

# Creating Art: An Experience Sampling Study in the Domain of Moving Image Art

Mathias Benedek, Emanuel Jauk,  
and Kevin Kerschenbauer  
University of Graz

Ruth Anderwald and Leonhard Grond  
Academy of Fine Arts, Vienna, Austria

This study investigated work-related behaviors and feelings in the process of creating art. In a collaborative effort by creativity researchers and artistic researchers, we invited artists to create a short film or video for an international art competition and monitored them for 2 weeks while producing the artwork. The artists provided daily reflections on their work process via smartphone or online experience sampling, and we assessed relevant person data via an online questionnaire. Multilevel models were used to explain variability in artwork advancement beyond linear increases over time. Artwork advancement was predicted by deliberate engagement, engrossment in details and enjoyment of work, and by reduced work-related feelings of anxiety and “walking in a fog.” Between-person analyses revealed that artists with higher past artistic achievement and lower agreeableness produced artworks of higher quality in terms of the evaluations by the competition jury. This study demonstrates the feasibility of experience sampling methods for the investigation of extended creative work and highlights some general processes and relevant traits in the process of creating art.

*Keywords:* arts, experience sampling, multilevel model, personality, creativity

What is going on in the studios and minds of artists when they create a piece of art? Is it a painful struggle for some deep-felt truth or rather a joyful period of creative expression? Is it a time of restless, deliberate work, or of procrastination until this fortunate moment of spontaneous insight (Currey, 2013)? There has been much theorizing on the course of the creative process over time. Classic stage models assume that creative work does not necessarily advance in a linear fashion but often faces impasses that are eventually resolved by sudden revelations (Wallas, 1926). However, empirical research on the creative process has either focused on brief episodes of problem-solving (Sio & Ormerod, 2009) or relied on qualitative analyses (e.g., Csíkszentmihályi, 1996) and anecdotal reports (e.g., Rothenberg, 1995). Therefore, this study aimed for a quantitative investigation of the conditions that characterize the full-scale process of creating an artwork.

The creative process can certainly be studied at different levels of complexity. On the one hand, laboratory research usually fo-

cuses on standardized creative thinking tasks applied mostly to student populations. This approach has been fruitful to understand cognitive mechanisms and brain processes involved in creative thought (Benedek & Jauk, 2014; Silvia, 2014). Other lines of research put the focus on the investigation of creativity under more realistic conditions. One approach toward this goal is the use of experience sampling, which enables regular polling of people during everyday life (Mehl & Conner, 2012). Experience sampling has been recently applied to the investigation of everyday creativity (Conner & Silvia, 2015; Silvia et al., 2014). Silvia et al. (2014) used an interactive voice response system to call college students 8 times a day for 1 week, asking whether they did something creative at the moment and how they felt. Students were engaged in creative activities 22% of the time and were more likely to feel happy and active when doing something creative. In a similar study, college students completed daily online diaries over the course of 2 weeks and reported on their creativity and feelings each day (Conner & Silvia, 2015). The students were a little creative each day on average, and, again, more creative days were days characterized by more positive emotions. Hence, experience sampling is a useful approach for a relatively unobtrusive study of day-to-day covariations in daily life, and it can also be applied to longitudinal designs (e.g., Poerio, Totterdell, Emerson, & Miles, 2016).

A second approach toward high external validity in creativity research is to study selective samples of professionally creative people or even eminent individuals (i.e., Pro-C and Big-C creativity, respectively; Kaufman & Beghetto, 2009; Simonton, 1999). Relevant research has entered many different creative domains.

---

Mathias Benedek, Emanuel Jauk, and Kevin Kerschenbauer, Institute of Psychology, University of Graz; Ruth Anderwald and Leonhard Grond, Academy of Fine Arts, Vienna, Austria.

This research was supported by the Austrian Science Fund (FWF): PEEK-project AR224. The authors are very grateful to Katrin Bucher Trantow and the Kunsthhaus Graz (Universalmuseum Joanneum) for supporting this research.

Correspondence concerning this article should be addressed to Mathias Benedek, Institute of Psychology, University of Graz, Universitätsplatz 2, 8010 Graz, Austria. E-mail: mathias.benedek@uni-graz.at

Studies have investigated the improvisational skills and personality of jazz musicians (Beaty, Smeeckens, Silvia, Hodges, & Kane, 2013; Benedek, Borovnjak, Neubauer, & Kruse-Weber, 2014), the brain process of writers (Erhard, Kessler, Neumann, Ortheil, & Lotze, 2014), the cognitive abilities of comedians (Greengross, Martin, & Miller, 2012), or the mating success among visual artists (Clegg, Nettle, & Miell, 2011). For example, Beaty and colleagues asked jazz musicians to improvise to a given theme and found that the improvisation performance was related to divergent thinking ability and working memory capacity. Most of this research aims to clarify how professionally creative people (e.g., artists) differ from lay people, or what predicts higher achievement within these selective groups. However, the tasks used often represent short and standardized test situations, which can only approximate the creative work performed by professionally creative people.

In the present investigation of the artistic process, we aimed to integrate the need for natural working conditions and professionally creative samples. To this end, we conducted an experience sampling study with visual artists. This investigation resulted from collaboration between artists from the field of artistic research and psychologists from the field of creativity research who teamed up to explore creativity in the artistic process (see on-dizziness.com). We invited artists to create a short time-based visual artwork for an international art competition and collected daily reflections on the work process as well as relevant person data. All artists worked on their project for 2 weeks, which allowed studying the artistic process on a more extended timescale than in most previous empirical research.

This study had two main goals: we aimed to understand (a) what behaviors and feelings accompany the advancement of artworks over time and (b) what predicts the quality of the final artwork. We hypothesized that making progress with the artwork certainly depends on deliberate efforts, but progress may also benefit from spontaneous ideas occurring when artists are not currently focused on their work (Sio & Ormerod, 2009). In addition, we were interested in the affective state associated with creative productivity because different sources have related creative work either to positive mood (Conner & Silvia, 2015; Silvia et al., 2014) or rather to feelings of uncertainty and torment (e.g., Jamison, 1989). Regarding the second goal, we examined what characteristics of the artists predict the creative quality of the artwork. Different lines of research suggest that creative performance depends on expertise (Ericsson, Krampe, & Tesch-Römer, 1993), relevant personality traits such as openness (Feist, 1998), and domain-general abilities such as divergent thinking ability (Jauk, Benedek, & Neubauer, 2014; Plucker, 1999).

## Method

### Participants

Participants were 38 visual artists (24 women, 14 men) between 17 and 65 years of age ( $M = 34.6$ ,  $SD = 10.4$ ) from different countries, including Austria, Croatia, France, Germany, the Netherlands, Poland, Sweden, Switzerland, the United Kingdom, and the United States. Most participants were full-time artists (63.2%), some part time (23.6%), and a few performed artistic work in their spare time (13.2%). The participants have been engaged in the arts for an average of 10 years ( $SD = 8.0$ ) and spend 30 h per week on

average ( $SD = 18.6$ ) on artistic work. Because most participants worked as artists at a professional level and given their high average experience and creative achievement (see also Table 4), this sample can be characterized as a Pro-C sample (Kaufman & Beghetto, 2009). An additional seven participants registered for the study but dropped out before submitting an artwork; thus, they were excluded from further analysis.

### Procedure

For the aims of this study, we launched an open international art competition at the Kunsthau Graz in cooperation with the Academy of Fine Arts Vienna and the Department of Psychology at the University of Graz. Artists and art students were invited to create a time-based visual artwork (i.e., a film or video) of 2–10 min on the topic “Living in a dizzying world.” The main prize of this competition was the inclusion of the artwork in an international group exhibition in 2017 on the theme *Navigating the Unknown* at the Kunsthau Graz. Participation in the art competition implied a mandatory participation in the accompanying empirical study, which consisted of an online questionnaire and an experience sampling part.

The art competition was internationally announced by facilities of the Academy of Fine Arts Vienna and the Kunsthau Graz as well as via relevant mailing lists. Registration to the art competition was open for 1 month. Registered participants completed an online questionnaire and received a login to the experience sampling platform. The art competition effectively started on the same day for all artists and lasted for 2 weeks. On the first day, participants received a quote by David Bowie, “Turn and face the strange,” which they were asked to consider as an inspiration in their work. During the 2 weeks of work, participants completed a daily diary with questions reflecting on their work process. The diary (18 invariant questions; see *Materials*) was completed via a smartphone application or online and was accessible each day after 7:00 p.m. (participants using the smartphone version received a reminder at 7:00 p.m.). At the end of the competition, participants uploaded their work to a submission portal installed at a university online platform.

### Materials

**Online questionnaire.** Personal information and trait measures were assessed via the online survey platform LimeSurvey (LimeSurvey GmbH, Hamburg, Germany). The questionnaire asked for the professional experience and working conditions of the artists (e.g., “How many years have you been active as artist in the domain of moving image art?”). The engagement in creative activities was assessed with the Inventory of Creative Activities and Achievements (ICAA; Jauk et al., 2014). To account for the Pro-C status of our sample, the ICAA was slightly adapted. In the creative activities scale, we asked for the average frequency of creative activities within the past 3 years with a more differentiated set of response options (*Never, Less than once per year, 1–2 times per year, 3–5 times per year, 1–2 times per month, 1–2 times per week, and almost daily*). We further included eight additional activities related to film, movie, photography, and media arts (e.g., “created a film/video” or “worked with analogue footage”), which were used as an indicator of *creative moving image art activities*.

The level of creative achievement was assessed in different ways. First, the artists were asked to briefly describe their three most significant artistic achievements so far (*creative top achievements*). The combined descriptions were then evaluated by two professional visual artists (R.A. and L.G) on a 6-point scale ranging from 0 (*no recognizable achievement*) to 5 (*highly recognized achievement*). If participants failed to provide their top achievements, then the judges evaluated the achievements listed on the artists' websites (available for five of nine participants with missing achievement data; interrater reliability = .80). In addition, we asked for seven domain-specific accomplishments (*creative achievement list*; e.g., "My work was included in an exhibition catalogue") and participants estimated how many people know their art (*public acknowledgment*) and how much money they have earned in the past 3 years with their art, including sales, grants, and commissions (*income from arts*).

Divergent thinking ability was assessed with three alternative uses tasks (*umbrella, car tire, shoe*). In each task participants had 2.5 min to find creative uses for everyday objects that other people would consider as original, clever, humorous, or innovative. Ideas were entered in a text box, which closed automatically after time out. Responses were evaluated for creativity by five independent judges (different from those who evaluated creative achievements) on a 6-point rating scale ranging from 0 (*not creative*) to 5 (*highly creative*) using the snapshot scoring method (i.e., an evaluation of all ideas per task at once, which seemed appropriate given the large variability in response fluency; Silvia, Martin, & Nusbaum, 2009). Interrater reliability was good across the judges, ranging from .81 to .90 in the three tasks. The internal consistency across the three tasks was indicated by a Cronbach's  $\alpha$  value of .87. In addition, we measured divergent thinking fluency, defined as the average number of responses per task.

Personality was assessed with a 21-item version of the Big Five Inventory (BFI-K; Rammstedt & John, 2005). A more differentiated assessment of trait openness was achieved with the 20 items from the Big Five Aspect Scales (BFAS), which provides separate facet scales for openness and intellect (DeYoung, Quilty, & Peterson, 2007). Perseverance and passion for long-term goals was assessed with the 12-item grit scale (Duckworth, Peterson, Matthews, & Kelly, 2007). One person failed to complete the online questionnaire and another person did not provide any responses in the divergent thinking task, which resulted in missing data for relevant analyses.

## Experience Sampling

On the basis of previous relevant research on creativity and the artistic process (e.g., Conner & Silvia, 2015; Merleau-Ponty, 1964), we compiled a set of 18 questions (see Appendix for the full list of questions and response format). The first three questions asked for the perceived advancement status of the artwork (in percent; with 100% corresponding to completed work that was conceptualized and realized to the full satisfaction of the artist), and the following questions asked for personal experiences (e.g., "I have had positive experiences"), work-related behaviors (e.g., "I have altered the conception of my work"), and work-related feelings (e.g., "I enjoy being engaged in my work") in the past 24 h. At the end, own observations and reflections could be openly stated in a text box.

The daily questions were made available via commercial experience sampling software (MetricWire; MetricWire Inc., Kitchener, Ontario, Canada) in a German and an English version. The artists answered the same set of 18 questions each day either on their personal smartphone (68.4%) or using a web version of the survey. The daily survey took about five minutes to answer.

## Evaluation of Artworks

All artworks were independently screened and evaluated by the three members of the jury (Katrin Bucher Trantow, chief curator at Kunsthau Graz, Austria; Sergio Edelsztein, director of the Center of Contemporary Art, Tel Aviv, Israel; and Anna Jermolaewa, internationally renowned artist, Russia/Austria). The jury evaluated the artistic quality of the work and their reference to the topic of the competition on a 10-point scale each (1 = *low* to 10 = *high*). Scores were averaged across both criteria to give a total evaluation. Jury members showed good interrater reliability with respect to evaluation of quality (intraclass correlation coefficient [ICC] = .86), the topic reference (ICC = .79), and the total evaluation (ICC = .85).

## Data Analysis

This microlongitudinal design yielded a data set with 18 responses on up to 14 days nested within people. The first goal was to identify within-person variables associated with advancement of the artwork. Within-person associations were analyzed with multilevel models (MLMs) in SPSS and MPlus 7. The outcome in these analyses was the advancement status of the artwork, which was defined as the average evaluation of how advanced the conception and realization was and how satisfied the artist was with the work (daily questions Q1 to Q3). These three indicators showed high within-person correlations ( $r = .59$  to  $.71$ ), and separate models for single indicators came to largely the same results; therefore, we decided to present only analyses for the compound indicator of artwork advancement.

In a second line of analysis, we aimed to understand what between-person variables (assessed by the online questionnaire) predict the creative quality of the finally submitted artwork. To this end, we computed a multiple regression analysis predicting the jury evaluation of the artworks by available trait measures, including indicators of personality, expertise, and creative potential.

## Results

### Descriptive Statistics

Participants completed their daily diary on 13 of 14 days, on average ( $M = 12.9$ ,  $SD = 1.7$ ; range 7–14; response rate = 92%). Table 1 presents descriptive statistics for the aggregated daily questions and their correlation with artwork advancement. The artists deliberately spent time on their work in 68% of days, on average. In addition, they reported that useful ideas came to their mind while they have been occupied with other things on approximately every second day. Major changes to the conception, working process, or material occurred on approximately 20% of days. The artists generally reported high levels of positive daily experiences and enjoyment of being engaged in work, whereas negative

Table 1  
*Descriptive Statistics of Aggregated Daily Measures and Within-Person Correlations With Artwork Advancement*

Daily questions	<i>M</i>	<i>SD</i>	ICC	Correlation with artwork advancement
Q1–3: Artwork advancement	55.55	20.06	.47	—
Q4: Different routine	3.93	2.16	.39	.06
Q5: Positive experiences	6.49	1.68	.40	.13
Q6: Negative experiences	2.84	1.59	.21	-.02
Q7: Deliberate work	0.68	0.20	.14	.15
Q8: Spontaneous work	0.52	0.27	.24	-.07
Q9: Conception changed	0.22	0.22	.24	-.14
Q10: Process changed	0.21	0.20	.18	-.14
Q11: Material changed	0.18	0.21	.27	-.05
Q12: Walking in fog	0.20	2.30	.66	-.19
Q13: Anxieties	3.80	2.70	.72	-.27
Q14: Stressed	3.67	2.34	.66	-.06
Q15: No sense of time	5.69	2.24	.47	.03
Q16: Engrossed in details	4.72	2.09	.36	.38
Q17: Forget myself	5.13	2.40	.56	.11
Q18: Enjoy my work	7.15	1.76	.43	.28

Note: ICC = intraclass correlation coefficient.

daily experiences, feelings of anxiety, and stress ranged below the average of the scale. The artists also commonly reported having lost the sense of time and forgetting themselves while being engrossed in the details of their work.

Figure 1 presents example data from one artist across the 14 days of creating the artwork. Although her artwork generally advanced over time, she experienced a substantial setback around Day 7. This setback was characterized by a reduced focus on details and lower enjoyment of work. Focus on detail and enjoyment reincreased as she managed to overcome the setback, leading to the rare case of an early completion of the artwork on Day 11.

It is informative to consider the daily verbal comments by the artist across time (see figure caption), which provide intimate insights into the aims, struggles, and progress of the artist accompanying the production of the artwork.

### Within-Person Effects

The ICC of within-person variables ranged from .14 to .72 (see Table 1). A low ICC indicates that most variability in this process occurred within participants (e.g., Q7: “I have deliberately spent time on my work”) whereas a high ICC indicates that a large part

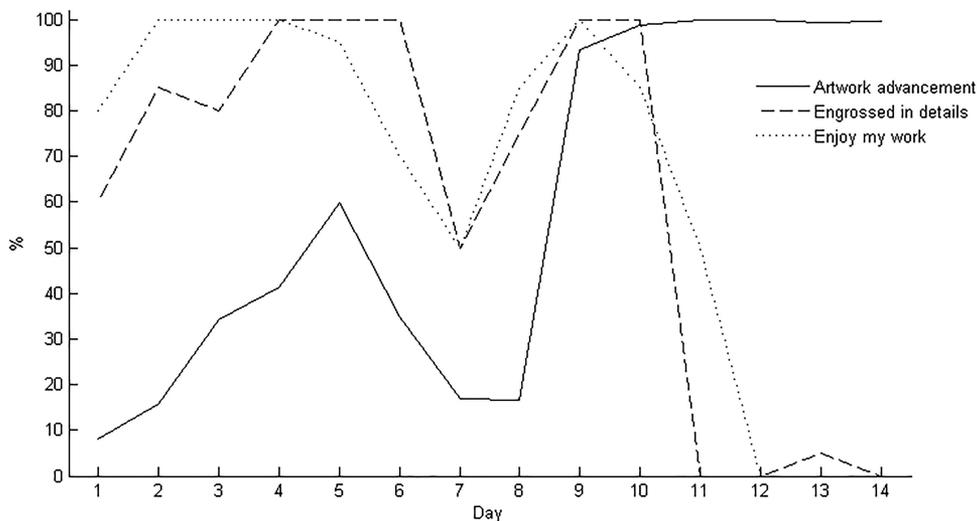


Figure 1. Exemplary daily data excerpt from one participating artist illustrating the advancement of the artwork over time and covariation of self-reported focus on detail and enjoyment of being engaged in work. Individual reflections on the work process included the following comments: Day 1 “. . . I am collecting ideas, trying things out . . .”; Day 3 “. . . the idea for the work is now clear . . .”; Day 5: “Today testing material . . . first doubts appear”; Day 7: “My plan did not work out . . . I have to start over”; Day 9: “. . . I found a new idea that corresponds to my original impulse . . .”; Day 11: “My work is done . . .”.

of variability occurred between participants and that this variable is thus more trait-like (e.g., Q13: “I have anxieties regarding my work”). We first tested an unconditional null model (Model 1), which revealed a significant random intercept (see Table 2). The substantial within-person variance observed in the ICCs and the significant random intercept supports the appropriateness to consider artists as a nested factor. We then tested an unconditional linear growth model considering the fixed and random effects of time on artwork advancement (Model 2). This model showed that artworks advanced on average by approximately 4% per day (fixed effect) starting from an average advancement level of 27% on Day 0 (intercept). In addition, we observed a significant random slope effect for time ( $u = 2.02, p < .05$ ) and significant negative covariance with the intercept ( $u = -24.31, p < .05$ ). Together with the significant fixed effect for day, this finding suggests that artworks generally advanced over time for all artists but at variable rates, with increases being higher for those with lower initial advancement on Day 0.

We then tested for additional within-person predictors of artwork advancement by entering daily reflections stepwise in the order of their absolute correlation with the criterion (see Table 1) as long as the model improved (Model 3). Five daily variables significantly predicted artwork advancement beyond linear progress over time: Advancement was positively predicted by being engrossed in details, enjoying engagement in work, and deliberate time spent on work and negatively predicted by feelings of anxiety and “walking in a dense fog” (Merleau-Ponty, 1964). We then specified an autoregressive covariance structure for time to better account for its repeated-measure nature (Peugh & Enders, 2005), which again substantially improved the model fit according to information criteria (Model 4). It is interesting to note that the random intercept is no longer significant in this model, suggesting that differences in average advancement are sufficiently explained by the predictors in this model.

Finally, we tested for potential random slope effects of the within-person variables in separate models. There was evidence for significant variability in the association between changes in the working process (Q10) and artwork advancement (Model 5). This effect was not dependent upon initial status (nonsignificant covariance with intercept). Considering that changes in the work process had no significant fixed effect on advancement, this effect suggests that changes in the working process entailed either increases or decreases in the advancement of the artwork for different artists. The MLM coefficients of this final model are presented in Table 3.

Table 2  
Comparison of MLMs

Model	AIC	-2 log-likelihood
Model 1 (null model)	4,424.25	4,420.25
Model 2 (growth model)	3,856.38	3,848.38
Model 3 (+ within-person fixed effects)	3,759.73	3,751.73
Model 4 (autoregressive)	3,691.98	3,685.98
Model 5 (+ random Q10)	3,674.88	3,664.88

Note. MLMs = multilevel models; AIC = Akaike's information criteria.

Table 3  
Significant Fixed and Random Effects on Artwork Advancement (Model 5)

Fixed effects	<i>b</i> ( <i>SE</i> )	<i>t</i> ( <i>df</i> )	<i>p</i>
Intercept	23.63 (3.96)	5.91 (151.38)	<.001
Time	3.57 (0.27)	12.99 (30.45)	<.001
Q7: Deliberate work	2.07 (0.94)	2.20 (364.19)	.029
Q12: Walking in fog	-0.88 (0.25)	-3.52 (393.32)	<.001
Q13: Anxieties	-0.60 (0.26)	-2.27 (414.33)	.024
Q16: Engrossed in details	0.86 (0.18)	4.71 (407.26)	<.001
Q18: Enjoy my work	0.82 (0.24)	3.47 (400.01)	.001
Random effects	<i>u</i> ( <i>SE</i> )	Wald <i>z</i>	<i>p</i>
Time AR1 diagonal	251.05 (81.79)	3.07	.002
Time AR1 $\rho$	0.82 (0.06)	13.80	<.001
Intercept	136.48 (93.96)	1.45	.146
Intercept $\times$ Q10	-22.56 (28.72)	-0.79	.432
Process change (Q10)	64.22 (25.42)	2.53	.012

Note. AR1 = First-order, autoregressive covariance matrix.

## Between-Person Effects

In a second line of analysis, we aimed to identify between-person variables predicting the creative quality of the created artwork. Table 4 presents descriptive statistics and intercorrelations for jury evaluation and between-person indicators of artistic expertise, creative achievement, creative potential, and personality. The jury evaluation of artworks tended to be associated with higher creative top achievements and was negatively correlated with agreeableness. It is interesting to note that divergent thinking ability (creativity and fluency) was also negatively correlated with jury evaluation of artworks. The negative correlation between divergent thinking fluency and creative top achievement may indicate that highly achieved artists cared less to respond and hence did not score well in this task.

A regression analysis was computed to examine what between-person indicators explain unique variance in jury evaluations. This analysis used the total jury rating as the criterion and all between-person variables were entered stepwise (to account for potential collinearity) in one block. As already suggested by the zero-order correlations, artists with higher previous creative achievements ( $\beta = .37, p < .01$ ) and lower agreeableness ( $\beta = -.45, p < .05$ ) produced more creative artworks,  $F(2, 28) = 5.00, p < .05$ . These two predictors explained 26% of variance of jury evaluations, and none of the other trait measures explained significant unique variance beyond them.

## Discussion

### Conditions of Artwork Advancement

One primary goal of this study was to describe factors that accompany the advancement of the artwork over time. In a first step, we modeled a linear effect of time, which showed that, as a matter of course, artworks gradually advanced over time. Once the linear effect of time is considered, further within-person associations can be seen to explain individual deviations from linear advancements over time. We identified five factors that were

Table 4  
Descriptive Statistics and Intercorrelation for Artwork Jury Evaluation and Artist Trait Measures

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Jury evaluation	24.42	12.68	—																		
2. Gender	1.37	0.49	.12	—																	
3. Age	34.62	10.40	-.26	-.08	—																
4. Experience as artist (years)	10.32	8.11	-.16	-.02	.54**	—															
5. Time spent on art (h/week)	30.38	18.57	.17	.27	.14	.04	—														
6. Creative MIA activities	2.04	0.88	.09	.12	-.26	-.09	.26	—													
7. Creative top achievements	2.63	0.67	.28*	.05	.17	.03	-.06	.15	—												
8. Creative achievement list	5.16	1.61	-.16	.10	.39*	.39*	.47**	.09	.21	—											
9. Public acknowledgement	5.03	1.76	-.06	.31*	.49**	.37*	.54**	.10	.41*	.69**	—										
10. Income from arts (1,000 Euro)	15.95	22.57	-.05	.05	.10	.12	.44**	.38*	.21	.54**	.41*	—									
11. DT creativity (snapshot)	1.72	0.82	-.36*	-.42*	.20	.32*	-.20	-.21	-.20	.01	-.10	-.04	—								
12. DT fluency	4.72	3.43	-.37*	-.09	.12	.20	.04	-.04	-.39*	.13	.07	-.11	.75**	—							
13. Neuroticism	3.14	0.65	.10	-.13	-.08	-.47**	-.12	-.16	-.10	-.15**	-.10	-.12	-.18	-.13	—						
14. Extraversion	3.41	0.84	-.28*	-.01	.26	.40*	.10	.11	.00	.53**	.23	.23	.20	.16	-.30*	—					
15. Openness	3.81	0.38	-.14	-.11	.13	.22	.18	.08	-.06	.26	.21	.09	.29*	.30*	-.10	.32	—				
16. Agreeableness	3.10	0.79	-.42*	.08	.23	.27	-.10	-.07	.21	.32*	.22	.09	.16	.11	-.13	.52**	.06	—			
17. Conscientiousness	3.56	0.76	-.05	.03	.18	.23	.18	-.04	.36*	.41*	.37*	.25	-.05	-.02	-.22	.22	.19	.18	—		
18. Openness (BFAS)	4.26	0.54	-.02	-.10	.01	-.02	.26	.25	.22	.05	.12	.14	-.05	-.17	.25	.07	.34*	.09	-.19	—	
19. Intellect (BFAS)	3.78	0.49	-.06	-.11	.18	.23	.35*	.14	.13	.22	.28*	.09	.17	.11	-.11	.24	.60**	-.01	.45**	.30	—
20. Grit	3.05	0.51	.06	-.01	.19	.28*	.09	-.01	.25	.25	.12	.11	.18	.13	-.32*	.25	.22	.32	.70**	-.16	.33*

Note. Gender coded 1 = women, 2 = men. MIA = moving image art; DT = divergent thinking.  
+  $p < .10$ . \*  $p < .05$ . \*\*  $p < .01$ .

associated with the advancement of the artwork beyond time. Two of them reflected work-related behaviors. Not much surprisingly, advancement was predicted by deliberately spending time on work and engrossing in details of the work. As it is true for probably any work, an artwork will not get done without investing time and effort on its concrete realization.

In addition to regularly devoting time to their work, the artists also commonly reported that useful ideas came to them when they were actually occupied by other things. Occurrences of spontaneous ideas were observed on half of the days on average. Although the relevance of spontaneous ideas and insights for creative work is widely acknowledged (e.g., Benedek & Jauk, in press; Ritter & Dijksterhuis, 2014; Sowden, Pringle, & Gabora, 2015), their prevalence has hardly ever been quantified. Stage models of the creative process assume that impasses during creative work lead to periods of incubation that are eventually followed by insights (Wallas, 1926). Research on this incubation effect has provided robust evidence that a break from creative problem-solving can have positive effects on subsequent performance (Sio & Ormerod, 2009). However, it is curious to note that incubation research has never demonstrated that relevant insights actually occurred during breaks from work but has only looked at postincubation performance and typically focused on creative problem-solving in Little-C samples rather than extended creative work performed by Pro-C people. The experience sampling data revealed that spontaneous work is highly common in artistic work because it occurred on approximately every second day; however, we did not see direct effects of spontaneous work on artwork advancement. A possible reason is that spontaneous ideas did not lead to immediate advancements in work but informed the understanding of the unfinished work and influenced later deliberate work. It also seems possible that spontaneous ideas may sometimes appear great at first glance but later turn out to be infeasible after giving it further thought or trying to implement them. Likewise, artists often reported to lose the sense of time and forget themselves while working. These experiences of high absorptiveness indicate a state of flow, which is seen conducive to optimal performance (Csikszentmihályi, 1996). Although these experiences were very common during artistic work, the quantity of these states did not predict artistic advancement beyond the other factors in our study.

Three other predictors of artwork advancement represented affective experiences. Artwork advancement was associated with higher enjoyment and lower anxiety regarding work and when work felt less like walking in a dense fog. Together, artwork advancement was generally characterized by positive work-related feelings whereas setbacks in work were characterized by negative work-related feelings. Artwork advancement was also correlated with positive everyday experiences, but this relationship was not significant beyond the effect of work-related emotions. These findings are in line with the growing evidence associating creativity with positive affect (Ashby, Isen, & Turken, 1999; Baas, De Dreu, & Nijstad, 2008). Recent experience sampling studies showed that engagement in creative activities is related to more positive emotions in that very moment (Silvia et al., 2014) and on the same day (Conner & Silvia, 2015). Our findings suggest that the positive affect-creativity association extends to Pro-C creativity of artists, which also provides further evidence against the popularly held belief that artists need to be in a state of psychological torment to create good art (e.g., Becker, 2014; Jamison,

1989). Regarding causality, different modes of effect appear possible in this relationship: Positive feelings toward one's work may facilitate advancements in creative work (e.g., Rowe, Hirsh, & Anderson, 2007), and making advancements in one's creative work may entail higher enjoyment of work, confidence, and clarity (Bujacz et al., 2016).

Negatively connoted affective states such as feelings of uncertainty or confusion (i.e., dizziness) may still be very common, particularly in earlier stages of creative work. They may even sometimes reflect a productive resource in artistic work because this dizziness confuses the determinations, which were valuable before dizziness occurred, and brings the artist back to a fundamental nonseparation of opposites. Alternatively, the artist may be conducted by dizziness or confusion to go back to this nonseparation—it makes the ambiguity reappear, which is underlying any opposition of thought (Rothenberg, 1971, 1986). This underlying, fundamental ambiguity resets the field of oppositions, dissolves it, and allows for other oppositions/other determinations to appear (Feyertag & Jullien, 2015). However, our findings indicate that these feelings of dizziness and confusion (as indicated by feelings of walking in a fog or anxiety) do not predict advancements on the very same day. Finally, changes in the working process were found to have a variable effect on artwork advancement across artists. For some artists, they may indicate setbacks that effectuated a major reorganization of work whereas changes in the work process were perceived as immediate progress toward artwork realization in others.

Creating a work of art can be seen as a complex, dynamic process, in which the artist constantly monitors the creative process and evaluates interim stages of the artwork, aiming to gradually improve the work over time (Kozbelt, 2006). Although the present study focused the perceived advancement of the artwork from the perspective of the artist, other studies have examined the judged quality of emerging artworks from the perspective of independent artist and nonartist judges (e.g., Kozbelt, 2006; Kozbelt & Serafin, 2009; Serafin, Kozbelt, Seidel, & Dolese, 2011). They found that artworks, which are ultimately judged higher in quality, showed a more jagged gradient of quality over time. This suggests that more creative work evolves in a less linear, predictive way because it may involve more radical and risky revisions rather than small incremental changes. For future research it would be interesting to combine the artists' and the recipients' perspectives and see how they concur in their evaluations of in-progress stages of artworks over time.

### Who Produces More Valued Work?

Although within-person analyses examined the concomitants of advancements in individual artworks, between-person analyses aimed at identifying predictors of higher quality of artworks across artists. We found that artwork quality was predicted by higher creative achievement and lower agreeableness of artists. What is true in other domains such as science (e.g., Hirsch, 2007) also appears to apply in the arts: Past performance is a good predictor of future performance. It is important to note that the jury of the art competition did not know the artists and was not aware of their past achievements. Their evaluations were solely based on the artistic quality and relevance of the artwork. The relationship between creative achievement and quality of artworks was inter-

estingly only observed for the rated creative top achievements but not for other indicators of expertise and creative achievement, such as years spent in the field, self-reported public acknowledgment, income, or a list count of creative achievements. Many of these indicators may simply accumulate over time as indicated by substantial correlations with age. Thus, these indicators may more strongly reflect a quantitative aspect of expertise and achievement whereas a snapshot evaluation of the creative top achievements may serve as a better indicator of the actual quality of previous achievements.

The second significant predictor of artwork quality was low agreeableness. Previous research on the personality of artists indicates that they are indeed less agreeable, less conscientious, and more open compared with nonartists (Batey & Furnham, 2006; Feist, 1998), but little is known about what differs more successful from less successful artists. For example, openness is arguably the most consistent predictor of creativity (Kaufman et al., 2016; McCrae, 1987), but the artists showed very low variance in openness; hence, this trait may not discriminate well between artists. Agreeable persons are described as friendly, altruistic, and compliant; in contrast, artists are commonly described as independent, nonconforming, and radical (Drevdahl & Cattell, 1958; Feist, 1998). These may be essential characteristics for artists who thrive to challenge established concepts and provoke, rather than entertain, their audience.

Quite unexpectedly, divergent thinking ability was found to be negatively related to the quality of artworks and creative top achievements. Because creative achievement already predicted artwork quality, divergent thinking ability explained no incremental variance in the regression analysis. However, we do not think that the ability to come up with creative ideas is an impediment to creative achievement (Plucker, 1999; Jauk et al., 2014). Another possible explanation would be that highly original artworks were not valued by the jury because they have a preconceived idea of good art; however, this hypothesis is challenged by the relationship between jury evaluation and low agreeableness. Rather, a closer look at the individual response behavior in the divergent thinking task suggests that highly achieved artists were not very compliant by giving few or inadequate responses. The divergent thinking task was the only cognitive performance test in this study, and it explicitly asked to be creative (Nusbaum, Silvia, & Beaty, 2014). Personal communications with several artists in the preparation of this study revealed a widespread objection to the notion that creativity can or even should be measured. Moreover, the term *creativity* was commonly considered a buzzword referring to everyday creativity at best, but certainly not to art, because contemporary artistic practice is rather linked to criticality than creativity. The timed divergent thinking task may have bundled these implicit objections; hence, the validity of this test is unclear in our artist sample. In sum, the quality of artworks were predicted by the artist's expertise (rated previous top-achievements) and personality (low agreeableness) but not divergent thinking ability. Future research may put more emphasis on the role of domain-general cognitive abilities for creative performance in expert samples by including measures of intelligence (e.g., Jauk, Benedek, Dunst, & Neubauer, 2013) and ensuring appropriate settings for timed cognitive tests.

## Strengths and Limitations of This Study

An important strength of the present study is that it studied creativity in a selective Pro-C sample of visual artists who worked in a realistic context of an international art competition. A major challenge in the design of the study was to capture the creative process by means of experience sampling from start to end. Professional artists would not sign up for an art competition without knowing the topic; however, as soon as the topic is known, the conceptual work can be assumed to begin. Therefore, we introduced a final prompt on the competition goal (i.e., David Bowie quote), which was intended to ensure that artists waited with their effective work or, at least, were forced to accordingly adapt their work. In any case, it can be assumed that most artists did not start from scratch on the first day but have partially reused material when creating their artwork. This was also evident in the significant random intercepts and random slope of the time variable as well as the significant negative covariation between intercept and slope, which suggests that artists started at different levels of advancement and advancements were lower for artists starting from a higher initial level. Fortunately, this variability across artists can be considered in multilevel analyses so that within-person effects reflect changes relative to individual slopes.

The international art competition did not only attract a selective sample, but it also represented a highly realistic task for the investigation of artistic work. Thus, it ensured high intrinsic motivation and external validity. The daily questions represented the only interference in the creative process, but the questions could be comfortably answered via smartphone application. At the end of the study, we asked all participants how it was to work under the conditions of the survey, which revealed that they did not feel particularly affected by the study procedure. As one participating artist put it,

Somehow I was comforted by the idea that other artists were reflecting on their process at the same time I was. It made me realize that the challenge of art making is not unique—it is difficult for all of us and can lead to different emotional states, etc. I thought that the survey was really beneficial for me in terms of paying attention to my process in an objective way.

## Conclusion

The advancement of an artwork can be characterized by significant ups and downs, but this individual variability is accompanied by a largely expectable pattern of work-related behaviors and emotions. Deliberate effort, overcoming states of uncertainty, and enjoyment in one's work predict progress in artistic work. Moreover, past creative achievement and low trait agreeableness were indicative of higher artistic quality of artworks. This study demonstrates the feasibility and usefulness of an experience sampling approach for the quantitative investigation of extended creative processes and suggests that artistic work actually shares some essential features with other, more mundane forms of work.

## References

Asby, F. G., Isen, A. M., & Turken, A. U. (1999). A neuropsychological theory of positive affect and its influence on cognition. *Psychological Review, 106*, 529–550. <http://dx.doi.org/10.1037/0033-295X.106.3.529>

- Baas, M., De Dreu, C. K., & Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? *Psychological Bulletin, 134*, 779–806. <http://dx.doi.org/10.1037/a0012815>
- Batey, M., & Furnham, A. (2006). Creativity, intelligence, and personality: A critical review of the scattered literature. *Genetic, Social, and General Psychology Monographs, 132*, 355–429. <http://dx.doi.org/10.3200/MONO.132.4.355-430>
- Beatty, R. E., Smeekens, B. A., Silvia, P. J., Hodges, D. A., & Kane, M. J. (2013). A first look at the role of domain-general cognitive and creative abilities in jazz improvisation. *Psychomusicology: Music, Mind, and Brain, 23*, 262–268. <http://dx.doi.org/10.1037/a0034968>
- Becker, G. (2014). A socio-historical overview of the creativity–pathology connection: From antiquity to contemporary times. In J. C. Kaufman (Ed.), *Creativity and mental illness* (pp. 3–24). Cambridge, United Kingdom: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9781139128902.003>
- Benedek, M., Borovnjak, B., Neubauer, A. C., & Kruse-Weber, S. (2014). Creativity and personality in classical, jazz and folk musicians. *Personality and Individual Differences, 63*, 117–121. <http://dx.doi.org/10.1016/j.paid.2014.01.064>
- Benedek, M., & Jauk, E. (2014). Creativity—Lost in simplification? *Creativity—Theories, Research, Applications, 1*, 213–219. <http://dx.doi.org/10.15290/ctra.2014.01.02.06>
- Benedek, M., & Jauk, E. (in press). Spontaneous and controlled processes in creative cognition. In K. C. R. Fox & K. Christoff (Eds.), *The Oxford handbook of spontaneous thought: Mind-wandering, creativity, dreaming, and clinical conditions*. New York, NY: Oxford University Press.
- Bujacz, A., Dunne, S., Fink, D., Gatej, A. R., Karlsson, E., Ruberti, V., & Wronska, M. K. (2016). Why do we enjoy creative tasks? Results from a multigroup randomized controlled study. *Thinking Skills and Creativity, 19*, 188–197.
- Clegg, H., Nettle, D., & Miell, D. (2011). Status and mating success amongst visual artists. *Frontiers in Psychology, 2*, 310. <http://dx.doi.org/10.3389/fpsyg.2011.00310>
- Conner, T. S., & Silvia, P. J. (2015). Creative days: A daily diary study of emotion, personality and everyday creativity. *Psychology of Aesthetics, Creativity, and the Arts, 9*, 463–470. <http://dx.doi.org/10.1037/aca0000022>
- Csikszentmihályi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York, NY: Harper Perennial.
- Currey, M. (2013). *Daily rituals: How artists work*. New York, NY: Random House.
- DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology, 93*, 880. <http://dx.doi.org/10.1037/0022-3514.93.5.880>
- Drevdahl, J. E., & Cattell, R. B. (1958). Personality and creativity in artists and writers. *Journal of Clinical Psychology, 14*, 107–111. [http://dx.doi.org/10.1002/1097-4679\(195804\)14:2<107::AID-JCLP2270140202>3.0.CO;2-T](http://dx.doi.org/10.1002/1097-4679(195804)14:2<107::AID-JCLP2270140202>3.0.CO;2-T)
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*, 1087–1101. <http://dx.doi.org/10.1037/0022-3514.92.6.1087>
- Erhard, K., Kessler, F., Neumann, N., Ortheil, H. J., & Lotze, M. (2014). Professional training in creative writing is associated with enhanced fronto-striatal activity in a literary text continuation task. *NeuroImage, 100*, 15–23. <http://dx.doi.org/10.1016/j.neuroimage.2014.05.076>
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*, 363–406. <http://dx.doi.org/10.1037/0033-295X.100.3.363>

- Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, 2, 290–309. [http://dx.doi.org/10.1207/s15327957pspr0204\\_5](http://dx.doi.org/10.1207/s15327957pspr0204_5)
- Feyertag, K., & Jullien, F. (2015). *Making ambiguity fertile is the present mission of thought (Karoline Feyertag in conversation with François Jullien)*. Retrieved from [http://on-dizziness.com/francois\\_jullien/](http://on-dizziness.com/francois_jullien/)
- Greengross, G., Martin, R. A., & Miller, G. (2012). Personality traits, intelligence, humor styles, and humor production ability of professional stand-up comedians compared to college students. *Psychology of Aesthetics, Creativity, and the Arts*, 6, 74–82. <http://dx.doi.org/10.1037/a0025774>
- Hirsch, J. E. (2007). Does the *h* index have predictive power? *Proceedings of the National Academy of Sciences of the United States of America*, 104, 19193–19198. <http://dx.doi.org/10.1073/pnas.0707962104>
- Jamison, K. R. (1989). Mood disorders and patterns of creativity in British writers and artists. *Psychiatry: Interpersonal and Biological Processes*, 52, 125–134. <http://dx.doi.org/10.1080/00332747.1989.11024436>
- Jauk, E., Benedek, M., Dunst, B., & Neubauer, A. C. (2013). The relationship between intelligence and creativity: New support for the threshold hypothesis by means of empirical breakpoint detection. *Intelligence*, 41, 212–221. <http://dx.doi.org/10.1016/j.intell.2013.03.003>
- Jauk, E., Benedek, M., & Neubauer, A. C. (2014). The road to creative achievement: A latent variable model of ability and personality predictors. *European Journal of Personality*, 28, 95–105. <http://dx.doi.org/10.1002/per.1941>
- Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: The four c model of creativity. *Review of General Psychology*, 13, 1–12. <http://dx.doi.org/10.1037/a0013688>
- Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., & DeYoung, C. G. (2016). Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *Journal of Personality*, 84, 248–258. <http://dx.doi.org/10.1111/jopy.12156>
- Kozbelt, A. (2006). Dynamic evaluation of Matisse's 1935 'Large Reclining Nude'. *Empirical Studies of the Arts*, 24, 119–137. <http://dx.doi.org/10.2190/A2VY-TEBW-VH45-285E>
- Kozbelt, A., & Serafin, J. (2009). Dynamic evaluation of high- and low-creativity drawings by artist and non-artist raters. *Creativity Research Journal*, 21, 349–360. <http://dx.doi.org/10.1080/10400410903297634>
- McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of Personality and Social Psychology*, 52, 1258–1265. <http://dx.doi.org/10.1037/0022-3514.52.6.1258>
- Mehl, M. R., & Conner, T. S. (Eds.). (2012). *Handbook of research methods for studying daily life*. New York, NY: Guilford Press.
- Merleau-Ponty, M. (1964). *Sense and non-sense* (H. L. Dreyfus & P. A. Dreyfuss, Trans.). Evanston, IL: Northwestern University Press.
- Nusbaum, E. C., Silvia, P. J., & Beaty, R. E. (2014). Ready, set, create: What instructing people to “be creative” reveals about the meaning and mechanisms of divergent thinking. *Psychology of Aesthetics, Creativity, and the Arts*, 8, 423–432. <http://dx.doi.org/10.1037/a0036549>
- Peugh, J. L., & Enders, C. K. (2005). Using the SPSS Mixed procedure to fit cross-sectional and longitudinal multilevel models. *Educational and Psychological Measurement*, 65, 717–741. <http://dx.doi.org/10.1177/0013164405278558>
- Plucker, J. A. (1999). Is the proof in the pudding? Reanalyses of Torrance's (1958 to present) longitudinal data. *Creativity Research Journal*, 12, 103–114. [http://dx.doi.org/10.1207/s15326934crj1202\\_3](http://dx.doi.org/10.1207/s15326934crj1202_3)
- Poerio, G. L., Totterdell, P., Emerson, L.-M., & Miles, E. (2016). Social daydreaming and adjustment: An experience-sampling study of socio-emotional adaptation during a life transition. *Frontiers in Psychology*, 7, 13.
- Rammstedt, B., & John, O. P. (2005). Kurzversion des Big Five Inventory (BFI-K) [Short version of the Big Five Inventory]. *Diagnostica*, 51, 195–206. <http://dx.doi.org/10.1026/0012-1924.51.4.195>
- Ritter, S. M., & Dijksterhuis, A. (2014). Creativity—the unconscious foundations of the incubation period. *Frontiers in Human Neurosciences*, 8, 215. <http://dx.doi.org/10.3389/fnhum.2014.00215>
- Rothenberg, A. (1971). The process of Janusian thinking in creativity. *Archives of General Psychiatry*, 24, 195–205. <http://dx.doi.org/10.1001/archpsyc.1971.01750090001001>
- Rothenberg, A. (1986). Artistic creation as stimulated by superimposed versus combined-composite visual images. *Journal of Personality and Social Psychology*, 50, 370–381. <http://dx.doi.org/10.1037/0022-3514.50.2.370>
- Rothenberg, A. (1995). Creative cognitive processes in Kekulé's discovery of the structure of the Benzene molecule. *The American Journal of Psychology*, 108, 419–438. <http://dx.doi.org/10.2307/1422898>
- Rowe, G., Hirsh, J. B., & Anderson, A. K. (2007). Positive affect increases the breadth of attentional selection. *Proceedings of the National Academy of Sciences of the United States of America*, 104, 383–388. <http://dx.doi.org/10.1073/pnas.0605198104>
- Serafin, J., Kozbelt, A., Seidel, A., & Dolese, M. (2011). Dynamic evaluation of high- and low-creativity drawings by artist and non-artist raters: Replication and methodological extension. *Psychology of Aesthetics, Creativity, and the Arts*, 5, 350–359. <http://dx.doi.org/10.1037/a0023587>
- Silvia, P. J. (2014). Why big theories are fruitless, fragmentation is ideal, defining creativity is overrated and method-driven research is urgent: Some thoughts on the flourishing state of creativity science. *Creativity. Theory-Research-Applications*, 1, 233–239. <http://dx.doi.org/10.15290/ctra.2014.01.02.10>
- Silvia, P. J., Beaty, R. E., Nusbaum, E. C., Eddington, K. M., Levin-Aspenson, H., & Kwapil, T. R. (2014). Everyday creativity in daily life: An experience-sampling study of “little c” creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 8, 183–188. <http://dx.doi.org/10.1037/a0035722>
- Silvia, P. J., Martin, C., & Nusbaum, E. C. (2009). A snapshot of creativity: Evaluating a quick and simple method for assessing divergent thinking. *Thinking Skills and Creativity*, 4, 79–85. <http://dx.doi.org/10.1016/j.tsc.2009.06.005>
- Simonton, D. K. (1999). Significant samples: The psychological study of eminent individuals. *Psychological Methods*, 4, 425–451. <http://dx.doi.org/10.1037/1082-989X.4.4.425>
- Sio, U. N., & Ormerod, T. C. (2009). Does incubation enhance problem solving? A meta-analytic review. *Psychological Bulletin*, 135, 94–120. <http://dx.doi.org/10.1037/a0014212>
- Sowden, P. T., Pringle, A., & Gabora, L. (2015). The shifting sands of creative thinking: Connections to dual-process theory. *Thinking & Reasoning*, 21, 40–60. <http://dx.doi.org/10.1080/13546783.2014.885464>
- Wallas, G. (1926). *The art of thought*. London, United Kingdom: Watts & Company.

(Appendix follows)

## Appendix

### Questions and Response Scales (in Brackets) of the Daily Experience Sampling Assessment

1. How far advanced is the conception of your work? [%]
2. How far advanced is the realization of your work? [%]
3. How satisfied are you with your work at the moment? [%]

When answering the following questions, please consider them with relation to the time that has elapsed since the last questionnaire (about the last 24 hours). Please indicate if and to what extent they apply to you in this time period.

4. My daily routine has differed from my usual routine (e.g., diet, sports, sleep). [0–10]
5. I have had positive (everyday) experiences. [0–10]
6. I have had negative (everyday) experiences. [0–10]
7. I have deliberately spent time on my work. [no/yes]
8. Useful ideas have come to me while I have been occupied with other things. [no/yes]
9. I have altered the conception of my work. [no/yes]
10. I have altered my working process. [no/yes]

11. I have changed the material I plan to work with. [no/yes]
12. When working, it feels like I'm walking in a dense fog. [0–10]
13. I have anxieties regarding my work. [0–10]
14. I feel overwhelmingly stressed. [0–10]
15. When I work, I lose my sense of time and forget my surroundings. [0–10]
16. At the moment I am engrossed in small details of my work. [0–10]
17. When I am working, I forget myself. [0–10]
18. I enjoy being engaged in my work. [0–10]

Use this space for your own observations and reflections: [open]

Received July 26, 2016  
 Revision received October 11, 2016  
 Accepted October 20, 2016 ■