question in different cities across countries using the following three indicators: walking speed (measuring the average walking speed to cover one hundred feet or about 30 m), clock accuracy, and postal speed (measuring the time it takes postal workers to complete a standard request for stamps). Using the same three components, Levine and Norenzayan compared the speed of life in 31 countries (Levine, 1997; Levine and Norenzayan, 1999). Levine and Norenzayan's research is a highly valuable approach to explore the topic as it highlights the interconnectedness of the pace of life with socio-cultural factors in defining a comparative "geography of time" related to different places and cultures. Nevertheless, the selection of the indicator's three components lacks grounding in theory and appears somewhat arbitrary.

Several researchers have identified pace or speed as a temporal dimension in the relationship of work and time in organizational culture including the examination of the hurriedness of work groups and the impact of pacing congruence on how fast things get done (the *Hurriedness Scale*, Jansen and Kristof-Brown, 2005). However, many approaches did not offer a validation of the actual tempo aspect. Another prominent example, Schriber and Gutek (1987: 643) defined pace as "the rate at which activities can be accomplished (i.e. the speed of activity or the number of activities that can be done within a given interval)." They developed an instrument to measure work pace in a questionnaire with five Likert-style items (Schriber and Gutek, 1987: 646). The items concerned with the speed or pace of work accounted for 3.8% of the variance in their *Time Dimension Scale* and showed marginal reliability (Cronbach's alpha of 0.60). Although Schriber and Gutek's instrument enables explicit insights into the speed of work, its use is limited to the organizational, strategic, or industry level and has been criticized as rather conceptual (Conte, 2007).

Multitasking and polychronicity have received a considerable amount of attention in the sociology of work. According to many studies, MT has greatly increased over the last quarter of the 20th century (Bianchi et al., 2006; Bittman and Wajcman, 2000; Mattingly and Bianchi, 2003) and is viewed as a fruitful indicator for the acceleration of the pace of life (Wajcman, 2015: 80). Onken (1999) used items from Schriber and Gutek's (1987) scales to measure the value placed on doing things quickly in an organization. This study found a substantial correlation between polychronicity and speed, $r = 0.44$, that was significant at the 0.05 level. Bluedorn and Martin (2008) also used Schriber and Gutek's five-item work pace scale and also found a statistically significant positive correlation ($r = 0.33$) between an entrepreneurs' levels of polychronicity and their preferences for working fast. Schriber and Gutek's nine-item schedules and deadlines scale and their four-item punctuality scale were also shown to be related to an emphasis on the pace of work. Notably, they discovered that Schriber and Gutek's work pace scale appeared to measure two variables–the perceived temporal flexibility and the preference for working fast–rather than just the pace of work (Bluedorn and Martin, 2008: 8). Given the established stature of Schriber and Gutek's scale, Bluedorn and Martin's results provided motivation for additional scale development as there were only two items measuring the preference for working fast. Moreover, the alpha coefficients reported in their study were lower than most researchers would prefer (Bluedorn and Martin, 2008: 14).

Time budget studies have been another prominent and useful way to empirically reflect the allocation of time use and time shortages. Several time diary studies were able to show an ongoing "speedup of life" (Garhammer, 1999, 2002; Gershuny, 2005; Robinson and Godbey, 1999) or presented empirical evidence of the density of leisure denoting a fast pace of life (Katz-Gerro and Sullivan, 2007, 2010; Sullivan, 2008). Yet, such studies are concerned with how much time people report on specific activities rather than general behavioral strategies toward time. Nevertheless, in their time budget study, Robinson and Godbey (1999) as well as Garhammer (2002) also introduced scale-type instruments to measure subjective aspects of everyday speed. Robinson and Godbey's *Time Crunch Scale* (1999) examined broad aspects of time stress and work-life balance, while Garhammer's *Time Pressure Index* (2002) aimed to measure hurriedness, time pressure, and scheduling difficulties at the same time and thus was criticized to mix possible causes and consequences. Other scale instruments to measure subjective feelings of time stress are the *Time Pressure Scale* (Roxburgh, 2004) and measures of time affluence (see e.g. Kasser and Sheldon, 2009).

To sum up our brief literature review: the studies listed in this overview mark important approaches for the analysis of various temporal dimensions, some of which are related to speed. However, most studies only analyze certain aspects of an accelerating life and do not intend to be generalized for the pace of life as such.

Moreover, many studies analyze time use at work, and findings should not be transferred to the pace of life outside of organizational culture, for example, to work done from home or the temporal structure of leisure time. The only relevant approach that deliberately claims to present a "pace of life indicator" (Levine, 1997; Levine and Norenzayan, 1999) has theoretical shortcomings, while its data are now more than two decades old. Hence, to the present date, while existing accounts deserve systematic credit, no instrument, scale, or indicator exists to empirically measure and compare the pace of life.

Definition of terms and conceptual framework

In the social science literature, the term "pace" refers to the frequency of a specific domain of activities in a social unit of time (Lauer, 1981). Several different terms have been applied to this construct, such as speed (Bluedorn, 2002; Bluedorn and Jaussi, 2007; Onken, 1999), tempo (Harvey and Novicevic, 2001), or time-deepening (Garhammer, 1999; Robinson and Godbey, 1999). As a conceptual framework for our empirical investigation, we follow Rosa's understanding of the pace of life and define it with Levine and Norenzayan (1999: 178) as the "rate, speed, and relative rapidity or density of experiences (…) and activities" (making reference to Amato, 1983; Lauer, 1981 and; Werner et al., 1985). Acceleration is concerned with everyday practices that function "as a temporal lathe with which to modify the contour of one's personal experience (of time)" and thus, include strategies that speed up the duration and frequency of activities (Flaherty, 2011: 15).

As discussed above, Rosa identifies four manifestations of the acceleration of the pace of modern life: "the speeding up of individual actions, the elimination of breaks, the temporal overlapping of activities (multitasking), and the replacement of temporally costly with time-saving activities" (2013: 128–129). Rosa suggests that if such temporal strategies form a consistent pattern, they consequently lead to an increase in the density of episodes of experience or actions per unit of time (be it a day, a month, a year, or a lifetime) and thus lead to an increase in the pace of life (Rosa, 2016: 35). We operationalize these four temporal strategies, including the following definitions.

Performing activities faster (FA) means that strategies are used to shorten the duration of activities by speeding up their pace. This conception is also found within an accelerated form of monochronic behavior established by Bluedorn and Jaussi (2007), who distinguish a one-thing-at-a-time approach performed at a slow, measured pace from an accelerated form involving a laser beam-like focus on a single task performed at a fast pace.

We define "break and downtime," transfer times, or WTs as time periods in which no activities are performed actively. As Flaherty has interpreted it, when

"we" (individuals) "try to accelerate the lived duration of travel and delay" (2011: 29), we are "filling the otherwise 'empty' intervals that stretch between what we have and what we want" (2011: 26).

According to Kenyon, Rosa, and many other authors, we define MT as "*the simultaneous conduct of two or more activities during a given time period*" (Kenyon, 2008: 286). For Rosa, MT still enables faster completion of activities in their entirety, although it may de facto reduce the pace of individual activities. Whoever performs several activities at the same time will probably be relatively time inefficient concerning each activity, but may still finish faster than in the case of a sequential completion of the corresponding actions (Rosa, 2013). Moreover, Bluedorn and Jaussi (2007) conceptually associate MT behavior with an accelerated speed of tasks because one wants to get more done in the same amount of time.

When investigating whether a replacement of time-intensive activities through time-saving activities (RE) takes place, we stipulate that such a replacement requires both activities to serve similar ends. Hence, this strategy reflects the customization of activities/experiences while replacing them with similar but faster alternatives.

For reasons of conceptual clarity, context is an important issue worth attending to. First, with the GAS as an indicator of the pace of life, we are not aiming at measuring beliefs, norms, or preferences on a cultural or organizational level as they do not necessarily address individual behavior (Poposki and Oswald, 2010). In an organizational and work context, even if individuals prefer to, that is, perform only one task at a time, they may be forced to behave differently, that is, perform multiple tasks by the requirements of the job. Thus, while much of the research on time use focuses on the impact of working practices, the empirical contribution of the GAS lies in its focus on individual temporal strategies and behavior in a free or leisure time context. Indeed, "what is a more fundamental process strategy than the choice of the pattern for one's activities?" (Bluedorn, 2002: 48). In line with many other authors, we define leisure time or free time "as the remaining time after time spent in market and nonmarket work and meeting physiological needs (…) is deducted" (Wajcman, 2015: 194). Note that temporal strategies attached to free time may not be as "free" as we imagine them to be. Regarding Shir-Wise (2019), free time is understood here not as a complete empty after-work space to be filled by actors as they wish, but as the nonmarket or nonjob-related time that may still be shaped by cultural and social forces. Second, the distinction between preference and behavior is an important one as shown in discussions about definitions of polychronicity and actual MT (Poposki and Oswald, 2010). Including preference in the definition of any of the four ways of acceleration might be problematic as we aim to measure actual behavior.

Operationalization and methods

Measures

The General Acceleration Scale. To measure the four ways of accelerating the pace of life, we have developed a GAS asking how individuals use their time in a typical hour of leisure time. We develop this scale because scales are a manifestation of latent constructs; they measure behaviors, attitudes, or hypothetical scenarios that are expected to exist as a result of theoretical reasoning. The GAS that we present in this study measures to what extent individuals pursue strategies to accelerate their pace of life, and hence, the scale as an aggregate indicates whether individuals live a comparatively fast or slow pace of life.

As shown in Table 1, the GAS consists of 16 items, with four subscales. These subscales each consist of groups of four items, asking whether individuals generally tend to FA, engage in MT, replace time-intensive activities through time-saving activities (RE), and fill breaks or WTs with productive activities. Table 2 shows the list of items we operationalized for the final study. Note that all items were originally developed (and empirically tested) in German. They have been translated for information in this article, but the English translation has not been empirically verified.

For the GAS' subscale on MT, we used items from existing scales. Three items (e.g. "… I do several things at a time.") were taken from König et al. (2010), who investigated time use at the workplace; hence, we slightly adapted the formulation to make them applicable to leisure time. The items regarding RE, FA, and WT were developed by ourselves. All items of the GAS were measured on a five-point Likert scale, ranging from "never" to "always" and contained the item stem "during a typical hour of my leisure time …." All items were designed to address temporal strategies in a general manner to reflect a variety of everyday activities and tasks which are performed to manipulate the *duration* of activities in leisure time (Flaherty, 2011). The five-point response scale was designed to indicate how often the temporal strategies were used, thereby reflecting the respondents' control over the *frequency* of the strategies. Additionally, participants could mark the option "does not apply."

The responses on all subdimensions reflect a continuum with higher scores indicating an intensified performance of the respective temporal strategies. Again, Rosa explicitly theorized that if these strategies form a consistent pattern, they will lead to a compression of activities and an increase in the pace of life. Thus, scores of the subdimensions were summed, with the higher scores representing a faster pace of life. At the other end of the continuum, we find participants who do not engage much in speeding up their pace of life.

Table 1. Sociodemographic characteristics of the study sample (n = 1161).

	N	%
Gender		
Male	581	50
Female	580	50
Age		
18 to 39 years	315	27.1
40 to 59 years	456	39.3
60 to 89 years	390	33.6
Monthly net income (Euro)		
0 to 999	241	20.8
1000 to 1999	365	31.4
2000 to 2999	307	26.5
3000 to 3999	141	12.1
4000 to 4999	67	5.8
5000 +	40	3.4
Work time per week (h)		
1 to 10	81	7
10 to 20	86	7.4
20 to 30	100	8.6
30 to 40	336	28.9
40 to 50	187	16.1
50+	28	2.4
No working time	291	29.4
Missing	2	0.2
Household size (people)		
1	279	24
2	545	46.9
3	185	15.9
4	109	9.4
5	30	2.6
6	5	0.4
6 +	6	0.5
Other/number of people varies	2	0.2
Number of children		
1	134	11.5
2	64	5.5
3	14	1.2
4	1	0.1
5	1	0.1
No children	947	81.6

(continued)

Table 1. Continued

	N	%
Time spent doing care work per week (h)		
1 to 10	145	12.5
10 to 20	44	3.8
20 to 30	21	1.8
30+	71	6.1
0/not applicable	880	75.8
Educational attainment		
Still in school	6	0.5
Elementary school	196	16.9
Secondary school	429	37
Graduation (university entrance qualification)	530	45.7

Criterion variables. The literature review has revealed speed as a multidimensional construct. Not only it is related to MT or fast monochronic behavior such as quick decision-making and speedy performance of tasks but also to the use of breaks in work time. In order to establish criterion validity, we included scales that measure related/comparable aspects to control for the four subscales of the GAS (i.e. each of Rosa's four ways of accelerating the pace of life).

To validate our subscale on MT, we included a polychronicity scale that has been used to identify an individual's *preference* for MT (see König et al., 2010). The five items of that German polychronicity scale match the polychronicity–monochronicity tendency scale (PMTS) in English, which has been developed and validated by Lindquist and Kaufman-Scarborough (2007).

Economic use of time represents a dimension of time perception that is independent of polychronicity (Usunier and Valette-Florence, 1991), while it is linked to people's behavior during WTs (Leclerc et al., 1995). Following Usunier and Valette-Florence (2007), we included a measure asking participants to rate how strongly they agreed with statements like "time is money" or "one should always make the most out of the time one has" on a five-point Likert scale. We suspect that individuals for whom time is optimizable will attach great importance to filling WTs with further activities.

To control for our subscale on how fast activities are performed (FA), we included a construct measuring "perpetual activation," taken from the Jenkins Activity Survey (Jenkins et al., 1979). Constructs testing for perpetual activation are used to analyze whether individuals generally and intrinsically feel pressured to perform activities rather fast than slow (for more information see Wright et al., 1992).

To empirically test whether the GAS was sufficiently discriminatory of other time measures, we included the General Procrastination Scale adapted from Lay

Table 2. Means, standard deviations, and other indices of items for the General Acceleration Scale.

Item	Mean	Standard deviation	Variance	Skewness	Kurtosis	Valid cases	Missing values	Dimension	Code
… I do several things at a time	2.93	0.989	0.979	−0.042	−0.585	1149	12	Multitasking (MT)	MT_1
… I perform more than one activity	2.93	0.985	0.971	−0.080	−0.543	1145	16		MT_2
… I do multitasking	2.72	1.086	1.180	0.003	−0.805	1134	27		MT_3
… I handle several tasks simultaneously	2.90	1.011	1.022	−0.073	−0.585	1153	8		MT_4
… I decide to do time-saving activities rather than time-consuming activities	3.02	0.888	0.789	−0.160	0.005	1134	27	Replacing time-consuming by time-saving activities (REs)	RE_1
… I replace time-intensive tasks to save time	2.90	0.898	0.807	−0.169	−0.046	1119	42		RE_2
... I try to replace time-consuming activities with other activities that save time	2.91	0.901	0.812	−0.177	−0.162	1127	34		RE_3
... I prefer to choose activities that do not last long rather than time-consuming activities	3.09	0.869	0.756	−0.268	0.021	1135	26		RE_4
… I do things very quickly	3.17	0.942	0.887	−0.219	−0.328	1148	13	Performing activities faster (FA)	FA_1
… I perform activities most speedy	3.48	0.890	0.792	−0.441	0.156	1152	9		FA_2
… I bring things to an end as quickly as possible	3.48	0.865	0.749	−0.421	0.166	1148	13		FA_3
… I get things done as fast as possible	3.41	0.907	0.823	−0.365	−0.032	1152	9		FA_4
... I use waiting times for other activities	3.01	0.974	0.949	−0.180	−0.238	1142	19	Filling break or waiting times with activities (WTs)	WT_1
… I use downtime and breaks for additional activities	3.00	0.939	0.881	−0.238	−0.309	1142	19		WT_2
… I try to fill breaks with as productive occupations as possible	3.04	1.004	1.009	−0.184	−0.443	1144	17		WT_3
… I make use of transfer times to get things done	2.79	0.998	0.997	0.025	−0.420	1114	47		WT_4

Note: respondents who choose “doesn’t apply” were coded as missing values.

(1986), which has been shortened and validated for scientific use in German by Klingsieck and Fries (2012)

Participants and procedure. To empirically test our scales and hypotheses, we conducted an online survey. For the iterative development of the GAS, we ran four pretests ($n = 52$, $n = 114$, $n = 33$, and $n = 115$) over the course of 18 months in 2018 and 2019. A total of 32 different items were tested. As suggested, for example, by Ziegler (2014), items with low factor loadings were iteratively excluded. In addition, we evaluated each item to maintain the content of the construct. Thinking aloud was used to improve scale items and to eliminate ambiguity. The pretests particularly served the purpose of developing simple, specific, concise, and easy to understand items. Following suggestions by Podsakoff et al. (2012), minimum steps were taken to reduce the effects of proximity and bias within the survey. Measures of predictor and criterion variables were separated within the survey. Common scale properties were never shared within one part of the survey. Answers were sorted in a random order for every participant wherever possible. Every point on response scales was labeled. Recoded items were tested but excluded from the final survey due to high error covariance in all pretests. Balancing positive and negative items did not work as negatively worded items and reversing the wording of some items may have altered their content.

The final survey ($n = 1393$) was conducted together with a panel organization (https://norstat.de). We introduced participants with a short cover story for their motivation to fill out the questionnaire with great care and offered the option to contact us for any further questions. Participation was remunerated. The panel institute had no relationship to this study other than recruiting participants based on screen out criteria to ensure the representativeness of the German population. The self-report questionnaire could be accessed from any device with an internet connection. We followed a cross-sectional research design where participants completed the survey in their everyday environment. *Unipark* was used as an online survey tool ensuring standards of data security. The sample of the final survey was refined to ensure minimum standards of data quality. As proposed by Meade and Craig (2012), two control questions were applied, due to which $n = 72$ participants were excluded (see also Berinsky et al., 2012). Furthermore, we controlled for response time as a link between very quick responses, and low data quality has been supported with evidence (Callegaro et al., 2009; Malhotra, 2008; Rossmann, 2010). Regarding Huang et al. (2012), we excluded $n = 65$ participants answering faster than 2 s per item. Following Greszki et al. (2014), we excluded another $n = 84$ participants who filled out the entire questionnaire in less than half of the median time of all participants. With an additional of $n = 11$ participants not delivering on the quotation questions, we arrived at a final sample of $n = 1161$. As Table 1 shows more details, the age of participants ranged between 18–89 years

(M = 49.9; SD = 15.7 years). Half of the participants considered themselves men and women, respectively. The socio-economic status of all participants, screened by income as well as achieved level of education, represents a normal distribution.

Statistical analysis

Statistical analyses was conducted using IBM SPSS statistics version 25 and AMOS version 26. Confirmatory factor analysis was performed in AMOS with maximum likelihood (ML) estimation. Bivariate correlations were computed using Pearson's correlation procedure. Tests for mean differences were calculated through *t*-test procedures. Before conducting statistical tests, the data was tested for univariate and multivariate normality (Child, 2006) and screened for univariate and multivariate outliers (Field, 2009). The assumption of linear relationship was determined (Gorsuch, 1983). The absence of multicollinearity was checked by looking at the variance inflation factor and tolerance (O'Brien, 2007).

Missing data

To reduce noise in our dataset, we urged participants to record their scores only if they were certain. We explicitly offered the option that items did not apply to them. Due to this constraint, these answers were missing by design and treated as incomplete questionnaire items. Incomplete values made up 1.4% of the overall values in our dataset and were found in 9.9% of the overall cases (at least one value missing in any single item). The items of the GAS showed nonresponse rates between 0.7 and 4%. We checked if incomplete values for missingness patterns and these were related to observed values on other variables in our dataset. A *t-test* revealed no significant mean difference between the complete and incomplete datasets when compared to their mean score for various socio-demographic features (age, income, work time per week, household size, number of children, and time spent doing care work). Incomplete responses in our dataset are thus assumed to be missing completely at random. We decided to deal with incomplete cases through pairwise and listwise deletions in SPSS and AMOS, respectively. Listwise and pairwise deletions have the potential to introduce bias and reduce explanatory power. Considering our sample size and our understanding of the incomplete cases, this decision may not be regarded as a threat to validity.

Results

Table 2 Presents all items of the GAS as well as among others, the means, and standard deviations.

Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) is a particularly useful analytic tool for developing and refining measurement instruments, assessing their validity, and confirmation of theories. The approach also allows for testing the relative fit of competing factor models. The CFA was conducted using AMOS with (ML extraction to estimate the model (Jackson et al., 2009). The proposed four-factor structure of the GAS–that is, Hartmut Rosa's four strategies to accelerate the pace of life–was evaluated with multiple indices (Kline, 2008), including χ^2 statistics (chi-square with degrees of freedom), the root mean square error of approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), the standardized root mean square residual (SRMR), and the *p*-values of close fit (PClose). Values of CFI and TLI approaching 0.95 and values no higher than 0.08 for RMSEA and SRMR indicate a good model fit (Hu and Bentler, 1999). If values of *p* are greater than 0.05 (i.e. not statistically significant), then it is concluded that the fit of the model is close (PClose). Moreover, we used the Akaike information criterion (AIC) to compare different models as suggested by Hu and Bentler (1999). After testing the hypothesized four-factor model, we also tested a four-factor model with a latent second-order factor. Moreover, we tested three-factor, two-factor, and one-factor models, collapsing the GAS and its subscales in all combinations. The χ^2 provided a statistical basis for comparing the relative fit of these models (Bollen, 1989). Finally, internal consistency reliabilities were calculated.

Model fit statistics

In a nutshell: the fit indices supported the four-factor structure of the GAS, meeting the cutoff criteria. See Table 3 for a summary of model fit indices for different four-factor models of the GAS. The various collapsed factor models provided a significantly worse fit to the data than the hypothesized four-factor model indicated by significant differences in the χ^2statistics. Moreover, the reliability coefficients indicated that each of the four dimensions of the GAS possessed adequate internal consistency (see Table 4).

We ran a CFA model with covariances between the latent factors of the four subdimensions (see Figure 1, Model A) and another four-factor model with the GAS as a latent second-order factor (see Figure 2, Model B). The models showed a similarly good fit. The 2nd model is a bit weaker considering the AIC.

The four-factor model with all 16 items revealed strong path loadings of the GAS with the latent factors FA, r = 0.65, and RE, r = 0.65, and the highest to MT, r = 0.80, and filling waiting times with activities (WTs), r = 0.88. The following measures were conducted to test for validity and reliability: composite reliability

Table 3. Summary of quality of fit for different four-factor models of the General Acceleration Scale.

Model		χ^2	df	χ^2/df	CFI	TLI	SRMR	RMSEA	PClose	AIC
A	16 items	286.7	98	2.93	0.976	0.971	0.041	0.043	0.977	362.7
B	16 items +2nd order factor	307.9	100	3.08	0.974	0.969	0.045	0.045	0.938	379.9
C	15 items	190.6	84	2.27	0.986	0.982	0.032	0.035	1.00	292.6
D	15 items +2nd order factor	206.9	86	2.41	0.984	0.981	0.036	0.037	1.00	274.9

Note: The *p*-value for all models was <0.001, numbers have been rounded. CFI = Comparative Fit Infex, TLI = Tucker–Lewis Index, SRMR = standardized root mean square residual, RMSEA = root mean square error approximation, AIC = Akaike information criterion.

Table 4. Results of the reliability and validity analysis for Model C (see Figure 3)

					HTMT analysis with correlation matrix			
	CR	AVE	MSV	MaxR(H)	WT	FA	RE	MT
WT	0.812	0.519	0.516	0.816	0.721			
FA	0.851	0.588	0.288	0.855	0.537***	0.767		
RE	0.762	0.518	0.344	0.774	0.587***	0.511***	0.720	
MT	0.903	0.700	0.516	0.910	0.719***	0.510***	0.509***	0.837

Note: MT = multitasking, RE = replacing time-consuming by time-saving activities, FA = performing activities faster, WT = filling break or waiting time with activities, CR = composite reliability, AVE = average variance extracted, MSV = maximum shared variance, and MaxR(H) = maximum reliability. Significance of correlations: *** = $p < 0.001$; the square root of the AVE for every subdimension is highlighted in bold within the correlation matrix.

(CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV). The analysis showed concerns with convergent validity for the factor RE: the AVE was 0.457 and somewhat less than the threshold of 0.50 (Henseler et al., 2015). There were no other warnings for the HTMT analysis (the heterotrait–monotrait ratio of correlations) and discriminant validity. Note that Malhotra and Dash (2011) argued that AVE is often too strict and reliability can be established through CR alone. Although showing a good fit for the model, the results suggested removing the item *RE_4* (see Table 2) to improve the AVE.

As a next step, both four-factor models were replicated to be tested in confirmatory factor analysis with 15 items (*RE_4* was excluded, see Figures 3 and 4 for Model C and D). The model fit statistics improved for both models. Using the AIC, Model D proved to be empirically the best model in this dataset.

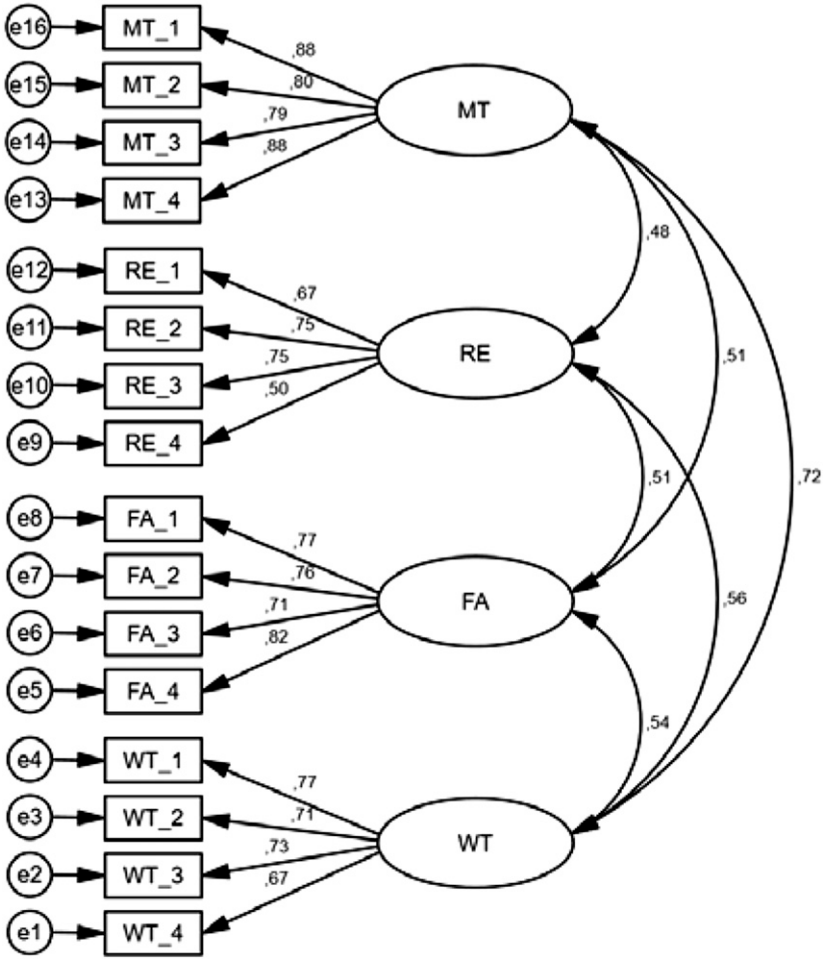

Figure 1. Model A with standardized estimates.

The results are consistent with suggestions to keep preference-related items (*RE_4*) out of the scale as the scope was to measure actual behavior (Poposki and Oswald, 2010).

Convergent validity, discriminant validity, and reliability

Table 4 shows the measures that were conducted to test for validity and reliability of Model C: CR, AVE, MSV, and MaxR(H).

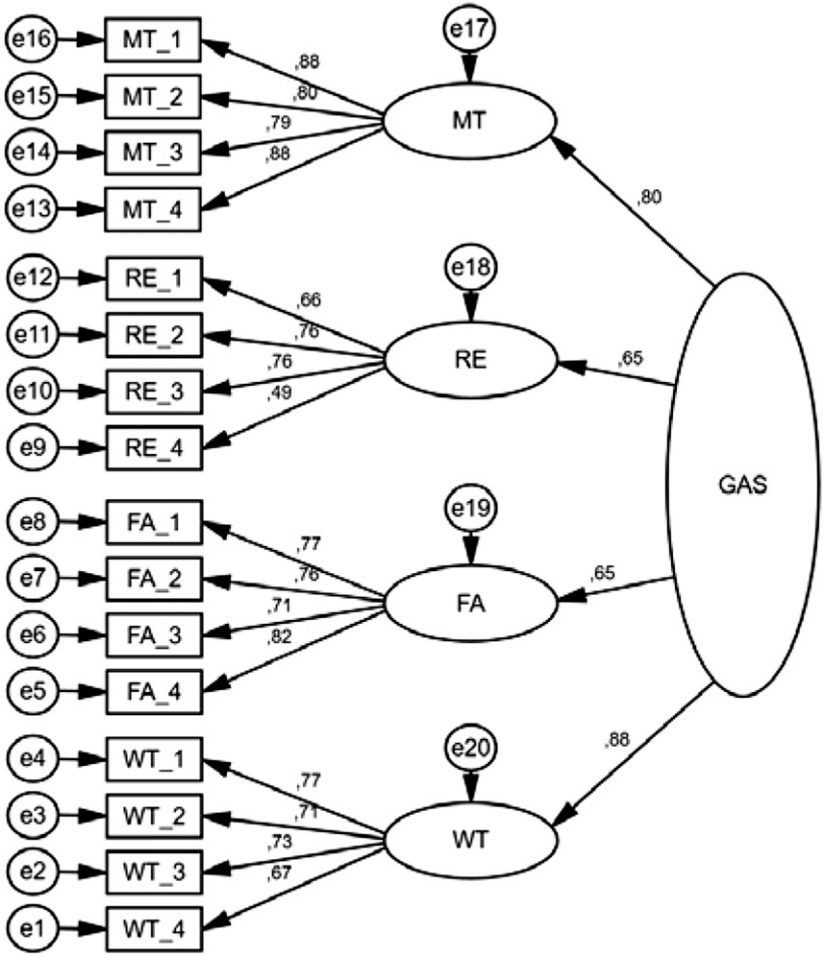

Figure 2. Model B with standardized estimates.

We examined discriminant validity within the four-factor GAS by calculating the HTMT among the four factors to indicate discriminant validity (see Table 4). Results showed that the HTMT ratios between each of the four factors in the GAS were less than 0.85, providing initial evidence of discriminant validity within the GAS (Henseler et al., 2015). The second-order construct (the GAS) with the four first-order subscales (Model D, see Figure 4) also showed good results for CR (0.836), AVE (0.565), and MaxR(H) (0.869). There were no warnings for the HTMT analysis either. We calculated Cronbach's alpha for the

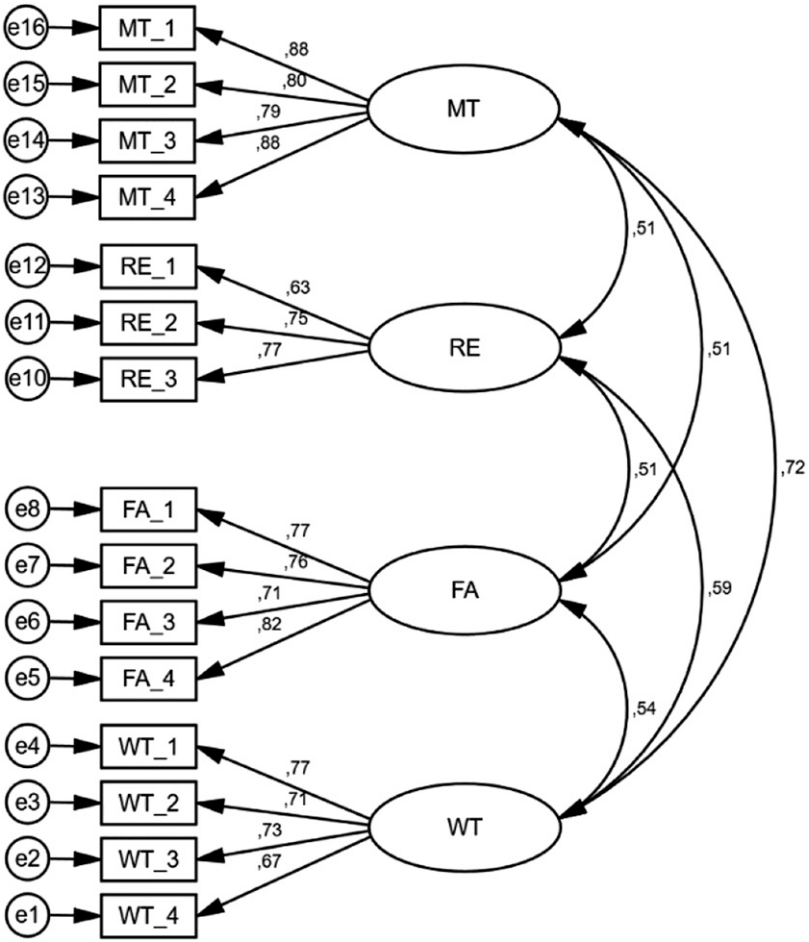

Figure 3. Model C with standardized estimates.

15 items of the GAS as a composite scale in SPSS and found an excellent score ($\alpha = 0.902$).

Evaluating measurement invariance

Before creating path analysis, configural and metric invariance was tested. Configural invariance was established testing for homogeneity of variance which showed nonsignificant differences across different groups (time to complete the survey and date of survey). Metric invariance was also good as evidenced by an

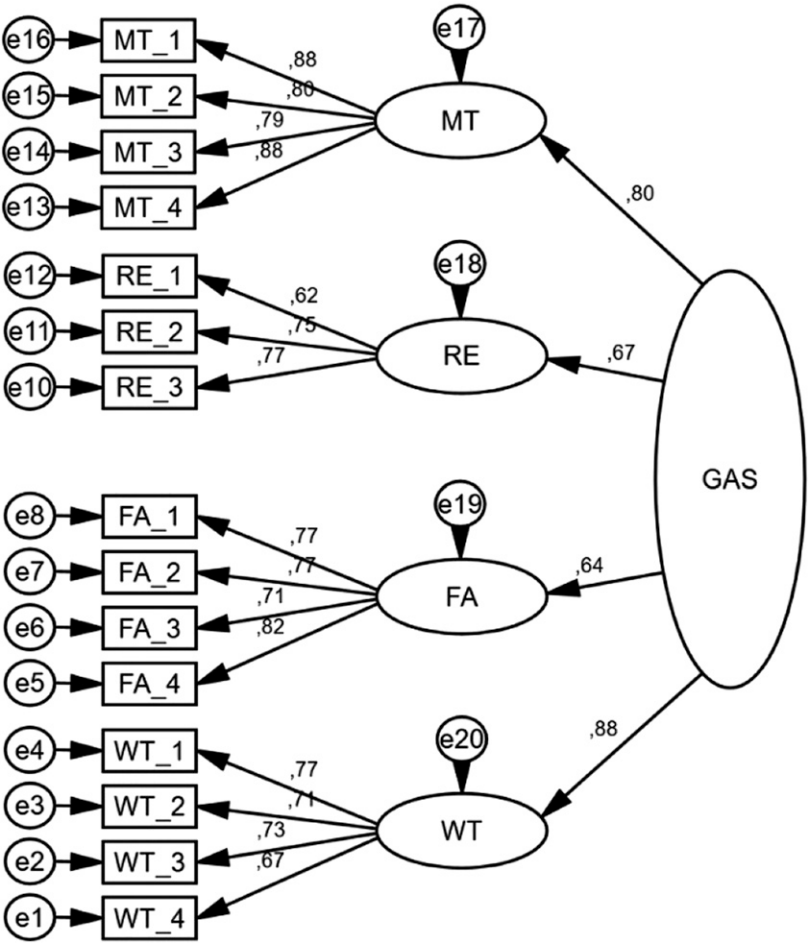

Figure 4. Model D with standardized estimates.

excellent model fit and a nonsignificant chi-square difference test between unconstrained and fully constrained models where the regression weights were constrained. The test for metric invariance showed that the indicators were related to the latent variables in the same way across the different groups tested. Scalar invariance was established observing nonsignificant differences in the measurement intercepts and structural covariance for these groups. To test for common method bias (CMB), we used Harman's single factor score, in which all items were loaded into one common factor. The total variance for a single factor was around 39%, suggesting that CMB did not affect our measurement.

Correlates

Criterion-related validity. Table 5 shows the Pearson correlations between the subdimensions of the GAS and other time-related measures. We found a high positive bivariate correlation between MT and polychronicity, r (1121) = 0.680, $p < 0.01$. MT represents the actual *performance* of everyday MT strategies, whereas polychronicity measured the *preference* of MT. Hence, the test for concurrent validity showed a satisfying result for the subdimension MT. Note that polychronicity cannot be used as a "gold standard" for criterion validity but is viewed as an appropriate criterion to validate this specific subscale. The test also supported the hypotheses that the other three subscales (FA, RE, and WT) are discriminant from measures of polychronicity. The measure of perpetual activation showed not only a small significant influence on FA but also on MT and WT. As a marker of subjective discomfort with dysfunctional time delay, the General Procrastination Scale showed a significant small negative bivariate correlation with the GAS, r (1045) = −0.88, $p < 0.01$. Hence, it can also be viewed as a discriminant measure of time use regarding the GAS.

Finally, and most interestingly, the economic use of time showed a moderate correlation with all subscales of the GAS. Moreover, the economic use of time correlated positively with the GAS as a composite variable, (r (953) = 0.388, $p < 0.001$). We ran a multiple linear regression (MLR) to explore if the economic use of time serves as a predictor of the GAS. The results of the MLR indicated that the model explained 14.9% of the variance and that the model was a significant predictor, F (1, 952) = 168.197, $p < 0.001$, $R^2 = 0.388$, and R^2 adjusted = 0.149.

Table 5. Pearson correlations between the composite factor scores of the subdimensions, the General Acceleration Scale as a composite score, and other time-related measures.

	Polychronicity (*n*)	Economic use of time (*n*)	Perpetual activation (*n*)	Procrastination (*n*)
GAS	0.552**	0.388**	0.188**	−0.082**
	(1039)	(953)	(1046)	(1046)
MT	0.680**	0.272**	0.181**	0.004
	(1121)	(1018)	(1128)	(1128)
RE	0.236**	0.296**	0.032	0.081**
	(1084)	(987)	(1091)	(1091)
FA	0.323**	0.345**	0.176**	−0.265**
	(1132)	(1027)	(1141)	(1141)
WT	0.464**	0.340**	0.168**	−0.076*
	(1090)	(995)	(1098)	(1098)

Note: GAS = General Acceleration Scale, MT = multitasking, RE = replacing time-consuming by time-saving activities, FA = performing activities faster, and WT = filling break or waiting time with activities. Significance of correlations **= $p < 0.01$(2-tailed), *= $p < 0.05$(2-tailed).

On the whole, the results of the correlates applied show a limitation of examining concurrent validity of the newly developed four subscales of the GAS. Appropriate criterion variables are not yet available for all the subscales.

Conclusions

Ever since Georg Simmel (1895, 1957, 2004) introduced the notion into sociological accounts of modernity, scholars have tried to empirically test the claim of an increasing "speed of life" in modern society. However, as our literature review of manifold empirical studies has shown, no comprehensive indicator has so far been developed that measures the pace of life on a sound theoretical basis. So far, quantitative empirical studies have either analyzed the pace of life by way of very specific items (e.g. "how fast do you respond to Emails" or the like), addressed the demands of working life as central to the need for speeding up (Ulferts et al., 2013), or presented a pace of life indicator that was not grounded on sound theory (Levine and Norenzayan, 1999).

With the "GAS", we have developed and presented a new measure that can be used as a straightforward pace-of-life indicator. The structure of our GAS, that is, its subscales, is built on sound theory (Rosa, 2013). And, its items are formulated in a general manner so that it applies to various contexts. For instance, the GAS can be used as a tool to create a new, comparative "geography of time," or it can be used as a tool to measure impacts of (or at least, correlations with) various other factors influencing everyday life, such as globalization or digitalization.

Compared to the symmetrical outline of the GAS with 16 items (four each of Rosa's "four ways" of accelerating the pace of life), our analysis showed that a version with 15 items (i.e. deleting the preference-related item on the dimension of "replacing time-intensive by time-saving activities"; RE) had the highest validity. Given the conditions of our survey and our statistical tests, including discriminate and control variables, the GAS has been proved valid and reliable.

For social acceleration theory, our empirical results prove an important part of Rosa's theory. The confirmatory factor analysis of the GAS fully supports Rosa's suggestion that the pace of life could be accelerated in four particular ways. Moreover, it shows that these are indeed four distinct temporal strategies that influence the intensity of time use; each strategy can be considered a legitimate construct and can be clearly distinguished from each of the other strategies. The pace of life is not only related to a polychronic sense of time, in which one keeps several operations going at the same time (MT). Rather, a fast pace of life includes several temporal acceleration strategies toward time use (MT, RE, FA, and WT).

In addition, correlations between the subdimensions of the GAS and other time-related scales, that is on polychronicity, perpetual activation, and procrastination, have proved that Rosa's "four ways" are distinct, yet significantly supported by these existing empirical foundations. The economic use of time was

positively correlated to each of the subscales and the GAS as a composite variable. It explained a significant amount of variance of the GAS. This finding allows for the conclusion that acceleration strategies serve in part as an answer to a cultural and economic logic of speed in modern societies ("time is money"), that is, as old as capitalism itself. The results specifically back up Rosa's claim that an economic logic of time is a particular driving force that propels social acceleration (Rosa, 2013).

The acceleration logic has been criticized as individuals seem to be passive actors in a larger temporal feedback loop (Vostal, 2014). Rather than being totally out of control, engaging in everyday temporal strategies can also be regarded as a form of agency toward individual time use (Flaherty, 2011). Hence, the GAS could not only serve as a straightforward pace of life indicator but also as a starting point for a task that has been considered "overdue" in social sciences (Vostal, 2014): the empirical investigation of acceleration and temporal agency (Flaherty, 2011; Wajcman, 2008).

To further explore the temporal strategies validated in this study, the relationship of the GAS and its subdimensions with various other dimensions of temporal personality (Francis-Smythe, 2006), activity level (Alreck and Settle, 2002), time orientation (Usunier and Valette-Florence, 2007), and other individual-level measures, such as time urgency (e.g. Conte et al., 2001), could be evaluated. Other possible fields of study could be to explore a possible relationship with consumption patterns or well-being.

Limitations and future research needs

Notwithstanding the validity and reliability of our GAS, this study contains some limitations. First, it relies on self-reported data for both the independent and dependent variables. One-time surveys can be sources of systematic measurement error. Although steps to tackle and test for method bias were carried out, factors such as common method variance could have influenced the data in this study. Moreover, different perspectives of the respondents on what constitutes their understanding of a particular item in their everyday life might also play a role in the magnitudes of correlations. That the world is speeding up is as much a popular cultural concern as it is a matter of contemporary theoretical importance (Sharma, 2014). Measuring the pace of life in a culture that is dominated by a narrative that the world is speeding up could also be influenced by social desirability.

Moreover, the GAS serves as an easy-to-use pace of life indicator but not as a measure of subjective and objective acceleration and hence, cannot be used to validate Rosa's entire theory of social acceleration. Such interrogations would require future research.

Regarding the validation of our GAS, future studies could strengthen the reliability analysis conducted in this survey examining its test–retest reliability.

Applying the PMTS served as a reliable control variable for the GAS' subscale on MT. Yet, further specific control variables for the other subscales of the GAS (i.e. for RE, FA, and WT) can improve reliability.

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ORCID iD

Tilman Santarius https://orcid.org/0000-0002-6026-3019

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