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CLINICAL PSYCHOLOGY IN EUROPE

The Official Academic Journal of the European Association of Clinical Psychology and Psychological Treatment

PsychOpen GOLD

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Contents

Editorial

Research Articles

Politics and Education

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Clinical Psychology in Europe

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Editorial

This Is Not a Christmas Editorial!

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When the two editors-in-chief of this journal met to discuss whether we should strive for a Christmas editorial this year, it was a moment of desperation. We began brainstorming potential topics over Zoom. It had been the fourth video conference on a Friday afternoon for both of us, and we were starting to experience headaches, fatigue, vision and concentration problems, as well as annoying noises in the ear. And we also felt that we are tired of speaking and writing about all the events that characterized this very special year. Last but not least we considered: Is a Christmas editorial still contemporary and fresh, especially if we want to express our openness to the diversity of people, cultures, and religions?

We started by investigating the background of Christmas, and we did it empirically (what else would you expect?). A word search in the Bible with typical, Christmas-associated items seemed a good way to start to evaluate religious chauvinism. However, neither “Rudolph, the red nosed reindeer” nor “Christmas tree” led to any hits. Wikipedia informed us that the Christmas tree goes back to the days of Nordic tribes, and many rituals of the end-of-the-year season have their roots in profane rites of celebrating the longest night. After a period of searching, even the origin of Santa Claus became more and more blurred. The white-bearded male with a BMI of >35 does not resemble any head of most popular religions in Europe. Eventually we decided that writing a Christmas editorial is not cultural chauvinism, but rather that it is more of a chance to reflect before the year ends on what has happened in 2020. But to be on the safe side: This is not a Christmas editorial.

So what should we write about? Many themes came to mind that we were tired to talk or write about. A virus posed a threat to all of us, but are our readers really keen to hear even more about the C-word at the very end of the year? Although some aspects

are still worth mentioning, even in a Not-a-Christmas-Editorial. This year we learned so much about Zooming, break-out rooms, and personal background preferences. What, for example, is the clinical implication of people preferring a Spiderman-virtual-background vs. a fake office background, or how relevant are the number of kids and cats appearing in the speaker's background? Is it really true that nations differed in terms of the choice of goods hoarded during lockdowns? Are these preferences really related to the people's mental health status in the respective countries, e.g. weed in the Netherlands, feta cheese in Greece, toilet paper in Germany, or wine and condoms in France? With a clear preference to migrate to France, we ended this discussion.

Now is the time to stand together and solve problems. Stop, no. We have to respect physical distancing. But why is there a country in Europe who really exaggerates social distancing? Shall we dedicate a special paper to this topic in our "Politics and education" section? How do we maintain the illusion of independent countries in the 21st century? But no, as with the C-word, we do not want to talk about the B-word either; we express our sympathies to all European and Non-European countries, even if they are on islands drifting around in the North Sea. You are always very welcome to join us under the umbrella of our journal.

Finally, in our discussion we turned to the US elections. Although we are not a political journal, this topic offers many possible starting points for an Editorial. For example, it would have provided perfect examples for psychological treatment (e.g. behaviour analysis, reality neglect, cognitive reframing and working with infantile schema modes). Since classification of mental disorders started more than 100 years ago, the starting point of classifying mental disorders was always the neglect of reality: medium in neuroses, even more serious in psychosis. However, while ruminating about these topics, we became more and more worried that we would end up writing a comprehensive overview of personality disorders, which is too big a topic, and beyond our expertise.

Therefore, we decided to write just a brief editorial with two major points. First, we want to express our thanks to all people involved in CPE's second volume. We wish to acknowledge our authors, reviewers, section editors, guest editors, and the whole publishing team. When we started with this journal more than two years ago, we were worried how the new publication would be accepted by the scientific community? It is risky to start a new scientific journal, in an era when scientists receive daily announcements and requests to submit to obscure and unknown journals.

But we did it. And it has been a really successful year for CPE. Not only have we published the first two volumes, but there are also a number of exciting manuscripts in the pipeline, and further manuscripts are waiting for consideration. We are grateful for all the support we have received – particularly in this tough and challenging year – and we are extremely pleased to see CPE becoming a more and more impactful journal.

Second, we want to wish you a Happy Holiday season and a peaceful and prosperous New Year. We hope it will soon be possible to meet up with family and friends, to

pursue hobbies, and to do all the things that belong to our previous regular life. We all know about the challenges of the current times, and should therefore use our knowledge and expertise in clinical psychology to get through this challenging time together and support those needing help.

We are looking forward to receiving your submissions in 2021 despite all the challenges that we are all facing. Thank you for your support of the journal.

Cornelia Weise & Winfried Rief

Pandemic-Compliant Greetings to All of You

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Research Articles

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How Strongly Connected Are Positive Affect and Physical Exercise? Results From a Large General Population Study of Young Adults

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Abstract

Background: Previous research has shown a link between low positive affect (PA) and numerous physical and psychological well-being outcomes but, recent research has raised the possibility that this relationship may be driven by physical activity. Thus, we were interested in exploring the PA-exercise connection by examining this relationship across differing levels of body mass and athleticism. We also looked at whether the item "active" that is used in many PA assessments was responsible for this effect.

Method: Participants were part of the Norwegian SHoT2018 national survey of 50,054 young adults (mean age = 23.2, 68.9% women), who completed electronic surveys about their exercise levels (duration, frequency and intensity) and affect.

Results: There was a clear and strong dose-response association between current state PA and the duration, frequency and intensity of exercise. For example, duration, magnitude, and slope effects were strongly driven by regular exercisers who had more than a 20-fold greater likelihood of being in the highest PA deciles compared to the least frequent exercisers. These dose-response connections replicated across both healthy and overweight BMIs, as well as in elite athletes. Removing the word "active" from the PA measure substantially reduced the size of this association, although the dose-response relationship remained.

Conclusion: The observed strong connections have critical implications for health researchers and clinicians, and point to a need to carefully consider what types of activities are most strongly tied to well-being.

Keywords

positive affect, exercise, physical exercise, vigor, well-being

Highlights

- There is a strong dose-response connection between exercise and positive emotion.
- This pattern persists across a range of body types and athlete characteristics.
- Overlap between adjectives in affect and self-reported activity scales partially but not fully explains the connection.
- Past work showing benefits of happiness on health may be partially or primarily driven by activity, not emotion.

It has long been established in both research and in common public knowledge that exercise can lead to greater positive affect (PA; Arent, Landers, & Etnier, 2000; Elavsky et al., 2005) as well as a reduction in negative affect (NA; e.g., depression) (Berger & Owen, 1983; Ströhle, 2009). While perhaps less recognised, it is also true that people high in PA engage in more physical exercise, as well as other positive health behaviors (Boehm et al., 2018; Cohen & Pressman, 2006) indicating potentially bidirectional and strongly interconnected associations between these two variables (Pasco et al., 2011). Recent work even indicates the value of positive psychology interventions for increasing physical exercise in the context of illness and stress (Huffman, Millstein, et al., 2020). With the common goal of improving well-being in patient samples, it is critical that we more fully explore this question so as to better inform the value of positive psychology interventions in clinical populations.

Understanding the nature of this association becomes even more critical given the burgeoning literature connecting PA to better physical health across a wide range of domains (Chida & Steptoe, 2008; Diener & Chan, 2011; Pressman, Jenkins, & Moskowitz, 2019). This includes longitudinal studies showing that PA predicts later health outcomes such as longevity (Danner, Snowdon, & Friesen, 2001; Pressman & Cohen, 2012; Willroth, Ong, Graham, & Mroczek, 2020), infectious illness (Cohen, Alper, Doyle, Treanor, & Turner, 2006; Cohen, Doyle, Turner, Alper, & Skoner, 2003), heart disease (Boehm & Kubzansky, 2012), HIV severity (Moskowitz, 2003) and other morbidities, even after accounting for critical covariates such as baseline health, medication use, negative affect, and other relevant factors. These types of studies, as well as recent positive psychology interventions showing improvements in later self-reported health (Kushlev et al., 2020) and mental health outcomes in diseased samples (see review by Pressman, Jenkins, & Moskowitz, 2019) point to the interesting possibility that PA can *cause* better health.

This work has helped foster a new field of "Positive Health" research (Seligman, 2008) as well as a burgeoning area of research trying to improve health via Positive Psychology

interventions (e.g., Huffman et al., 2011; Moskowitz et al., 2017, 2012). However, as discussed recently (Pressman & Cross, 2018), this literature becomes potentially less compelling and the focus on positive psychology interventions for health promotion less useful, if the reason that the PA-health association is largely due to the overlap between positive affect and physical exercise or fitness. That is, is PA correlated with better health primarily because happy people are also more physically active, and therefore *healthier* people? Recent evidence confirming the causal effects of positive psychological interventions on increased exercise and general activity points to this possibility (e.g., Huffman, Feig, et al., 2019).

This problem is compounded by the fact that when utilizing self-report scales, there can be a large overlap between physical health self-reports and PA self-reports. For example, many popular affect measures rely on adjectives like "active" and "energetic" to tap positive affect (McNair, Lorr, & Droppleman, 1971; Watson, Clark, & Tellegen, 1988). While these items do tap feelings of vitality important to the conceptualization of PA, critically, they also tap physical fitness and perceived health, as evidenced by frequently used self-reported health scales that use these types of items (Kind, Brooks, & Rabin, 2005; McNair et al., 1971). That is, if we take the word "active" (an item from the Positive and Negative Affect Schedule [PANAS]; Watson, Clark, & Tellegen, 1988) literally, then someone *feeling* active may also *be* more (physically) active. Assessments do not distinguish between psychological versus physical forms of these vigorous feelings. This is problematic because to the extent that these measures represent the same underlying construct, it may be that feelings of happiness and joy are not predicting future health, but rather that it is health predicting health.

We examined this issue recently in a large sample of over 5000 older adults (Petrie et al., 2018). Consistent with past PA-mortality research (Chida, Hamer, Wardle, & Steptoe, 2008), lower PA was associated with nearly *double* the mortality risk over a 16-year follow-up as compared to those with the highest PA. However, when unpacking the subtypes of PA responsible for this effect, we found that the association was primarily driven by the active item of the PANAS. This effect remained after accounting for the effects of the remaining PANAS items, demographics, and other important covariates. Thus, it was not the more emotionally laden and less activity/arousal based items driving longevity but the PANAS activity item. While we did control for exercise in analyses as well, a limitation was that physical activity was assessed by only a single 3-point item asking about weekly level of exercise which did not allow us to look more closely at the nature of the PA (or felt activity) and exercise connection.

This minimalist approach to assessing physical activity is echoed across the PA-health literature, including in studies showing that it is the high and not low energy components of PA most tied to reduced mortality (no activity control) (Pressman & Cohen, 2012) and decreased susceptibility to catching the common cold (included a simple measure of days exercised multiplied by effort) (Cohen et al., 2003). This practice is also

common in studies on the connections between general PA and longevity where studies use single yes/no item regarding vigorous activity (Steptoe & Wardle, 2011) or no activity assessment (Danner, Snowdon, & Friesen, 2001). Unfortunately, it is also the case that many studies focused on physical activity do minimal assessments of PA, relying, for example on assessments of only one type of PA (e.g., vigor) or instead infer PA and well-being because of a drop in mental health problems like depression or anxiety symptoms (Berger & Motl, 2000; Penedo & Dahn, 2005; Schinke, Stambulova, Si, & Moore, 2017).

Thus, clearly there is a need to examine the association between these related variables in more detail where PA can be compared to a range of activity markers across a large number of individuals. Furthermore, given the concern about high PA simply being a marker of healthy fitness, this should be tested in those both high and low in fitness. This will enable a deeper understanding of the degree of connection association between fitness and high arousal PA, and more clarity about past research linking PA to health and mortality. To examine the extent to which PA and physical activity are overlapping constructs, we used data from the SHoT2018 study, a sample of over 50,000 Norwegian young adults. We hypothesized that PA would be strongly associated with *all* measures of self-reported physical exercise including exercise frequency, intensity and duration. In addition, we consider several previously unexplored avenues. We capitalized on the survey questions that distinguished young people who self-identified as elite athletes. This allowed us to examine whether top athletes had significantly greater odds of also having higher PA, as well as whether the opposite would be true in individuals with high Body Mass Index. The large size of the sample also enabled an examination of whether the PA-physical exercise connections holds between men and women and within each of the frequency, intensity and duration of exercise dimensions. Finally, based on its importance in our past work, we explored to what extent the associations found in the above analyses changed when the word "active" was removed from the PANAS PA measure and the size of the association of feeling "active" with these exercise measures.

Method

Participants

The SHoT study (an acronym for the Norwegian name: Studentenes Helse- og Trivselsundersøkelse *[Students' Health and Wellbeing Study]*) is a national student survey for higher education in Norway. Details of the study have been published elsewhere (Sivertsen, Råkil, Munkvik, & Lønning, 2019). So far, three health surveys of the student population in Norway have been completed (2010, 2014, and 2018). Both the size and scope of the SHoT studies have expanded over time, and now include detailed information on both mental and physical health, quality of life, and health-related behaviours.

The SHoT2018 study was a joint effort between the three largest student welfare organizations in Norway and the Norwegian Institute of Public Health (NIPH). The study was conducted between February 6th and April 5th, 2018, on all full-time Norwegian students taking higher education (both in Norway and abroad). The collection of the health survey was in close collaboration with all the student welfare organizations in Norway. Students were told that participation was completely voluntary, and that there were no penalties for not filling out the survey. Eight percent of the sample were immigrants, defined as either the student or his/her parents being born outside of Norway.

The study protocol was approved by the Regional Committee for Medical and Health Research Ethics of Western Norway (no. 2017/1176/REK vest), whose directives are based on the Declaration of Helsinki. Written electronic consent was obtained from all subjects included in this study.

Measures

The Positive and Negative Affect Schedule (PANAS)

The PANAS (Watson et al., 1988) is a 20-item questionnaire which comprises two subscales, one that measures positive affect (PA) and the other which measures negative affect (NA). The PA scale of interest here includes the terms interested, alert, enthusiastic, excited, proud, inspired, strong, active, and attentive. Participants are instructed to rate to what extent they experience each emotion right now, rated on a 5-point scale from "very slightly or not at all" (coded as 1) to "extremely" (coded as 5). A sum score is calculated with higher scores representing greater PA. For the purpose of the present study, the sum scores were divided into both tertiles and deciles separately for men and women. The Cronbach's alpha for the PA subscale in the current study was 0.91. The NA subscale was not included in the SHoT study[1].

Physical Exercise

The students were first presented with the following brief definition of physical exercise: "With physical exercise, we mean that you, for example, go for a walk, go skiing, swim or take part in a sport." Physical exercise was assessed using three sets of questions, assessing the average number of times exercising each week, and the average intensity and average hours each time: 1) *"How frequently do you exercise?"* (Never, Less than once a week, Once a week, 2–3 times per week, Almost every day); 2) *"If you do such exercise as frequently as once or more times a week: How hard do you push yourself?* (I

1) NA was not the focus of the paper given our past work showing that it does not alter PA-health associations (Petrie et al., 2018), extensive work on the independence of PA and NA in the PANAS (Watson et al., 1988), existing work on this sample examining NA and mental health (Grasdalsmoen, Eriksen, Lønning, & Sivertsen, 2020), and the fact that the questions here target the potential overlap specific to PANAS PA (not NA) and physical activity measurements.

take it easy without breaking into a sweat or losing my breath, I push myself so hard that I lose my breath and break into a sweat, I push myself to near-exhaustion); and 3) *"How long does each session last?"* (Less than 15 minutes, 15–29 minutes, 30 minutes to 1 hour, More than 1 hour". Detailed results of college students' exercise in the SHoT studies have been published elsewhere (Grasdalsmoen, Eriksen, Lønning, & Sivertsen, 2019). This 3-item questionnaire has previously been used in the large population-based Nord-Trøndelag Health Study (the HUNT studies). Previous validation studies (Kurtze, Rangul, Hustvedt, & Flanders, 2008) have demonstrated moderate-to-strong correlations between the questionnaire responses, and direct measurement of VO_2max (r = 0.48), (an objective indicator of cardiorespiratory fitness) during maximal work on a treadmill, with ActiReg (r = 0.39), an instrument that measures PA and energy expenditure (EE), and with the International Physical Activity Questionnaire (IPAQ; r = 0.55). Respondents were also asked if they considered themselves to be a "top athlete" (yes/no), and if so, how many hours per week they trained (drop-down menu: 0 to 40 hours).

Statistical Analyses

IBM SPSS Statistics 25 for Mac (SPSS Inc., Chicago, IL) was used for all analyses. Multinomial logistic regression models were computed to assess the association between levels of physical exercise (independent variable; lowest level of the three physical exercise variables being the reference category) and deciles of PA (dependent variable; first decile being the reference category). Being similar to binary logistic regression, multinomial regression is used when the dependent variable is nominal with more than two levels. Results are presented as odds-ratios (ORs) with 95% confidence intervals (95% CIs). There was very little missing data on the PA items, with missing responses ranging from n = 167 (1.1%) to n = 1092 (2.6%), and hence techniques involving multiple imputations were not considered, and missing values were handled using listwise deletion.

Results

Descriptive Statistics

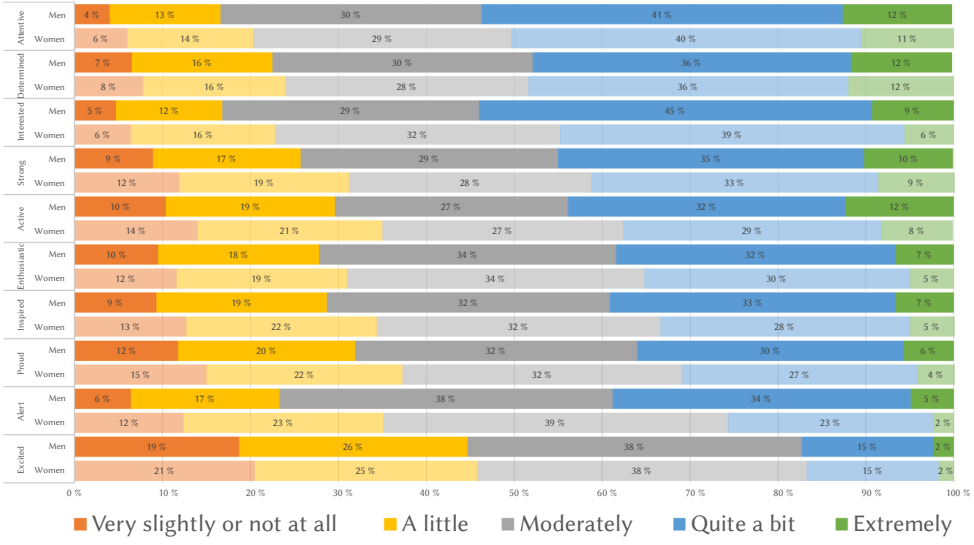
In terms of *frequency* of physical exercise, 24% of the sample reported being physically active "every day", while 47% responded exercising "2-3 times per week". Moreover, 16%, 12% and 4% reported training "once a week", "less than once a week", or "never", respectively. Regarding the students' reports of their average physical exercise *intensity*, 11% of the sample responded "I push myself to near-exhaustion", while 71% reported "I push myself so hard that I lose my breath and break into a sweat" and 18% responded "I take it easy without breaking into a sweat or losing my breath". On the item assessing the *duration* of each episode of physical exercise, 37% reported an average duration of

"more than 1 hour", compared to 52%, 10% and 2% reporting "30 minutes to 1 hour", "15–29 minutes", and "less than 15 minutes", respectively.

The response distribution of the 10 PA items for both men and women are presented in Figure 1. As shown, the proportion of students responding feeling "attentive" either quite a bit or extremely was 51%, followed by "determined" (48%) and "interested" (47%). In contrast, only 17% of the sample responded feeling "excited" quite a bit or extremely. There were only marginal sex differences in terms of the response distribution of PA items.

Figure 1

Distribution of Positive Affect Items in Men and Women in the SHoT2018 Study



Note. Sorted by proportion of students reporting each item "quite a bit" or "extremely".

Is Positive Affect Associated With Physical Exercise?

The physical exercise characteristics according to sex-specific tertiles on the PA-scale are presented in Table 1. Low PA scores were more prevalent among those with lower exercise levels. These trends were present in a dose-response manner, and evident across all four physical exercise items (see Table 1 for details).

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Table 1

Age Group and Physical Exercise Characteristics by Positive Affect (PA) Tertile Stratified by Sex in the SHoT2018 Study, Norway, 2018

	Women			Men		
Group Characteristics	**PA Lower tertile**	**PA Middle tertile**	**PA Upper tertile**	**PA Lower tertile**	**PA Middle tertile**	**PA Upper tertile**
Age group						
18-20 years	36.0%	34.8%	29.2%	36.5%	32.8%	30.7%
21-22 years	33.5%	34.7%	31.8%	31.7%	34.0%	34.3%
23-25 years	33.7%	34.0%	32.3%	33.8%	31.8%	34.3%
26-28 years	35.6%	32.2%	32.2%	39.0%	30.4%	30.6%
29-35 years	30.3%	32.7%	37.0%	38.8%	31.9%	29.3%
Physical exercise (frequency)						
Never	59.5%	27.2%	13.3%	62.5%	24.4%	13.1%
Less than once a week	47.1%	34.2%	18.8%	51.6%	28.2%	20.1%
Once a week	39.9%	35.3%	24.8%	40.2%	35.7%	24.0%
2–3 times per week	31.1%	35.5%	33.5%	31.6%	34.5%	34.0%
Almost every day	24.6%	31.4%	44.1%	22.0%	31.3%	46.8%
Physical exercise (intensity)						
I take it easy without breaking into a sweat or losing my breath	43.5%	34.6%	21.9%	48.0%	29.7%	22.3%
I push myself so hard that I lose my breath and break into a sweat	31.0%	34.7%	34.3%	31.4%	34.1%	34.5%
I push myself to near-exhaustion	27.0%	31.0%	42.1%	27.4%	30.4%	42.2%
Physical exercise (duration)						
Less than 15 minutes	55.0%	29.0%	16.0%	58.5%	25.4%	16.2%
15–29 minutes	43.5%	34.8%	21.7%	42.8%	31.7%	25.5%
30 minutes to 1 hour	33.4%	34.3%	32.3%	35.5%	33.5%	30.9%
More than 1 hour	27.9%	34.5%	37.6%	28.2%	32.8%	39.0%
Top athlete						
Yes	18.8%	26.9%	54.3%	15.6%	23.0%	61.3%
No	24.9%	31.6%	43.5%	22.2%	31.8%	46.0%

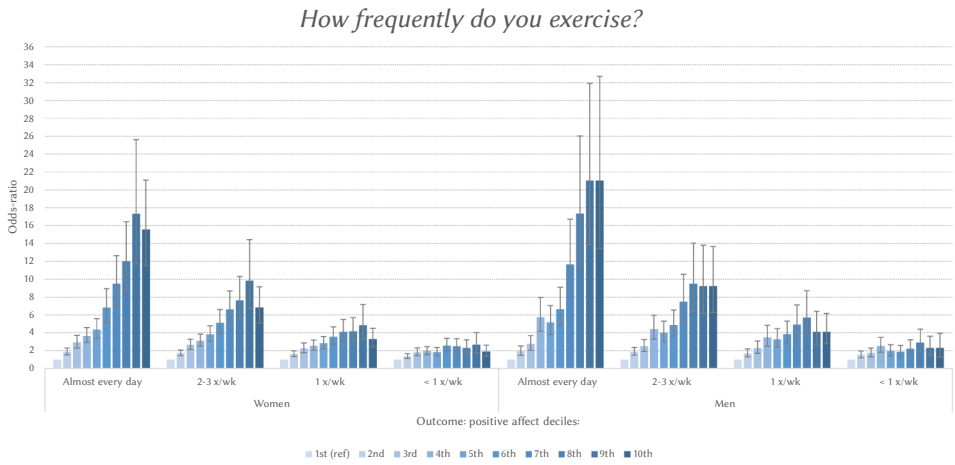
Note. All $p < .001$. p values refer to the results from the chi-squared tests.

Figure 2 displays the results from the multinomial regression analysis examining the predictive effect of each physical exercise item on the level of PA, operationalized by deciles on the PA-subscale. As shown, there was a strong dose-response relationship between frequency of physical exercise and PA level. Although the associations were significant across all response categories of physical exercise (compared to "never"), the odds-ratios were especially strong among students reporting to train multiple times per week. Similarly, the effect sizes gradually increased parallel to elevating PA deciles. For example, students training every day had more than 20-fold increased odds of having a PA-score above the 90th percentile (compared to the lowest decile). The correlations between the total PA score and exercise frequency for men and women were r = 0.28 and r = 0.23, respectively (both ps < .001).

A similar pattern was observed for the item assessing the *intensity and duration* of physical exercise and PA level. As displayed in Figure 3, the harder the exercise, the higher the odds-ratio between physical exercise and PA. Similar to the frequency item, there was a clear dose-response association for both men and women. The *duration* of the physical exercise (Figure 4) was also associated with PA level in a similar manner: the *longer* the exercise, the stronger the association with high levels of PA. For example, both men and women reporting an average duration of exercise of more than one hour had between six to eight times increased odds of scoring in the top decile of the PA-subscale.

Figure 2

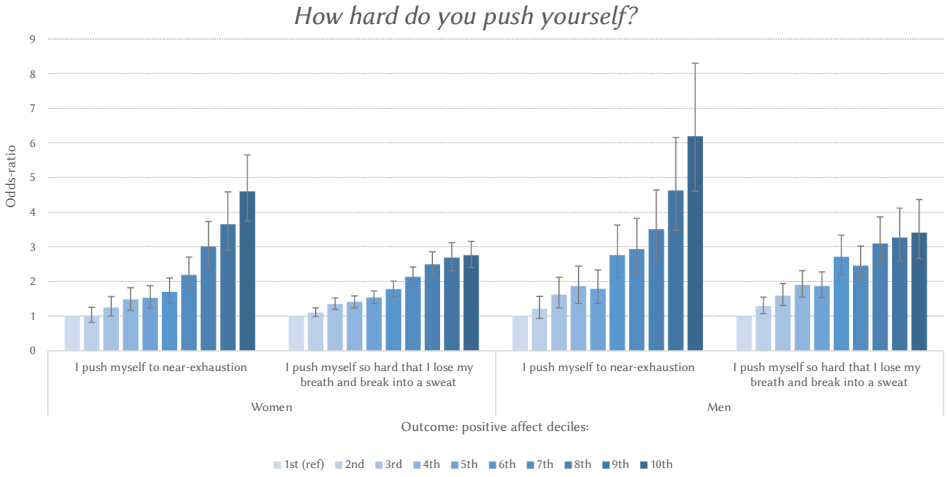
Odd-Ratios of Frequency of Physical Exercise Associated With Deciles of the Positive Affect (PA) Subscale of PANAS Stratified by Sex in the SHoT2018 Study



Note. Reference category: *never*. Error bars represent 95% confidence intervals.

Figure 3

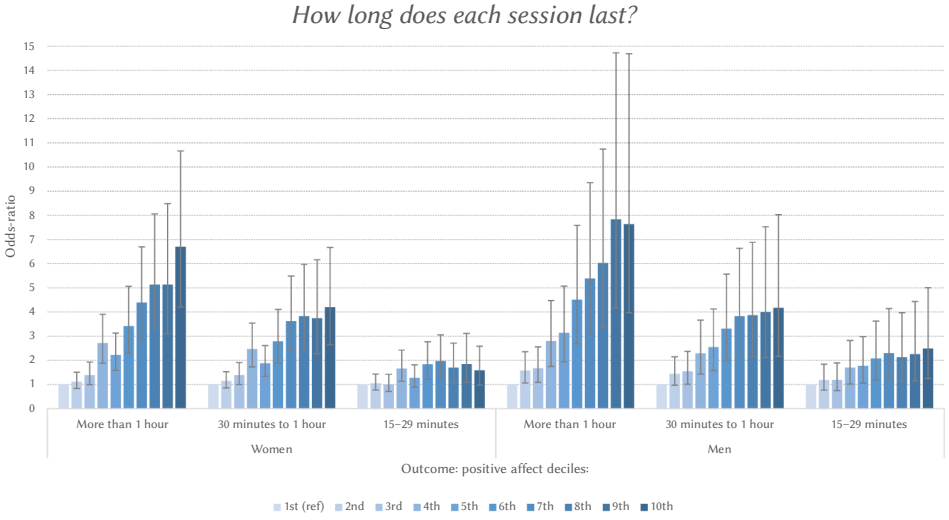
Odd-Ratios of Intensity of Physical Exercise Associated With Deciles of the Positive Affect Subscale of PANAS Stratified by Sex



Note. Reference category*: I take it easy without breaking into a sweat or losing my breath.* Error bars represent 95% confidence intervals.

Figure 4

Odd-Ratios of Duration of Physical Exercise Associated With Deciles of the Positive Affect Subscale of PANAS Stratified by Sex



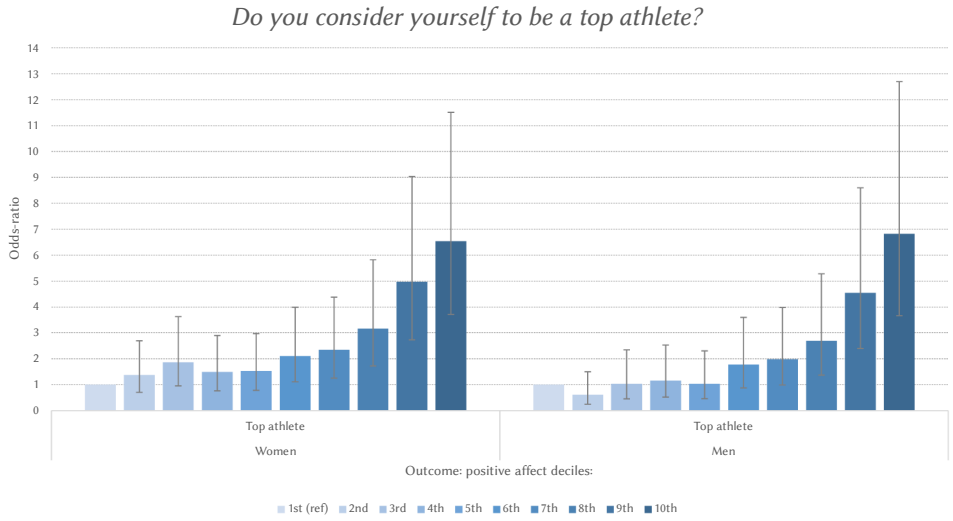
Note. Reference category*: "Less than 15 minutes".* Error bars represent 95% confidence intervals.

What Is the Relationship Between Exercise and Positive Affect in Top Athletes?

Finally, students considering themselves to be a top athlete had significantly higher odds of also having a high level of PA. As shown in Figure 5, the associations were also here in a dose-response manner, although the associations were particularly strong for the top two deciles of the PA-subscale (above the 80th percentile). These patterns were similar for both men and women, and there were no significant sex interactions for any of the analysis.

Figure 5

Odd-Ratios of Being a Top Athlete Associated With Deciles of the Positive Affect Subscale of PANAS Stratified by Sex



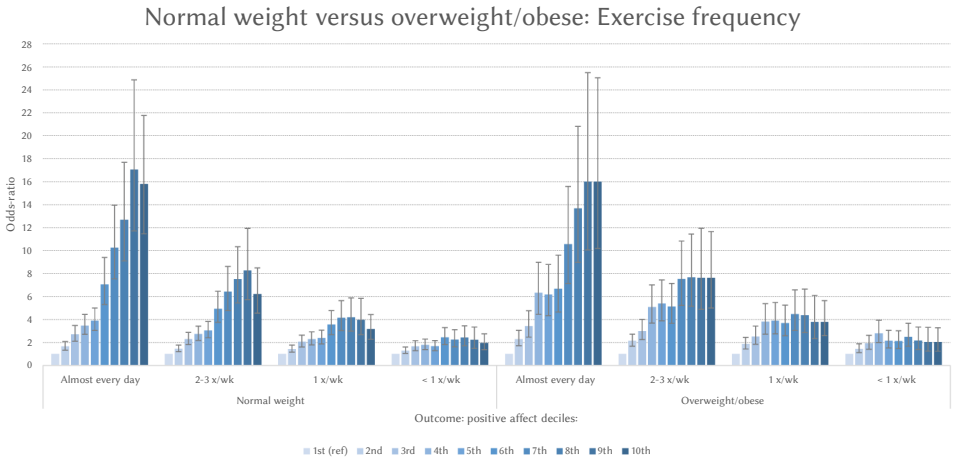
Note. Reference group: Those not indicating that they are a top athlete. Error bars represent 95% confidence intervals.

Is This Graded Association True in Both Lean and Overweight/Obese Participants?

As shown in Figure 6, across healthy weight and obese/overweight categories, the association persists and is seen to be nearly identical across the two BMI groups at different levels of exercise.

Figure 6

The Association Between Exercise Frequency and Decile of PANAS Positive Affect for Normal and Overweight/Obese Participants



What Happens When the Word Active Is Separated From the PANAS?

Removing the adjective "active" from the PANAS cut the association between PA and exercise frequency a great deal. As shown in Figure 7, when considering exercise frequency, while the graded association remained robust and in the same pattern, some associations dropped by 50%. For example, the odds for daily exercisers of being in the highest PA decile went from approximately 18x to 9x (Figure 7, Panel 1). The degree of change in odds was less severe at lower levels of exercise. While not as dramatic a change, but in the same direction, the odds of being in the top decile for those who push themselves the hardest during exercise dropped from a 4.8 to a 3.8 (Figure 7, Panel 2). On the flip side this pattern was present in other activity outcomes, although not to the same degree. For example, in the duration of exercise outcome, there was no observable change from removing "active" from the 15-29 minute of exercise at a time subset (Figure 7, Panel 3).

Figure 7

Panel 1

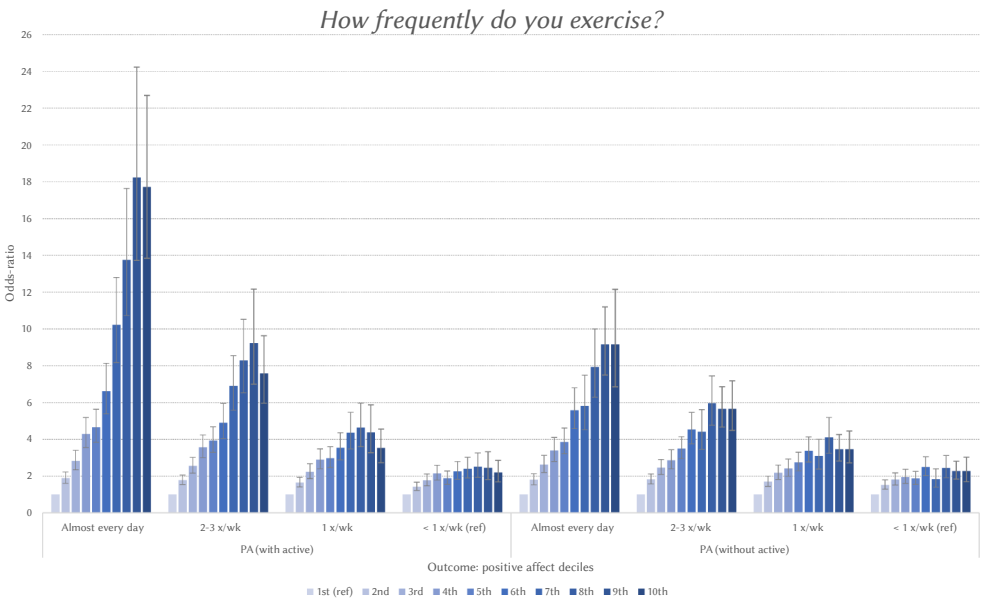


Figure 7

Panel 2

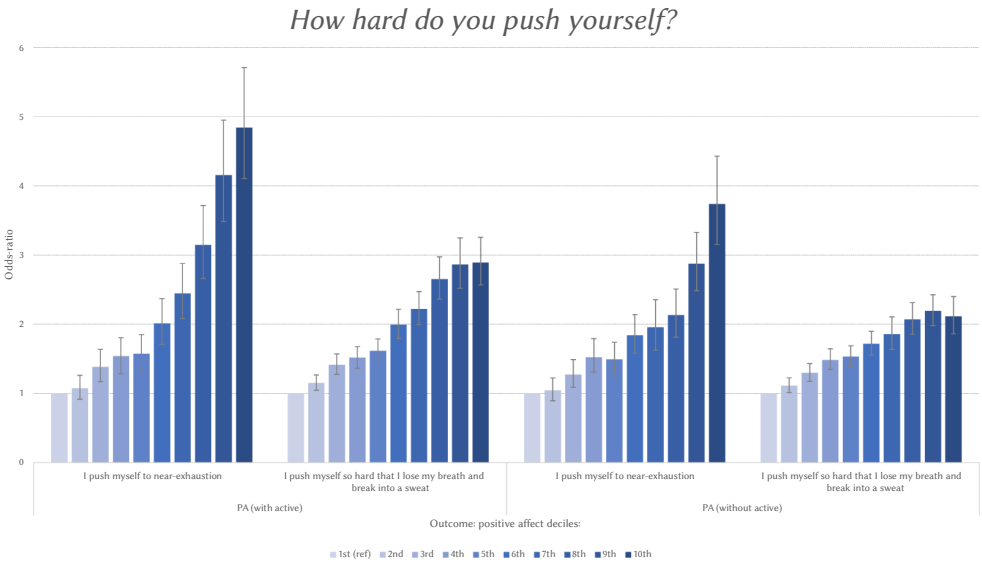
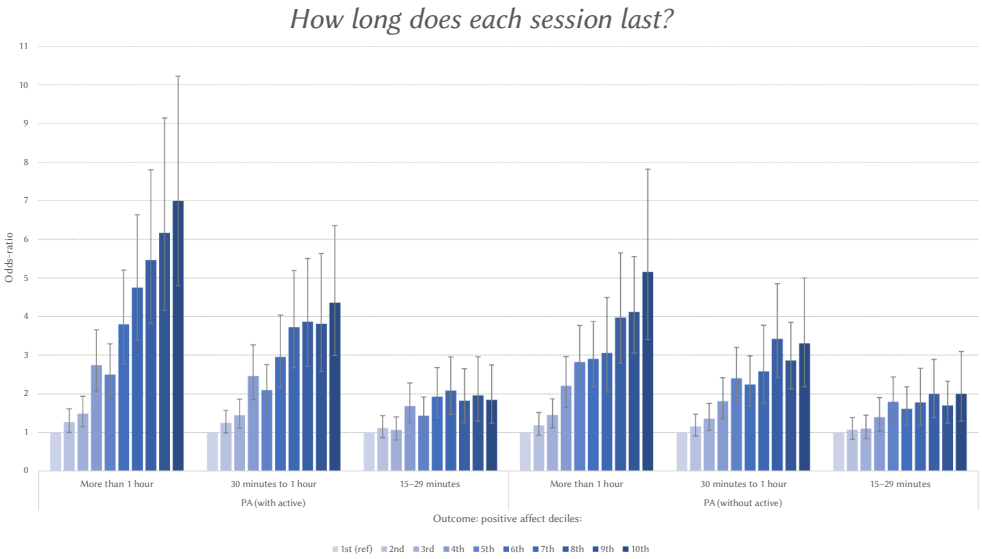


Figure 7

Panel 3



Note. (Panels 1, 2, 3). Odd-ratios of frequency, intensity and duration of physical exercise (versus lowest categories displayed in Figure 2, Figure 3, and Figure 4) associated with deciles of the positive affect (PA) subscale of PANAS organized by full scale (left) and the PANAS minus the word "active" (right). Error bars represent 95% confidence intervals.

Discussion

Overall, this study replicates past findings indicating a strong association between PA and exercise in a large general population study of over 50,000 Norwegian young adults, but it also adds a great deal of new information. First, we show for the first time a surprisingly clear and strong dose-response relationship between PA and physical exercise across *all* three self-reported assessments (i.e., duration, frequency, intensity). The magnitude and slope of the dose-response relationships were particularly driven by those participants who exercise regularly. For example, those training every day had a more than *20-fold increased odds* of being in the top 10% of PA scores (versus those not exercising regularly), albeit with large confidence intervals. Similarly, when indexing other measures of self-reported exercise, those reporting more than 1 hour per session had between six to eight times increased odds of scoring in the top decile of the PA-subscale. Also, those who considered themselves to be elite athletes were overrepresented in the top 80th percentile of PA with approximately five to six times the odds of being in

these top groups versus non elite athletes. Importantly, these effects were seen across all levels of body mass index indicating that this is not simply about physical fitness, but perhaps more about *actual* activity. Relevant to this interpretation, removing the word active from the PANAS made a large difference in the size of the PA association with exercise, in some cases, cutting the linkage size by 50% in the highest and most consistent exercisers, but having less of a dramatic effect in the less active individuals.

All together, these results indicate that high PA, as assessed by the PANAS, is in fact picking up on activity to a large extent, especially when assessing regular exercisers. That is, the majority of the *most* positive people are regular exercisers, and in some cases, elite athletes. The robust effect of removing the activity item from the PANAS highlights further this issue, that is, that the highest people in PA are the most active people, partially because, the PANAS *measures* activity. People who say they are *feeling* active, are by in large *actually* more active. Clearly qualitative work is needed to explore what people are evaluating in their lives and emotions when they answer these PANAS PA items, as well as work tying objective fitness (e.g., as measured by V02max) to PANAS active and other PA items.

We must also ask the more critical question of how these results impacts our interpretation of the literature connecting PA to better health? The findings clearly cast some doubt on health studies utilizing the PANAS PA or similarly active measures of PA (e.g., vigor), especially among results that don't account for the effects of physical activity in some way. That said, even if they did, given the typically limited fitness measures used in some studies, more work is probably needed to ensure that it is not simply the most physically fit, active, and healthy people driving these findings or some other related third variable (e.g., cardiovascular health, mitochondrial function) (Fuchs, 2015; Picard, 2011; Stevens, 2009). The study also raises questions about whether PA intervention studies in ill populations are in fact increasing the correct factors for health promotion since much of this work is based on past found associations between active PA and health. The current study points to the possibility that exercise may be a more important or sufficient target in some populations (a popular intervention in some diseased or high risk populations) (Ornish et al., 1998; Ryan, Cassidy, Noorduyn, & O'Connell, 2017; Theou et al., 2011; e.g., van der Wardt et al., 2020) as opposed to focusing on emotion in interventions.

In future research exploring the relationship between PA and health we recommend researchers consider taking extra effort to separate the effects of PA from physical activity when exploring health outcomes. This might be done by utilizing objective fitness indicators such as VO2max, accelerometers, extensive exercise and activity self-reports, in addition to covarying perceived health which is likely to relate strongly to fitness. It is only with these deeper and more objective approaches that we will begin to understand when feelings of positivity are promoting health versus activity levels (i.e., healthiness) promoting health.

This study has both strengths and weaknesses. While it is well powered and has an array of physical exercise assessments, it is limited by its cross-sectional design and reliance on self-report. Generalization is also limited to young, healthy, and primarily Caucasian samples. Given the high self-reported exercise levels of this sample, it would be interesting to also contrast these levels against objective activity assessments as well as to look at less active and older samples.

In addition, the use of a state (current) affect scale was weaker than that of a trait (long lasting) affect scale, although the two are known to be highly correlated (Diener & Emmons, 1984). It should also be noted that some of the 95% confidence intervals were quite large, especially for the top deciles of the PA scale. This should be kept in mind when interpreting the results. Finally, we could have opted to remove other active/high arousal affect items, such as the word "strong", from the PANAS to examine the resulting change in association with exercise. We chose "active" due to its more regular use in affect and health assessments as well as due to past results revealing that it was clearly the most tied to health (specifically, all-cause mortality with a hazard ratio of ~1.9). The association of the word "strong", for example, was comparable to many other PA items (HR ~ 1.4 which was similar to PANAS adjectives like interested and attentive) (Petrie et al., 2018).

Overall, this study shows strongly that exercise and positive emotions are closely intertwined, especially for the healthiest and most fit individuals. Future work should examine how the same effects are found with objective measures of activity and fitness, and should also further examine the implications for physical health outcomes. That is, when examining PA and health connections, to what extent do these change if we focus on PA measures that do not tap energy, felt vigor, and activity? What happens when we take great efforts to account for activity and fitness? From this data, we might infer that this would not have major implications for sedentary samples, however, for samples that include active individuals, effects may change drastically. It is essential that those of us interested in PA and health start measuring exercise well and that we take the possible different interpretations of high activity/arousal PA effects into account. The extent that we discover that activity levels underlie a large amount of previously observed PA health benefits, it may be the case that activity interventions (with or without PA) may be a more fruitful approach to improving health.

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Post-Event Processing After Embarrassing Situations: Comparing Experience Sampling Data of Depressed and Socially Anxious Individuals

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Supplementary Materials: Materials [see Index of Supplementary Materials]

Abstract

Background: Post-event processing (PEP) after social interactions (SIs) contributes to the persistence of social phobia (SP). This study investigated whether PEP as a transdiagnostic process also occurs in major depressive disorder (MDD) and controls. We also tested to what extent PEP was explained by trait levels of social anxiety (SA) or depression.
Method: For seven days, a total of n = 165 patients (n = 47 SP, n = 118 MDD) and n = 119 controls completed five surveys per day on their smartphones. Event-based experience sampling was used. PEP was assessed following subjective embarrassment in SIs with two reliable items from the Post-Event Processing Questionnaire. Data were analysed via multilevel regression analyses.
Results: Individuals with SP or MDD experienced more embarrassing SIs than controls and, accordingly, more PEP. The relative frequency of PEP after embarrassing SIs was equally high in all groups (86-96%). The groups did not differ regarding the amount of time PEP was experienced.

After controlling trait depression, embarrassment occurred more frequently only in SP compared to controls. When controlling trait SA, between-group differences in indications of embarrassment, and consequently in PEP, dissipated.
Conclusions: PEP could be interpreted as a common coping strategy among all individuals, while more frequent embarrassment might be specific for clinical groups. Embarrassment was primarily driven by SA. The alleviation of SA could lead to the reduction of embarrassment and, further, of PEP. On this basis, a model describing PEP in MDD is proposed, while current models of PEP in SP are complemented.

Keywords

post-event processing, social anxiety, depression, transdiagnostic processes, embarrassment, experience sampling

Highlights

- Individuals with social phobia or major depression experienced more embarrassing social interactions than healthy controls and, accordingly, more post-event processing.
- The frequency of post-event rumination within embarrassing interactions was high in all groups (86-96%).
- After controlling trait levels of social anxiety, between-group differences in the number of embarrassing situations, and consequently in post-event processing, dissipated.
- When controlling trait levels of depression, post-event rumination was higher in social phobia compared to healthy controls and major depression.

Background

Social phobia (SP, or social anxiety disorder) is characterised by fear of acting in a way that could cause embarrassment or rejection from others in one or more social situations (APA, 2013). SP is highly persistent and usually has a chronic and stable course (Beesdo-Baum et al., 2012; Fehm, Beesdo, et al., 2008). One of the key processes that contributes to its persistence is post-event processing (PEP; Brozovich & Heimberg, 2008; Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997).

PEP refers to ruminative thinking that centres on one's self-perception and anxious feelings following a social event (Abbott & Rapee, 2004; Clark & Wells, 1995). It is highly associated with in-situation anxiety and with avoidance of future social situations (Dannahy & Stopa, 2007; Hofmann, 2007; Mellings & Alden, 2000; Rachman et al., 2000). During PEP, the affected individual mentally reviews a previous event in detail, while pondering over thoughts indicative of the belief that he or she was evaluated negatively (Abbott & Rapee, 2004). This leads to the event being recalled as more negative than it actually was (Hofmann, 2007). Accordingly, PEP serves as a chain link in a vicious cycle in which recollections of past "failures" lead to anticipatory anxiety and to predictions

of negative evaluation in subsequent social events (Mellings & Alden, 2000), thus increasing the probability to avoid such events completely (Rachman et al., 2000). Therefore, interventions designed to minimise PEP were included in prominent treatment protocols for SP (e.g. Rapee & Heimberg, 1997).

Because individuals with SP predominantly fear scrutiny by others, social situations in which said persons felt embarrassed or humiliated could bear particular risk for heightened social anxiety (SA) and PEP. In social interactions (SI), embarrassment usually results from *unwanted exposure* of a topic or motive that a person would rather keep hidden or concealed from others (Crozier, 2001). To avoid such exposure, individuals with SP maintain high self-focused attention, while scanning their environment for impending negative evaluation. They usually detect such signs rapidly, deeming their behaviour as embarrassing (Bögels & Mansell, 2004; Rapee & Heimberg, 1997). Both negative evaluation by others (Makkar & Grisham, 2011) and negative self-evaluation (Chen et al., 2013; Perini et al., 2006) have been shown to significantly predict PEP. Thus, embarrassment, as a catalyst for perceived negative evaluation, might significantly contribute to PEP.

Patterns of ruminative thinking such as PEP, are however symptomatic for many mental disorders (McEvoy et al., 2010). This is due to shared cognitive and behavioural processes underlying a wide range of clinical conditions (Ehring & Watkins, 2008; Harvey et al., 2004). Hence, it remains unclear whether PEP is specific to only SP.

Another disorder to which ruminative thinking has a robust and consistent relationship is major depressive disorder (MDD; Mor & Winquist, 2002; Nolen-Hoeksema et al., 2008). In MDD, rumination is defined as a response style that consists of repetitive and negative thinking about causes and implications of depressive symptoms (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008). Rumination is associated with dysphoric mood in MDD (Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1993), and is predictive of the onset and duration of future depressive episodes (Nolen-Hoeksema, 2000; Nolen-Hoeksema et al., 1993). Rumination exacerbates and maintains depression by interfering with effective problem solving and with instrumental behaviour (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema et al., 2008; Pyszczynski & Greenberg, 1987). Unlike PEP in SP though, rumination in MDD is not bound to specific social events, but rather presents a more general, trans-situational style of thinking (McEvoy et al., 2010). Also, it revolves around depressive symptoms and themes of loss (Nolen-Hoeksema et al., 2008), while PEP in SP is related to social anxiety and thoughts of negative evaluation (Kocovski & Rector, 2007). However, as patients with MDD exhibit pronounced interpersonal problems as well (e.g. Garrison et al., 2012; Pemberton & Fuller Tyszkiewicz, 2016), this opens the possibility that they, just like socially anxious individuals, would also engage in PEP after social events.

In interpersonal encounters, depressed individuals were shown to be inhibited, reassurance seeking, and less socially skillful (Allen & Badcock, 2003; L. H. Brown et al., 2011; Hames et al., 2013; Joiner et al., 1999). This leads others to behave towards them in a

more detached manner during the interaction or to avoid them completely (Gotlib et al., 2004; Segrin, 2000). Rejection by others can lead to feelings of loneliness and heightened dysphoric mood, which ultimately can lead to rumination (Hames et al., 2013; Heinrich & Gullone, 2006).

Individuals with MDD also have the propensity to process interpersonal reactions in a negative manner, even if they were not inherently harmful (Bistricky et al., 2016; Joiner et al., 1999). As embarrassing SIs are often accompanied by a certain reaction from others, like an evaluative gaze (Robbins & Parlavecchio, 2006), they could as well be potentially detrimental for individuals with MDD. Behaviours like that could be highly ambiguous and be appraised as negative evaluation (Gotlib et al., 2004; Joiner et al., 1999; Trew & Alden, 2009). Perceived negative evaluation can trigger depressive feelings and successive rumination in individuals with MDD, especially when it is linked to people close to the individual (like family members or partners; Anderson et al., 1999; Garrison et al., 2012). Hence, it can be assumed that feelings of embarrassment in SIs, once they are triggered, can produce ruminative thinking in depressed individuals.

One major methodological problem of the studies cited is recall bias, which refers to systematic errors during the retrieval of autobiographical episodes (Shiffman et al., 2008). Recall bias is especially accentuated in individuals prone to ruminative thinking (Williams et al., 2007), like individuals diagnosed with SP or MDD. These individuals tend to resort to *overgeneral memory* (Conway & Pleydell-Pearce, 2000) and tend to have difficulties recalling specific episodes. As a result, research methodologies that limit recall bias are needed. Experience sampling method (ESM) as a data collection strategy that is anchored in daily life has proven to bypass these limitations (Fahrenberg et al., 2007). While PEP in SP has successfully been investigated in everyday life (Badra et al., 2017; Helbig-Lang et al., 2016), no study to date has used ESM to explore whether PEP is a transdiagnostic phenomenon occurring in MDD as well. The findings could advance the understanding of the genesis, the predecessors and the clinical specificity of PEP, and shine light on its natural occurrence in everyday life. It would provide insights into social behaviour of individuals with MDD and the transdiagnostic character of PEP as well, which could contribute to the development and enhancement of appropriate treatment strategies.

On this basis, we explored the frequency and duration of PEP after embarrassing SIs in patients with SP and MDD, as well as controls without SP or MDD. We derived two main hypotheses. The first hypothesis (H1) concerned between-group differences in frequency and duration of PEP. Because PEP is primarily linked to SA and social situations (Fehm et al., 2007), and because of the higher importance of embarrassment in SP, we hypothesized that the frequency and duration of PEP would be significantly higher in SP compared to MDD. Due to symptoms of SA or depression being elevated in both MDD and SP, however, we also hypothesized that the frequency and duration of PEP would be significantly higher in both clinical groups (SP and MDD) compared to controls. The

second hypothesis (H2) concerned the contribution of trait SA and trait depression to indications of embarrassment and to PEP. Due to the previously exemplified relation of dysphoric feelings to interpersonal rejection (e.g. Gotlib et al., 2004) we expected that PEP in MDD would be primarily driven by trait levels of depression, while PEP in SP would be facilitated by trait SA. To test this hypothesis, we analysed between-group differences while partialling out trait SA or trait depression. We expected that after controlling trait depression, PEP would remain elevated in SP compared to controls. On the other hand, when controlling trait SA, we expected that PEP would remain significantly higher in MDD compared to controls. Lastly, in our third hypothesis (H3) we explored if there are differences in embarrassment and PEP between the comorbid SP/MDD group and the SP group without MDD as comorbidity, and the MDD group without SP as a comorbid diagnosis. Because of elevated levels of *both* depression and SA, we predicted that PEP would be significantly higher in the comorbid group compared to the non-comorbid groups. We tested all our hypotheses in an ESM framework to minimise recall bias and to enhance ecological validity.

Method

Study Design

The study was part of a larger project about daily symptom fluctuations in MDD and SP (Gloster et al., 2017). Data collection was conducted at two research centers, one in Switzerland and one in Germany. Financing was provided by the Swiss National Science Foundation. The study protocol was approved by the ethics committee of the University of Basel (Approval # EKBB 236/12).

Participants

Recruitment and Selection Criteria

Participant recruitment and data collection occurred between May 2014 and August 2016 (Gloster et al., 2017). Patients with SP and MDD were recruited through the outpatient clinics of the research centres, through local practitioners and through internet advertisements. If the recruited individuals were 18-65 years old, met diagnostic criteria for SP or MDD according to the Diagnostic and statistical manual of mental disorders (4th ed., text rev., DSM-IV-TR; APA, 2000), and did not meet any of the exclusion criteria, they were invited to participate in the study. The diagnostic assessments were conducted with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 1997). The exclusion criteria were: current suicidal tendencies, current substance abuse and physical disabilities that prohibited proper use of a smartphone (e.g. an inability to see text on the screen or hear the smartphone's signal; Gloster et al., 2017). The inability to understand German was exclusionary. The controls were recruited through internet advertisements.

If, according to the SCID-I, they did not meet criteria for SP or MDD and were 18-65 years old, while not meeting any exclusion criteria, they were eligible for inclusion.

Sample Size Calculation

The outpatient clinics, from which the patients were recruited, see an estimated 110 SP and 520 MDD patients per year. Thus, the sample size calculation of the overall project (Gloster et al., 2017), in which the present study was embedded, was grounded on the assumption that the maximum number of patients with SP that could feasibly be recruited within the study time period would be n = 48. Assuming a dropout rate of 5%, this led to an expected number of 45 SP patients to complete the study. This number was used for the power analysis which assumed alpha = .05, power = .8, and a two-sided test for group comparisons on the between-subjects level. Based on a medium effect size (d = 0.5), and 45 subjects in the SP group, the sample size necessary to achieve .8 power is 111 subjects in each of the other groups (MDD & controls). Assuming a 5% dropout rate, 117 subjects would need to be recruited in each of these two groups. Given that we conducted multilevel analyses on the within-subjects level, which usually requires a smaller number of subjects to reach a certain degree of statistical power than the between-subjects level (Bellemare et al., 2016; Charness et al., 2012), we considered this sample size sufficient for the test of our hypothesis.

Final Sample

A total of N = 290 participants were initially included, but n = 6 of them did not complete at least 50% of the ESM time points. As an a priori decision (Gloster et al., 2017), these participants were removed from the dataset. The final sample size consisted of N = 284 (n = 119 controls; n = 118 with MDD; n = 47 with SP). In the SP group, n = 15 (31.9%) had co-morbid MDD, while n = 29 (24.6%) patients with MDD had co-morbid SP. In controls, n = 9 subjects fulfilled criteria for a clinical diagnosis. The sociodemographic and clinical characteristics of the sample, as well as prevalent diagnoses among controls are presented in Table 1.

Table 1

Sociodemographic and Clinical Characteristics of the Sample (N = 284)

Characteristics	Controls (*n* = 119)	MDD (*n* = 118)	SP (*n* = 47)
Age (*M*, *SD*)	32.2 (12)	32.7 (12)	28.3 (7.8)
Female (%)	67.2	66.1	66.0
Education (Years) (%)			
8-10	12.0	21.1	9.3
11-13	53.0	51.4	67.4
14+	35.0	27.5	23.3
Living arrangement (%)			
Alone	30.3	22.9	21.3
Family/partner	49.6	60.2	55.3
Other	20.2	16.9	23.4
Employed (%)	57.1	52.5	38.3
Number of diagnoses (%)			
0	90.8[a]	0.0	0.0
1	6.7	45.8	44.7
2	1.7	29.7	27.7
3+	0.8	24.6	27.7
In therapy (%)	14.3	58.5	46.8

Note. Controls = Control group; MDD = Major depressive disorder; SP = Social phobia.
[a]Following diagnoses were prevalent in controls: Specific phobia (*n* = 3), Panic disorder (*n* = 2), Anxiety disorder, unspecified (*n* = 1), Obsessive-compulsive disorder (*n* = 2), Agoraphobia with panic disorder (*n* = 1).

Measures

Post-Event Processing

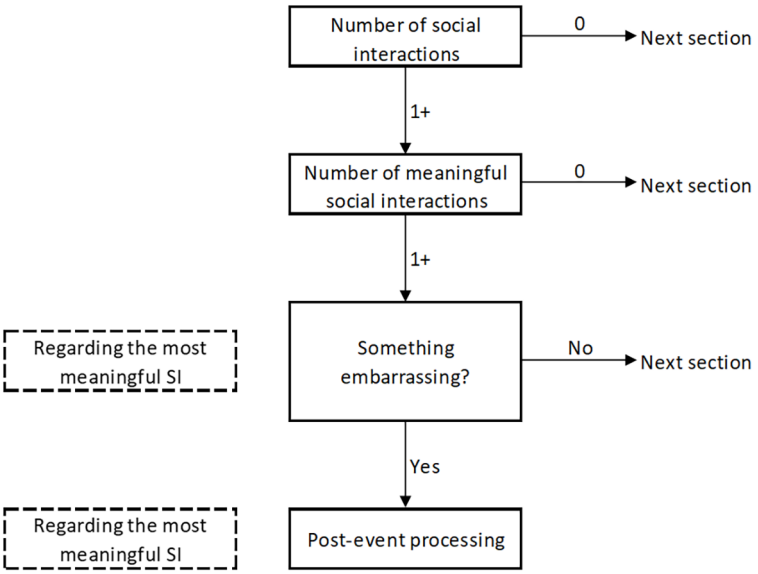
PEP was measured with two items from the Post-Event Processing Questionnaire (PEP-Q; Rachman et al., 2000; German Version: Fehm, Hoyer, et al., 2008): 1. *"Do you still think about the embarrassing moment from the interaction?"*; and 2. *"Do you have difficulties to forget the embarrassing moment?"*. The items were rated on a scale from 0 = *not at all* to 100 = *100% of the time since the interaction* (50 = *50% of the time*). The anchors of the scale were changed to percentages because the "percentage of time" approach is preferable to asking for durations, when symptoms lack a clear beginning or end (Schimmack et al., 2000). These items were chosen because of their high factor loadings on the first factor (Fehm, Hoyer, et al., 2008). The German version of the PEP-Q had an internal consistency of α =.72 in the original translation of the PEP-Q and α = .90 in the extended version (see Fehm, Hoyer, et al., 2008).

SIs

Participants were asked about the number of Sis (*"Since the last inquiry, how many social interactions did you have?")* and the number of meaningful Sis (*"Since the last inquiry, how many of your social interactions were meaningful for you?")* since the last inquiry. They could indicate their answers on a scale from 0 = *none* to 6 = *more than five* (1 = *one SI*, 2 = *two SIs*, etc.). If they indicated having at least one meaningful SI, they were asked to report about one SI that was the most meaningful for them (from then on questions began with *"Regarding the most meaningful SI..."*). They were then asked whether they behaved in an embarrassing manner during that SI ("*Regarding the most meaningful SI, did you, in your own opinion, in some way behave in an embarrassing manner?*"). Only if they indicated doing something embarrassing, were they asked about the degree of PEP (for survey structure see Figure 1).

Figure 1

Survey Structure



Social Interaction Anxiety Scale (SIAS)

The SIAS is an inventory developed to assess anxiety in SIs (Mattick & Clarke, 1998). It consists of 20 items that depict multiple socially anxious behaviours. The items are rated on a five-point scale. The German version of the SIAS (Stangier et al., 1999) showed high internal consistency (α = .89-.94) across SP and MDD, as well as high test-retest reliability (*r* = .92) across various samples.

Beck Depression Inventory II (BDI-II)

The BDI-II (Beck et al., 1996) is the most widely used measure of depression. It consists of 21 items depicting various dimensions of depression. The German version (Hautzinger et al., 2006) that was used in the present study showed sound psychometric properties, exhibiting a high internal consistency (Cronbach's α = .92-.93) and a high test-retest reliability (r = .93).

Procedure

In the overall study project, data were collected over two weeks with observations in seven-day intervals (Gloster et al., 2017). Time 1 occurred on the first day, Time 2 on the eight day and Time 3 on the 15th day of the study. The ESM took place between Time 2 and Time 3. Both the SIAS and BDI-II were assessed as traits at time point 2 before giving out the smartphones (for the complete study design see Gloster et al., 2017).

Participants received a smartphone and were instructed in its use. They were shown how to operate the smartphone, how to recognize the signal tone and how to initiate a survey after a signal.

The ESM took place for seven days. Every day participants completed five surveys on the smartphone screen at fixed times, every three hours, meaning that participants could have completed a maximum of 35 (i.e. 7 x 5) surveys (Gloster et al., 2017). Prior to receiving the smartphone, participants could decide whether the first survey of the day would be at 10 a.m. or at 11 a.m. The survey would then start on all of the following days at that chosen time.

Statistical Analysis

Data were analysed with Stata Statistical Software Version 14.2. (StataCorp, 2015). For the analysis of between-group differences in SIs, in indications of embarrassment and in the relative frequency of PEP (H1, frequency; exploratory analysis), random effects logistic regression analyses were conducted (Rabe-Hesketh & Skrondal, 2012). For these purposes, both PEP variables were recoded. If participants indicated having PEP in both items, the answer was coded with 1, and in the opposite case with 0. Also, the items assessing the number of overall and meaningful SIs were dichotomized (0 = 0, ≥ 1 = 1). To analyse the contributions of trait-social anxiety (SA) and trait-depression to PEP (H2), the SIAS and BDI-II scores were mean-centred and added as level-2 variables in the previous regression analysis. Additionally, we estimated via multilevel mixed effects linear regression analysis (H1, duration) whether groups differed regarding time spent thinking about the event (PEP, Item 1) and regarding time spent having difficulties to forget the event (PEP, Item 2). In all estimations, the variable indicating group-affiliation was dummy coded (controls = 0, MDD = 1, SP = 2) and used in the regression analysis as predictor. For comparisons of two groups, the group coded with the lower number was

used as the reference group (controls in the case of controls vs. MDD and controls vs. SP; MDD in the case of MDD vs. SP). The mentioned analyses were conducted also for comparisons between the "pure" SP (without MDD, coded as 0) and MDD group (without SP, coded as 1) and the comorbid group (mixed SP/MDD; H3). The intercept was specified as random. Except for the linear regression analysis, odds ratios with corresponding 95% confidence intervals were calculated as the resulting measures. In all analyses, the *p*-value was set to .05.

Results

Overall, the participants completed 91.8% of the EMA-assessments. There were no between-group differences in the response rate (see Supplemental Materials).

SIs and Embarrassment

The controls differed from MDD and SP regarding the number of overall SIs, while there was no difference between MDD and SP. There were no between-group differences in the number of meaningful SIs (see Table 2). For a more detailed overview of results see Villanueva et al. (2020). The relative frequencies of embarrassing situations within the reported meaningful interactions were significantly higher in MDD and SP in comparison to controls, while there were no differences between MDD and SP. Also, we explored between-group differences in instances of repeated embarrassment on the same day. These were higher in MDD and in SP compared to controls, while MDD and SP did not differ (see Table 2).

PEP After Embarrassing SIs (H1)

Frequency

When considering only the interactions in which participants felt embarrassed, participants indicated thinking repetitively about the interaction (PEP Item 1) in 95.68% of embarrassing SIs (controls: 96.67%; MDD: 96.07%; SP: 94.62%). Difficulties to forget the event (PEP Item 2) were reported in 94.02% of embarrassing SIs (controls: 86.67%; MDD: 93.82%; SP: 96.77%). There were neither differences between the groups in the relative frequency of repetitive thoughts (PEP, Item 1: controls vs. MDD, $OR = 0.85$, $p = .888$, 95% CI [0.09, 7.70]; controls vs. SP, $OR = 0.58$, $p = .646$, 95% CI [0.06, 5.69]; MDD vs. SP, $OR = 0.69$, $p = .567$, 95% CI [0.19, 2.47]), nor in the relative frequency of difficulties to forget the event (PEP, Item 2: controls vs. MDD, $OR = 4.57$, $p = .170$, 95% CI [0.52, 40.16], controls vs. SP, $OR = 7.45$, $p = .123$, 95% CI [0.58, 96.11], MDD vs. SP, $OR = 1.62$, $p = .651$, 95% CI [0.20, 13.50]). Due to elevated indications of embarrassment in SP and MDD compared to controls, it follows that PEP would also be higher in the clinical groups.

To account for imprecisions during the answer selection on the visual analogue scale (e.g. mistakenly marking a low number instead of a 0), we repeated the analyses while recoding the PEP variables as 0 when PEP ≤ 5% and when PEP ≤ 10%. However, no between-group differences were found. Results are available upon request.

Duration

The reported duration of PEP is presented in Table 3. There were no between-group differences.

Controlling for Social Anxiety and Depression (H2)

Embarrassment in SIs

When trait SA was controlled, no differences between MDD and controls were found in indications of embarrassment. When trait depression was controlled, SIs were interpreted as embarrassing significantly more in SP compared to controls. The results are shown in Table 2.

PEP After Embarrassing SIs

The between-group differences in the frequency and duration of PEP remained non-significant even after controlling for levels of SA and depression of the individual. The results are presented in the Supplemental Materials.

Day-Level Embarrassment and PEP

We calculated day level embarrassment and PEP in the groups and we explored between-group differences. Controls differed significantly from MDD and from SP in each embarrassment and PEP (both variables), while there were no differences between MDD and SP (see Table 4).

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Table 2

Between-Group Differences in Relative Frequencies of Indications of Overall SIs, of Meaningful SIs and of Embarrassment Within Reported Inquiries (N = 284)

	Controls	MDD	SP	Controls vs. MDD			Controls vs. SP			MDD vs. SP		
Variable	**rf (%)**	**rf (%)**	**rf (%)**	***OR***	***p****	**95% CI**	***OR***	***p***	**95% CI**	***OR***	***p***	**95% CI**
Any SI[a]	80.4	74.0	72.6	**0.63**	**.006**	**[0.45, 0.87]**	**0.57**	**.010**	**[0.37, 0.87]**	0.90	.625	[0.58, 1.38]
Any meaningful SI[b]	84.9	85.3	85.2	1.01	.682	[0.73, 1.38]	1.09	.682	[0.72, 1.67]	1.09	.702	[0.71, 1.66]
Indications of embarrassment[c]	2.14	8.96	11.73	**4.78**	**< .001**	**[2.55, 8.96]**	**6.93**	**< .001**	**[3.35, 14.35]**	1.45	.213	[0.81, 2.60]
Repeated embarrassment[d]	3.33	14.04	12.90	**2.80**	**.005**	**[1.04, 5.91]**	**2.76**	**.006**	**[1.05, 6.20]**	0.21	.836	[-1.25, 1.54]
Differences in indications of embarrassment while controlling for	Trait social anxiety			1.86	.085	[0.92, 3.76]		–			–	
	Trait depression				–		**3.76**	**.001**	**[1.77, 7.98]**		–	

Note. Controls = Control subjects; MDD = major depressive disorder; SP = Social phobia; rf (%) = relative percentages.
[a]Frequencies are relative to the total sum of social interactions: 9105 (Denominators: Controls = 3868, MDD = 3747, SP = 1490).
[b]Frequencies are relative to the total sum of meaningful social interactions: 6965 (Denominators: Controls = 3111, MDD = 2772, SP = 1082).
[c]Frequencies are relative to the total sum of reports about the most meaningful social interaction: 4183 (Denominators: Controls = 793, MDD = 1986, SP = 1404).
[d]Frequencies are relative to the total sum of indications of embarrassment: 301 (Denominators: Controls = 30, MDD = 178, SP = 93).
*Significant differences are bold.

Table 3

Between-Group Differences in the Duration of Time Spent Engaging in Post-Event Processing (N = 284)

	Controls	MDD	SP	Controls vs. MDD			Controls vs. SP			MDD vs. SP		
Variable	***M* (*SE*)**	***M* (*SE*)**	***M* (*SE*)**	***z***	***p***	**95% CI**	***z***	***p***	**95% CI**	***z***	***p***	**95% CI**
PEP, Item 1	35.50 (5.47)	43.57 (2.60)	40.05 (3.75)	1.33	.182	[-3.79, 19.94]	0.69	.493	[-8.45, 17.56]	-0.77	.440	[-12.48, 5.43]
PEP, Item 2	32.10 (5.72)	43.68 (2.78)	40.72 (4.05)	1.82	.069	[-0.88, 24.06]	1.23	.219	[-5.12, 22.37]	-0.60	.546	[-12.59, 6.67]

Note. PEP, Item 1 = Time spent thinking repetitively about the embarrassing event; PEP, Item 2 = Time spent having difficulties to forget the embarrassing event; Controls = Control group; MDD = major depressive disorder; SP = Social phobia.

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Table 4

Between-Group Differences in Day Levels of Embarrassment and Post-Event Processing (N = 284)

	Controls	MDD	SP	Controls vs. MDD			Controls vs. SP			MDD vs. SP		
Variable	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***z***	***p***	**95% CI**	***z***	***p***	**95% CI**	***z***	***p***	**95% CI**
Embarrassment	0.03 (0.20)	0.21 (0.55)	0.29 (0.60)	**5.16**	**< .001**	**[0.11, 0.25]**	**5.30**	**< .001**	**[0.16, 0.34]**	1.41	.16	[-0.03, 0.15]
PEP1	0.03 (0.19)	0.20 (0.54)	0.27 (0.59)	**5.09**	**< .001**	**[0.11, 0.24]**	**5.06**	**< .001**	**[0.14, 0.32]**	1.21	.22	[-0.03, 0.14]
PEP2	0.03 (0.18)	0.20 (0.54)	0.28 (0.58)	**5.10**	**< .001**	**[0.11, 0.24]**	**5.29**	**< .001**	**[0.15, 0.33]**	1.44	.15	[-0.02, 0.15]

Note. PEP, Item 1 = Time spent thinking repetitively about the embarrassing event; PEP, Item 2 = Time spent having difficulties to forget the embarrassing event; Controls = Control group; MDD = major depressive disorder; SP = Social phobia.

We also explored associations between embarrassment and both PEP variables on the day level. Both variables significantly predicted embarrassment: Repetitive thoughts, β = 0.58, $p < .001$, 95% CI [0.56, 0.60]; Difficulties to forget the event, β = 0.43, $p < .001$, 95% CI [0.42, 0.45].

Controlling for Co-Morbidities Between MDD and SP (H3)

To investigate the contribution of co-morbidity, we divided the groups into patients with MDD and no SP as a co-morbid diagnosis (= *MDD/noSP*), patients with SP and no MDD as a co-morbid diagnosis (= *SP/noMDD*) and patients with mixed MDD and SP (= *mixed/MDD/SP).* We then analysed differences between these groups in indications of embarrassment as well as in the duration and frequency of both PEP items. No between-group differences were found regarding any of these variables. Results are presented in the Supplemental Materials.

Discussion

The findings highlight the high incidence of PEP in individuals with SP and MDD, as well as controls, whenever a situation is perceived as embarrassing. The comprehensive nature of PEP and its close ties to embarrassment are best reflected in its consistently high rates across all groups. At least 86% of all participants, irrespective of their diagnostic status, reported PEP following an embarrassing SI. The groups differed regarding neither its relative frequency nor its duration. These findings must be interpreted with caution, as we do not know the specific content of those repetitive thoughts in clinical groups and controls. While the clinical groups may have reinforced their dysfunctional cognitions, the controls might have focused more on coping with the embarrassing moment. However, while repetitive thinking about a recent embarrassing event seems to be common to all individuals, the more frequent indications of the event as being embarrassing in the first place might be specific for SP and MDD. Thus, we can argue that the repetitive thoughts or difficulties to forget the embarrassing moment are not unusual, but rather the contextual processes preceding and laying foundation for their emergence, like the higher occurrence of subjective embarrassment. This was evident in the repeated embarrassment and the day-levels of embarrassment as well.

One explanation may be that individuals with SP and MDD engage in misappraisals of the situation. Such misappraisals are driven by high SA, characteristic not just for socially anxious but depressed individuals as well (e.g. T. A. Brown et al., 2001), as between-group differences in indications of embarrassment dissipated after holding SA constant. This is in line with existing research of self-perception and cognitive biases related to SA. Individuals with elevated levels of SA scrutinise their behaviour and underestimate how well they appear to others (Mansell & Clark, 1999). They are especially

sensitive to threat cues and are more likely to interpret ambiguous reactions as evidence of negative social evaluation (Heinrichs & Hofmann, 2001; Stopa & Clark, 2000).

An alternate explanation is that individuals with SP or MDD actually behave in more embarrassing ways due to a potential lack of social competence or due to the use of open or covert safety behaviours and concerns about their appearance (e.g. Moscovitch et al., 2013). Empirical data make this explanation, however, less probable as individuals with high social anxiety tend to be more biased in their evaluation of their own performance than in their social competence per se (Alden & Wallace, 1995; Stopa & Clark, 2000).

Accordingly, we can assume that heightened SA contributes to an event more likely to be perceived as embarrassing by the individual. However, once feelings of embarrassment are activated, they can produce subsequent ruminative patterns irrespective of the diagnostic status. When trait SA is low, the indications of embarrassment, and consequently PEP, are reduced to non-clinical levels. Nonetheless, because of the higher occurrence of repeated embarrassment and day-level embarrassment in the clinical groups, day-level PEP was also significantly increased compared to controls. We can draw on these findings to propose a model of PEP in MDD and to complement previous research on the formation of PEP in SP.

Considering our analyses, in MDD both depressive *and* socially anxious states function as catalysts for PEP, but only symptoms of SA are a prerequisite to experience PEP. Hence, the following cycle can be proposed: heightened levels of SA in MDD might lead to more social events being interpreted as embarrassing. Once embarrassment is experienced, the ongoing ruminations in depressed individuals, which are more general and encompass various areas of life (McEvoy et al., 2010; Nolen-Hoeksema et al., 2008), might include social encounters as a subject matter too, so that PEP arises. On the other hand, if SA is low in MDD, it can be argued that social events might drop out as a possible content of ruminations, thus reducing the frequency of PEP. However, it is not clear from our data what the content of these ruminations was, because only the frequency and duration of PEP was assessed. While the *quantity* of PEP might have been the same, just as with SIs in previous research (Baddeley et al., 2013; Nezlek et al., 2000), the "quality" (i.e. content, affectivity) might have differed. According to previous research, it is reasonable to assume that in MDD the content consists of interpersonal rejection and accompanying beliefs of being less valuable (Dill & Anderson, 1999; Gotlib et al., 2004; Segrin, 2000). To explore this possibility, additional research investigating the cognitive content of PEP in MDD is needed.

In relation to SP, our results imply that SA and the heightened probability of PEP are mediated through feelings of embarrassment. This is consistent with previous findings that negative self-perception mediates the relationship between SA and PEP (Perini et al., 2006). The present study expands those findings to other diagnoses, as well as to healthy individuals. On this basis, we can argue that SA is a marker that facilitates negative self-perception, which then enhances feelings of embarrassment and ultimately PEP.

A treatment approach for PEP could comprise interventions correcting for maladaptive interpretations that act as its precursor. Thus, by minimising the (mis-) perceptions of embarrassment during SIs, it can be argued that the probability of subsequent PEP might significantly be reduced. Another strategy would be meta-cognitive therapeutic interventions correcting for the subsequent ruminations (Wells, 2009).

Also, we found that patients with MDD or SP indicated less frequently having had *any* SI since the last inquiry than controls. This might reflect the social difficulties of the clinical groups (e.g. L. H. Brown et al., 2011; Chen et al., 2013). However, the groups did not differ in indications of *meaningful* SIs. This could reflect the importance of social values compared to other values for patients with MDD and SP. Patients tend to exhibit value-consistent behavior in social life areas, which could lead them into SIs that are meaningful to them (Wersebe et al., 2017).

Limitations and Outlook

The question remains whether the contents of those ruminations were maladaptive as well, since we only inquired if repetitive thinking occurred and if individuals had difficulties forgetting the events. It is possible that the controls focused on coping with the event and reframing the embarrassing moment in a positive way, while the clinical groups focused on negative evaluation or self-worthlessness. To discriminate between controls and clinical groups, as well as between specific cognitive biases in SP and MDD, future research should include additional items exploring the content of ruminative thoughts.

An additional limitation is the use of only two items to measure PEP, which makes our assessment highly specific. Future studies should include a questionnaire that encompasses multiple dimensions of PEP and ideally a cut-off score for clinically significant severity of PEP. That would allow us to explore whether the incidence rates of PEP remain equally high in controls as in the clinical groups. It could as well be possible that the current PEP measure is not sensible enough to detect differences between clinical groups and controls. Even though we assessed the duration of PEP as well and did not find differences between groups, an option in future research could be the inclusion of multiple PEP measures.

Also, the nested structure of the survey allowed for explorations of PEP only within *the most meaningful* SI in which *also* feelings of embarrassment were experienced. This is due to the study being embedded within a large research project that explores a variety of transdiagnostic phenomena with multiple measures and across multiple disorders (Gloster et al., 2017). While this strategy provides an abundance of insights across multiple domains, some questions regarding PEP remain open. Most notably, it remains unclear how often PEP occurs across other SIs (vs. the most meaningful) during the day. Future ESM studies constructed specifically for the investigation of PEP should explore these research questions.

Lastly, as the present study put the importance of embarrassment forward, it would be intriguing to explore further emotion and thought patterns following embarrassing SIs. Since this goes beyond the scope of the present article, it should be also a matter of future ESM studies.

Conclusions

The main conclusions of the study were that patients with SP and MDD had equal durations and frequencies of PEP as controls, but more frequent indications of embarrassment in meaningful SIs than controls. The indications of embarrassment were primarily driven by trait social anxiety.

The limitations notwithstanding, the investigation clearly demonstrated that SA and embarrassment (as a potential mediator) can be considered important psychological mechanisms behind PEP in SP and in MDD. By implementing ESM, responses are ecologically valid and less biased than in questionnaire or laboratory research.

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Supplementary Materials

The Supplementary Materials contain the following sections (for access see Index of Supplementary Materials below):

- Section X1 = Between-group differences in the occurrence of post-event processing after embarrassing social interactions after controlling for social anxiety and depression
- Section X2 = Differences in embarrassment, and the frequency and duration of post-event processing between the exclusive SP and MDD groups and the comorbid SP/MDD group
- Section X3 = Differences in completed EMA-assessments

Index of Supplementary Materials

Čolić, J., Latysheva, A., Bassett, T. R., Imboden, C., Bader, K., Hatzinger, M., . . . Hoyer, J. (2020). *Supplementary materials to "Post-event processing after embarrassing situations: Comparing experience sampling data of depressed and socially anxious individuals"* [Additional information]. PsychOpen. https://doi.org/10.23668/psycharchives.4429

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Intuitive Judgments in Depression and the Role of Processing Fluency and Positive Valence: A Preregistered Replication Study

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Supplementary Materials: Preregistration [see Index of Supplementary Materials]

Abstract

Background: Recent preliminary evidence indicates that depression is associated with impaired intuitive information processing. The current study aimed at replicating these findings and to move one step further by exploring whether factors known as triggering intuition (positivity, processing fluency) also affect intuition in patients with depression.

Method: We pre-registered and tested five hypotheses using data from 35 patients with depression and 35 healthy controls who performed three versions of the Judgment of Semantic Coherence Task (JSCT, Bowers et al., 1990). This task operationalizes intuition as the inexplicable and sudden detection of semantic coherence.

Results: Results revealed that depressed patients and healthy controls did not differ in their general intuitive performance (Hypothesis 1). We further found that fluency did not significantly affect depressed patients' coherence judgments (H2a) and that the assumed effect of fluency on coherence judgments was not moderated by depression (H2b). Finally, we found that triads positive in valence were more likely to be judged as coherent as compared to negative word triads in the depressed sample (H3a), but this influence of positive (vs. negative) valence on coherence judgments did not significantly differ between the two groups (H3b).

Conclusion: Overall the current study did not replicate findings from previous research regarding intuitive semantic coherence detection deficits in depression. However, our findings suggest that

enhancing positivity in depressed patients may facilitate their ability to see meaning in their environment and to take intuitive decision.

Keywords

depression, intuition, meaning detection, positive affect, positive valence, processing fluency, replication, semantic coherence judgments

Highlights

- The pre-registered replication study did not find intuition deficits in patients with depression.
- Processing fluency did not affect coherence judgments in depressed patients or healthy controls.
- Depressed patients and healthy controls use positive valence as cue for intuitive coherence judgments.
- Future studies should test whether enhancing positivity in depressed patients boosts their ability to find meaning (e.g., meaning in life).

People continuously make decisions and judgments without long consideration by relying on their gut feelings. Following one's intuition does not only *feel* right (Thompson et al., 2011), but also leads to adaptive outcomes, especially in complex situations, during stress or when a person is experienced in the given environment (Kahneman & Klein, 2009). By integrating a multitude of factors such as implicit personal needs and goals (Baumann & Kuhl, 2002; Lieberman et al., 2004), intuitions enable people to make "smart" decisions (Gigerenzer, 2007), and to interact with other people (e.g., facilitating adaptive parent-child interaction; Parsons et al., 2017). Moreover, intuition is associated with central aspects of mental well-being, such as experiencing meaning in life (Heintzelman, Trent, & King, 2013; Hicks & King, 2007; Hicks et al., 2010; Schlegel et al., 2011).

Intuition relies on processes that are based on experience, run quickly and unconsciously, and allow many relevant aspects to be effortlessly integrated into a coherent whole (Kahneman, 2011). By this, intuition enables people to detect coherence and meaning. The Judgment of Semantic Coherence Task (JSCT; Bowers et al., 1990) operationalizes this core characteristic of intuition by asking people to discriminate word triads in terms of their semantic relatedness. Research using this task consistently shows that people can intuitively discriminate semantically related word triads (e.g., deep salt foam; common denominator: sea) from semantically unrelated word triads (e.g., dream ball book; no common denominator) (Bolte & Goschke, 2005; Bowers et al., 1990) without being able to explicitly name the basis for their judgment – they just know it without knowing why (Epstein, 2008).

It seems reasonable to assume that people are not always able to intuitively detect meaning and coherence. One important influencing factor seems to be the affective state

of a person. Positive mood broadens the scope of attention, facilitates associative processing (Fredrickson & Losada, 2005; Harel, Tennyson, Fava, & Bar, 2016) and increases the preference for thematic processing that is needed for semantic coherence detection (e.g., Maldei, Baumann, & Koole, 2020). In line with this, people are more likely to rely on intuition (Zander-Schellenberg, Remmers, Zimmermann, Thommen, & Lieb, 2019) and are more accurate in discriminating meaning from meaninglessness when in a positive mood (Balas et al., 2012; Bolte et al., 2003). Negative mood states, in contrast, are associated with narrowing attentional focus and inhibiting associative processing (Sass et al., 2012). Along this line, negative mood and a tendency to brood have been shown to impair intuition (Baumann & Kuhl, 2002; Bolte et al., 2003; Remmers & Zander, 2018; Sweklej et al., 2015). Here, we assume that intuitive processing is impaired in depressed patients in particular.

Depression is characterized by negative mood and a brooding, rigid, style of thinking. This is opposed to an intuitively integrating and holistic style of processing (see Remmers & Michalak, 2016). While intuitive processing is accompanied by cognitive ease, feelings of rightness and the detection of meaning and coherent structures in the environment (see fluency-affect intuition model; Topolinski & Strack, 2009a), depressive thinking is doubtful – as a consequence, nothing feels easy and right anymore. Furthermore, depression is associated with experiencing less meaning in life and with lower abilities to construct coherent narratives of one's life (Baerger & McAdams, 1999; Mascaro & Rosen, 2005). As finding meaning is mainly a product of intuitive processing (Hicks & King, 2007), and intentional, analytical search for meaning can impair the intuitive detection of meaning (Topolinski & Strack, 2008), it seems reasonable to assume that intuitive meaning detection is impaired in depression where a ruminative processing style is prevalent (Watkins & Teasdale, 2004). Recent research has indeed shown that patients with depression have deficits to intuitively detect semantic coherence as compared to healthy control participants (Remmers & Michalak, 2016; Remmers, Topolinski, Buxton, Dietrich, & Michalak, 2017; Remmers, Topolinski, Dietrich, & Michalak, 2015). The current study seeks to replicate these findings and moves one step further in exploring the underlying mechanisms of assumed intuition impairments in depression.

Apart from the influence of people's mood states (Balas et al., 2012; Bolte et al., 2003), research has investigated further cognitive-affective processes underlying intuition and semantic coherence detection. The fluency-affect model of intuition suggests that processing fluency and subtle positive affect are major factors jointly driving coherence judgments (Topolinski & Strack, 2009a). Coherent triads are processed more fluently (i.e., faster), and fluency leads to a brief positive affective response channeling the intuitive judgment (e.g., a positive feeling of ease that is used in the following judgment or decision; Reber, Schwarz, & Winkielman, 2004; Reber, Winkielman, & Schwarz, 1998). Moreover, it has been shown that coherent triads are liked more than incoherent triads and that the mere reading of coherent triads activates people's smiling muscle and

relaxes the frowning muscle (indicating decreased negative affect and mental effort; see Topolinski, Likowski, Weyers, & Strack, 2009). These results suggest that coherence is fluently processed and triggers subtle positive affect that in turn functions as an internal cue generating the intuitive coherence judgment (Topolinski & Strack, 2009a; see also Winkielman & Cacioppo, 2001, for psychophysiological evidence on the effects of processing fluency and positive affect).

In addition, there is also evidence showing that manipulating both fluency and positive affect influences whether people feel coherence. Manipulating positivity on a subtle level (e.g., by subliminal affective facial priming or by manipulating the affective valence of word triads or solution words; Balas et al., 2012) increases participants' tendency to judge triads as being coherent (independent of their actual coherence). In a similar vein manipulating the fluency of word triads (e.g., by manipulating the figure-ground contrast in which triads are presented) makes it more likely that people judge these as being coherent (as compared to less fluently processed word triads presented in a low figure-ground contrast; Topolinski & Strack, 2009a). Yet, whether manipulated fluency and positivity also influence depressed patients' intuitive coherence judgments has not been investigated so far.

The Current Study

The aim of the current study was to replicate and extend preliminary evidence on intuition deficits in depression. We tested a sample of depressed inpatients and compared their performance in the Judgment of Semantic Coherence Task (JSCT; Bowers et al., 1990) to a healthy control sample. Going one step further, we also aimed at investigating potential underlying mechanisms of impairments in intuitive coherence detection in patients with depression.

The following main hypotheses were pre-registered and investigated (see the Supplementary Materials for the preregistration): The first hypothesis (H1) refers to the replicability of recently found intuition deficits in depression (Remmers et al., 2015; Remmers et al., 2017). We hypothesized that patients with an acute episode of major depression are less able to intuitively discriminate semantic coherence from semantic incoherence in the JSCT than healthy controls.

The second hypothesis (H2a) assumes that processing fluency triggers semantic coherence judgments in patients with depression. Building up on basic research, we expected that in depressed patients word triads that are presented in a high figure-ground contrast – and which are therefore presumed to be processed more fluently – are more likely to be judged to be coherent than triads presented in a low contrast. Given that research using self-reports (Tsourtos et al., 2002; see also O'Connor et al., 1990) as well as experimental tasks supports the notion that mental activity is slowed in depression (e.g., Den Hartog et al., 2003), we also expected that the effect of processing fluency

on coherence judgments would be smaller in the depressed sample as compared to the healthy sample (H2b).

The third hypothesis (H3a) was that the positive valence of stimuli influences semantic coherence judgments in patients with depression. Building up on basic research (Topolinski & Strack, 2009a; Experiment 8) showing that healthy subjects are more likely to judge triads to be coherent that consist of positive as compared to negative words, we expected that this effect would also emerge for depressed patients. However, it seemed reasonable to assume that depression moderates the effect of positive valence on coherence judgments because research shows that the preference for positive stimuli usually found in healthy samples is attenuated in depressed patients (Deveney & Deldin, 2006; Joormann & Gotlib, 2007). Thus, we hypothesized that the effect of positive valence on coherence judgments is smaller in the depressed sample as compared to the healthy sample (H3b). An a priori power analysis can be found in Appendix A.

Method

Participants

Forty inpatients were recruited from the Vivantes Klinikum Berlin-Kaulsdorf, Germany, a municipal psychiatry. The clinic staff informed the trained research assistant from the Freie Universität Berlin about patients potentially fitting the inclusion criteria, who were then approached in person. In addition, patients were addressed in the weekly psychoeducation depression group therapy. The healthy control sample was recruited through advertisements in social media, local newspapers and online advertisement platforms and tested by research assistants at the Freie Universität Berlin. In the clinical sample, the presence of a current episode of unipolar depression was required for inclusion. Exclusion criteria for the clinical sample were presence of psychotic symptoms, a bipolar disorder and acute suicidal tendencies. For the control sample, the presence of any mental disorder was an exclusion criterion. For all participants inclusion in the study additionally required a minimum age of 18 years and signed written consent. The inclusion and exclusion criteria were verified by conducting the affective and psychotic disorder modules of the Structured Clinical Interview according to DSM-IV with each participant (SCID; German version: Wittchen, Zaudig, & Fydrich, 1997). In the clinical sample, five subjects were excluded from the study. Two subjects did not fulfill the criteria for a current depressive episode. One subject had to be excluded due to the presence of psychotic symptoms and in one patient a depressive diagnosis due to a medical condition could not be excluded. Another subject could not credibly distance herself from suicidal tendencies during the interview, so that the hospital staff was called in and participation in the study was terminated. In the healthy sample, no subject was excluded. A total of 70 subjects took part in the study (35 in each group).

Procedure

Upon arrival both at the clinic and at the University laboratory, participants were welcomed and received the informed consent that they were asked to sign. Participants were then interviewed by a trained rater with the SCID. Either directly after the SCID interview or at an appointment shortly afterwards, included subjects completed the intuition task consisting of three blocks (general intuition, fluency, valence; for a detailed description see Appendix B).

The procedure of the JSCT was identical to that of previous studies (Remmers et al., 2015, 2017). Participants saw a set of word triads (e.g. DEEP SALT FOAM; DREAM BALL BOOK) and were asked to indicate for each triad whether it was coherent or incoherent by pressing the respective key on the computer keyboard. Each trial began with the presentation of a fixation cross (1000 ms), followed by the presentation of the triad (1500 ms). After disappearance of the triad from the screen, "coherent" and "incoherent" appeared on the left or right side of the computer screen. The key positions of "coherent" and "incoherent" were randomized for each participant; once assigned, the key positions remained the same for each participant throughout the experimental task. Participants had 2000 ms to press the reaction key on the keyboard for their corresponding coherence judgment. If a participant failed to react within 2000 ms, "too slow" appeared on the screen and the next trial started. If participants managed to respond within the given reaction time window, they could type in an X or a possible solution word within 8 seconds. Each word triad was only presented once, which prevented exposure and repetition effects as well as analytic insight.

All participants performed three blocks that followed the procedure above but with varying stimulus material (see Appendix B for a detailed description). In the general intuition block, only coherence (coherent triads vs. incoherent triads) was manipulated. In addition to manipulating coherence, we manipulated fluency (high figure-ground contrast vs. low figure-ground contrast) in the fluency block and valence (positive triads vs. negative triads) in the valence block, resulting in four conditions in the latter two blocks respectively. At the end of each block participants indicated how much they trusted their intuition in the respective task on a 7-point Likert scale. All three blocks were programmed using jsPsych, a JavaScript library for creating behavioral experiments in a web browser (de Leeuw, 2015).

After completion of the three intuition blocks, subjects filled out a demographic questionnaire as well as other self-report instruments, not of interest for the current paper (see Supplementary Materials for all measured variables) and then received an AMAZON voucher as study compensation. Participating in the entire study lasted about 1 – 1.5 hours. The study was approved by the ethical committee of the Freie Universität Berlin and in compliance with the Helsinki Declaration.

Statistical Analysis

Participants' performance in the JSCT was the main outcome of the study. Trials were discarded in which participants did not provide their coherence judgment within the given time window of 2000 ms. These missed trials were analyzed separately and served us to explore whether patients and healthy controls differed in their ability to react within the given short time window. Solved trials were also discarded from the following coherence judgment analyses because these trials were indicative of explicit insight and not intuition (see Topolinski & Strack, 2009a). A trial was considered as solved when a participant provided the correct solution word or a synonym after the coherence judgment, being rated by two raters independently. Solved trials were thus analyzed separately and served us to explore whether depressed patients and healthy controls differed in the extent to which they had explicit insight. Participants who had missed responding in the given time window were not asked to type in a solution word. Missed trials and solved trials did not overlap.

To test H1, we computed a discrimination index for each participant after exclusion of missed responses and solved trials. For this, we first computed hit rates (i.e., the proportion of coherent trials that were correctly judged as coherent, but which were not solved) and false alarm rates (i.e., the proportion of incoherent trials, which had incorrectly been judge as coherent). We then calculated a simple discrimination index by subtracting false alarm rates from hit rates (called P_r in Snodgrass & Corwin, 1988; see also Bolte & Goschke, 2008). This index conveys participants' ability to discriminate between coherent and incoherent trials (see Bolte et al., 2003; Remmers et al., 2017; Topolinski & Strack, 2009a). Participants' responses are defined as accurate to the extent that their hit rate exceeds their false alarm rate. We tested H1 using an independent samples *t*-test with depression as the independent variable and the discrimination index from the JSCT general intuition block as the dependent variable.

Hypothesis H2a was tested using a random intercept model, which is conceptually equivalent to fitting a repeated measures ANOVA. In this model, the four conditions of the JSCT fluency block are nested within participants (i.e., each participant contributes four data points, and the random intercept accounts for the fact that the four assessments are usually positively correlated). We used coherence, fluency, and their interaction to predict the percentage of triads that have been judged as coherent (after deleting missed and solved triads). The relevant effect here was the effect of fluency. Note that we only included participants with depression for testing this hypothesis. In contrast, H2b was tested in the full sample, again using a random intercept model. This time, we used coherence, fluency, depression, and their two- and three-way interactions to predict the percentage of triads that have been judged as coherent in the fluency block. The relevant effect here is the interaction effect of depression and fluency. Hypotheses 3a and 3b were tested using the same approach, this time based on data from the JSCT valence block and using valence instead of fluency as a predictor.

In line with the preregistration, we corrected univariate outliers within groups ($|z| > 2.5$) prior to hypothesis testing using the winsoring method. This way, we corrected 19 data points in 21 variables across 70 participants (1.3%). The criterion for inferences for each hypothesis was $p < .05$ (two-tailed). Satterthwaite's approximations were used to derive p-values for fixed effects in random intercept models. All analyses were conducted within the statistical environment R (R Core Team, 2018). Random intercept models were estimated using full maximum likelihood estimation implemented in the R package "lme4".

Results

Descriptive Statistics

The depressive sample ($M = 41.74$, $SD = 12.40$) and the control sample ($M = 44.37$, $SD = 16.85$) did not differ significantly from each other in terms of age, $t(62) = 0.74$, $p = .46$. Also, with respect to gender (depressed group: 22 females; control group: 21 females), there was no significant group difference, $\chi^2(1) = 0.06$, $p = .806$. However, there was a significant difference in terms of education, $U(35, 35) = 445.5$, $p = .032$, with the control sample having a higher educational degree as compared to the depressed sample.

Preparatory Analyses of the General Intuition Block

Results suggested that depressed patients did not differ significantly from healthy controls regarding the number of missed trials (i.e., trials in which subjects did not respond within the given time window), the number of solved trials (i.e., coherent trials for which the correct solution word was typed in), and the average response time (see Appendix C for details). Moreover, depressed patients ($M = 0.50$, $SD = 0.18$) and healthy control participants ($M = 0.47$, $SD = 0.21$) did not differ significantly in the hit rate (i.e., proportion of triads that they correctly judged as coherent), $t(68) = 0.68$, $p = .50$, 95% CI [-0.06, 0.13]. Also, with regard to the false alarm rate (i.e., proportion of triads that were incorrectly classified as coherent), there was no significant difference between the depressed sample ($M = 0.32$, $SD = 0.17$) and the healthy sample ($M = 0.28$, $SD = 0.14$), $t(68) = 1.01$, $p = .31$, 95% CI [-0.04, 0.11]. Finally, on average, participants from both samples could discriminate between coherent and incoherent trials above chance level. This was indicated by one sample t-tests showing that the discrimination index differed from zero in both the depressed sample ($M = 0.18$, $SD = 0.17$, $t[34] = 6.13$, $p < .001$) and the healthy sample ($M = 0.19$, $SD = 0.18$, $t[34] = 6.10$, $p < .001$).

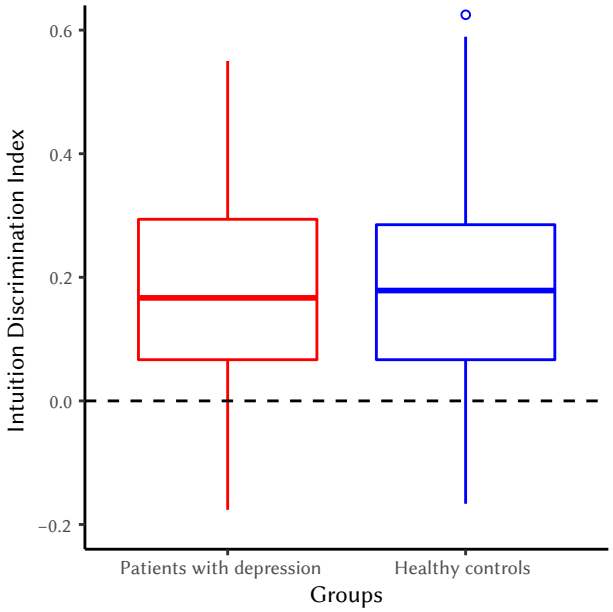
Confirmatory Hypotheses Testing

Analyses regarding H1 revealed that depressed patients and healthy control participants did not differ significantly in their ability to discriminate semantic coherence from

semantic incoherence in the JSCT general intuition block, $t(68) = -0.12$, $p = .90$, 95% CI [-0.09, 0.08] (see Figure 1).

Figure 1

Boxplots of Intuition Discrimination Index for Patients With Depression (Red Column) and Healthy Control Participants (Blue Column)

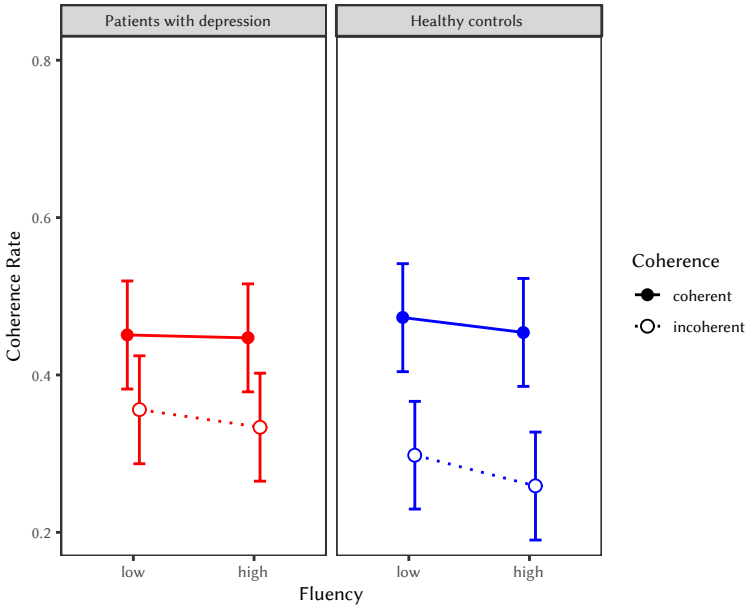


With regard to H2a, results showed that fluency did not significantly predict the percentage of triads that have been judged as coherent in depressed patients, $F(1,105) = 0.21$, $p = .65$. However, coherence had a significant effect on coherence judgments, with coherent trials being more likely to be judged as coherent as compared to incoherent trials, $F(1,105) = 13.57$, $p < .001$. The interaction between coherence and fluency was not significant, $F(1,105) = 0.11$, $p = .74$ (see left panel in Figure 2).

With regard to H2b, results revealed that the interaction effect of depression and fluency was not significant in predicting coherence judgments, $F(1, 210) = 0.19$, $p = .66$. Thus, our findings do not support the hypothesis that the effect of fluency on coherence judgments was smaller in the depressed sample as compared to the healthy sample. In this model, only coherence, $F(1, 210) = 60.95$, $p < .001$, and the interaction of group and coherence, $F(1, 210) = 4.75$, $p = .03$, significantly predicted the percentage of triads that have been judged as coherent. Fluency, depression, and further interaction effects were not significant (see Figure 2).

Figure 2

Coherence Judgment Rates for Depressed Patients and Healthy Controls in the High vs. Low Fluency and Coherent vs. Incoherent Conditions



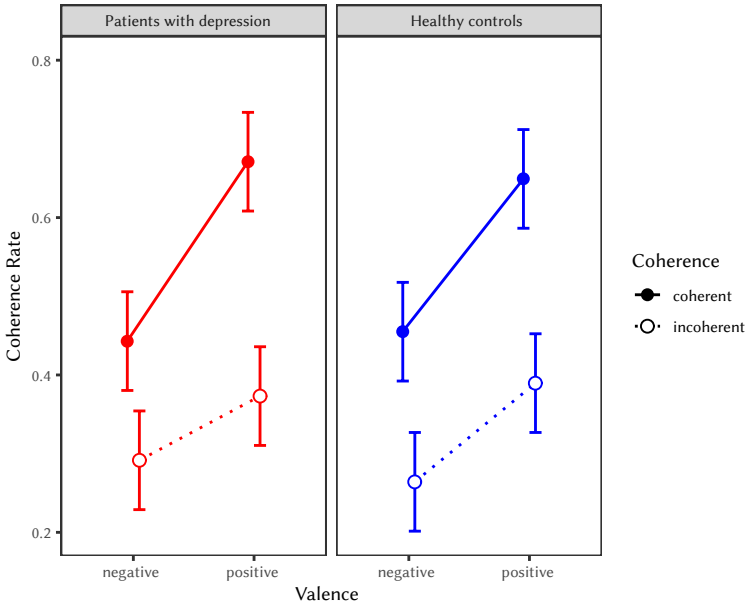
Note. Figure 2 indicates no significant effect of the fluency manipulation on coherence judgments and no interaction effect between group and fluency on coherence rate.

In line with H3a, analyses revealed that positive valence of word triads significantly predicted semantic coherence judgments in depressed patients, $F(1, 105) = 38.45$, $p < .001$. Furthermore, the effect of coherence, $F(1, 105) = 80.98$, $p < .001$, and the interaction effect of valence and coherence were significant, $F(1, 105) = 8.60$, $p < .01$. The pattern of results suggested that coherent triads that were positive in valence were most likely to be judged as coherent (see left panel of Figure 3).

With respect to H3b, results did not confirm the hypothesis that depression moderated the effect of positive valence on coherence judgments. The effect of positive valence on coherence judgments was not smaller in the depressed sample as compared to the healthy sample, $F(1, 210) = 0.02$, $p = .88$. In this model, valence, $F(1, 210) = 85.52$, $p < .001$, coherence, $F(1, 210) = 175.04$, $p < .001$, and their interaction, $F(1, 210) = 10.01$, $p < .01$, were significant. The effect of group and its interaction with valence and coherence were not significant (see Figure 3).

Figure 3

Coherence Judgment Rates for Depressed Patients and Healthy Controls in the Positive vs. Negative Valence and Coherent vs. Incoherent Conditions



Note. Figure 3 indicates a significant effect of the valence manipulation in both the depressed group and the control group and no interaction effect between group and valence on coherence rate.

Exploratory Follow-up Analyses

For testing our main preregistered hypothesis regarding intuition deficits in depressed patients, we selected a simple discrimination index (i.e., the difference between hit and false alarm rates) that has also been used in previous studies (Bolte & Goschke, 2008). To check the robustness of our results, we calculated another index established in signal detection theory, namely A'. This non-parametric measure accounts for small numbers of observations per cell and corrects for hit rates of 1.0 and false-alarm rates of 0.0 (Pollack, 1970; Pollack & Norman, 1964). A' of .5 indicates performance on chance level, and perfect discrimination yields an A' of 1. We repeated our analyses for H1 using A' and found that results did not differ from results using the simple discrimination index (see Appendix C).

We also repeated our preparatory analyses and analyses for H1 combining the data from all blocks (i.e., including the data from the fluency and valence block). With regard to H1, again no significant differences emerged, neither for the simple discrimination index nor for A'. We also did not find significant differences in the number of solved

trials. However, across all intuition blocks, depressed patients missed more trials and had significantly higher reaction times as compared to healthy controls (see Appendix C).

Discussion

The aim of the present study was to replicate recently demonstrated deficits in intuitive semantic coherence detection and to explore the effects of processing fluency and positivity on intuition in depressed patients. One major finding was that patients with depression did not differ from healthy controls in their ability to discriminate semantic coherence from semantic incoherence (H1). Even though controls were better at discriminating coherent from incoherent triads compared to depressed patients in the fluency block (indicated by a significant interaction between group and coherence), differences in discrimination indices were not significant when considering data from all blocks.

These findings may query the hypothesis of impaired intuition in depression. However, methodological issues should be considered. The true difference between the groups might be smaller than expected (based on prior research). Thus, our study may have lacked the power to detect it. Moreover, hit and false alarm rates were computed after exclusion of missed trials. Thus, subjects who only responded when they were relatively confident in their judgment (i.e., when seeing a comparably easy triad) might have yielded a higher intuitive discrimination index as compared to subjects who missed relatively few trials. As such, the non-significant difference in intuitive performance might have resulted from depressed patients' higher tendency to not respond within the given time window, for example when being unsure and less confident, or when confronted with more difficult trials. Indeed, depressed patients missed significantly more trials as compared to healthy control participants when considering their responses across all three intuition blocks.

Our exploratory analyses with reaction times also showed that on average and across all blocks, depressed patients were slower than healthy controls. Together with the finding on missed trials, this result points out that future research would do well in elucidating how longer response times are associated with patients' intuitive discrimination accuracy. Researchers should hereby distinguish between simple between-subject approaches such as mean reaction time analyses and more sophisticated within-subject methodologies. Using, for example, stochastic diffusion models, can provide important insights into speed-accuracy trade-offs (Voss, Nagler, & Lerche, 2013). The latter take information from individual distributions into account and hereby help to disentangle how performance differs between conditions (or groups), and – importantly – in which way it does and how speed-accuracy interactions may reflect cognitive biases (e.g., being more accurate when responding faster may reflect intuitive capacities). Although this kind of model can be applied to many experimental paradigms and provides much more

insight than the analysis of mean response times, it is still rarely used in cognitive psychology and in clinical psychopathology research in specific.

Altogether, our findings and considerations call for more replication studies to elucidate the question whether depressed patients are impaired in intuitively detecting meaning and coherence in their environment and within themselves (e.g., meaning in life). Regarding the latter, it seems fruitful to connect intuitive coherence detection research with research on memory coherence, i.e., the ability to construct one's autobiography in a coherent, integrated way. As memory coherence is associated with psychological health, positive therapy outcomes and seems to buffer protectively against the impact of early life stress (Adler et al., 2013; Baerger & McAdams, 1999), future research should explore to what extent performance in the JSCT is associated with a person's memory coherence. Hereby, upcoming research should also take the heterogeneity of depression (Monroe & Anderson, 2015) as well as interindividual differences into account. Hicks and colleagues (2010) showed for example how interindividual differences in self-reported preference for intuitive processing influence the interplay between positive affect and intuition. With respect to our research question arises whether intuitive processes are especially impaired in patients with recurrent forms of depression, (and) or only in patients with anhedonia? In other words: It should be explored for which patients the assumption of impaired intuitive processing holds to get a better understanding of this issue.

Results did not reveal any effect of our fluency manipulation, and thus our hypotheses regarding fluency (H2) were not supported. As such, the current study could not replicate previous results that bolstered the fluency model proposed by Topolinski and Strack (2009a, 2009b). In order to explore whether processing fluency will prove as a major determinant of coherence judgments or not, future studies should use other fluency manipulations such as priming (see Topolinski & Strack, 2009a). In addition, future research should take into account that fluency may not always lead to positive affective responses (Gamblin, Banks, & Dean, 2020) and thus also not to coherent responses. Given that processing fluency and affective responses may interact differently depending on characteristics of the presented stimulus or the responding individual, future studies should disentangle the differential effects of processing ease on task performance.

The results further showed that positive (vs. negative) valence triggered coherence judgments (H3a) and that this effect was – in contrast to our hypothesis (H3b) – not moderated by depression. This suggests that depressed patients may be susceptible for positive affectivity conveyed by the valence of word triads and used it – when provided externally – in their judgments. This is an important finding, because even though depression is characterized by anhedonia (i.e., the inability to experience positivity), patients seemed to be inclined to detect meaningfulness and coherence when encountering positive valence, bolstering the idea that positivity plays a major role in finding meaning.

How can the current findings be reconciled with previous research depressed patients' processing of positivity? At first glance they seem to stand in contrast to research showing that – opposed to healthy people – depressed patients do not direct their attention to positivity and are less susceptible to positive stimuli (Duque & Vázquez, 2015; Pool, Brosch, Delplanque, & Sander, 2016; Winer & Salem, 2016). In their comprehensive review LeMoult and Gotlib (2019) conclude that biases (e.g., faster reaction time in response to negative as opposed positive stimuli) are mostly found when stimuli are presented longer and when faces as opposed to words are presented. Thus, it is conceivable that depression did not moderate the effect of positive valence manipulation in our study because (a) presentation of stimuli was short enough (and hereby prevented conscious processing) and (b) words (and no faces) were presented. However, these comparative conclusions should be drawn cautiously because our main outcome were binary coherence judgments and not response times. Given the heterogeneity of previous research on biases in the processing of positive affect (e.g., Yoon, Joormann, & Gotlib, 2009), future studies would do well in examining different cognitive abilities (memory, attention, intuitive decisions) along together. Also, it remains open to what extent positivity exhibited its effect on a conscious level. Future work should elucidate this issue by exploring whether rather implicit or explicit induced positive affect resonates in depressed patients.

Our findings also revealed a significant interaction between valence and coherence in the valence block (i.e., positive word triads that were coherent were most likely to be judged as coherent in both groups). This finding indicates that positivity (conveyed by positive valence in the current study) may lead to more accurate intuitive judgments and is in line with previous research showing that not only "tonic" positive affect (e.g., manipulated or freestanding positive mood; Balas et al., 2012; Bolte et al., 2003) but also "phasic" positive affect (induced by the activation of positively valenced memory content) can strengthen the accuracy of coherence judgments (Topolinski & Strack, 2009b). In a similar fashion, Balas et al. (2012) demonstrated increased accuracy for triads with positive solution words as compared to triads with negative solution words. Future research should test the underlying theoretical assumptions on the positive affect-intuition-interplay by implementing measures assessing positive affect in individuals, because otherwise it remains speculative whether it is indeed "affect" (within the individuals) that triggers these effects (see Alves et al., 2015, for potential alternative explanations on the effects of positive valence).

Along this line, it is of important practical relevance to test whether depressed patients can themselves produce the positive affect needed to go with their intuition in daily life. Extending laboratory research, a recent daily diary study found that people are not only inclined to make decisions intuitively when they are in a good mood (as compared to a negative mood, Remmers & Zander, 2018) but that people also report to feel better after intuitive as compared to analytical decisions (Zander-Schellenberg, Remmers,

Zimmermann, Thommen, & Lieb, 2019). To explore whereas these decision-mood dynamics also apply to currently depressed patients outside the laboratory, is an important next step also in terms of ecological validity and clinical relevance.

From a therapeutic perspective, the current findings imply that targeting positive affect in psychotherapy may be important in fostering patients' ability to detect coherence. It would be an important next step to investigate the intuitive detection of meaning not only with regard to laboratory stimuli but also on a broader level with regard to finding coherence and meaning in life. Hereby, clinical researchers may build upon recent basic psychological research on how intuitive processing, positive affect, and finding meaning in life interact (Heintzelman & King, 2013). Considering that finding meaning in life is rather a product of intuitive processing than a result of analytical reasoning or explicit meaning construction (Heintzelman & King, 2013), research in this field may have far-reaching practical and theoretical clinical implications.

A number of limitations should be taken into account. First, even though the sample size was in compliance with the a-priori power analysis, it was still relatively small. Thus, future studies should test our assumptions with larger samples to increase the power and reliability of findings. Furthermore, a limitation of the current study was that the samples were not matched in terms of educational level. Even though the relatively lower educational level of depressed patients is consistent with epidemiological studies showing that the prevalence of psychological disorders is higher in low socioeconomic groups, future studies should take care of the matching issue to avoid potential confounds. In addition, we randomized different factors such as the key position for the coherence judgments and the stimuli that were either presented in the main intuition block or the fluency bock. Even though randomization is of methodological importance, this may have led to reduced comparability of responses between subjects and thus to reduced power to detect group differences. Thus, future research should use larger sets of stimuli and larger sample sizes in order to ensure randomization and reduce statistical noise. Furthermore, conclusions with regard to the role of positivity should be drawn cautiously because our study was lacking a neutral control condition. Thus, we cannot rule out that, for example, reduced negativity (as opposed to increased positivity) drove our effects in the valence block. Future studies should test whether positivity (e.g., conveyed by the valence of stimuli) alters subtle affective responses in subjects. Only by this means we can conclude whether positive affect elicited in subjects triggers coherence judgments (see Topolinski & Strack, 2009a for a detailed description of the fluency-affect intuition chain).

Albeit these considerations, the current study presents an important contribution to the field. It is a preregistered replication study which follows current state-of-the-art demands to bolster the robustness of psychological research findings. In addition, we used experimental paradigms from basic psychology and hereby build the bridge from basic to clinical research. Altogether one may conclude from the current study that the

cognitive profile of depressed patients is not merely deficient. The results elucidate the importance of positivity when it comes to detecting meaning and coherence. The latter is of major clinical importance, because in a depressed state, people often experience their life as meaningless and cannot find coherence. Whether promoting positivity may not only enhance how patients feel but will also help them to find meaningfulness and to follow their intuitions is a fruitful endeavor to study for future research.

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Supplementary Materials

The supplementary materials include the preregistration protocol for this study (for access see Index of Supplementary Materials below).

Index of Supplementary Materials

Remmers, C., Zimmermann, J., Topolinski, S., Richter, C., Zander-Schellenberg, T., Weiler, M., & Knaevelsrud, C. (2020). *Supplementary materials to "Intuitive judgments in depression and the role of processing fluency and positive valence: A preregistered replication study"* [Preregistration protocol]. OSF. https://osf.io/5fpwk

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Appendices

Appendix A: Power Analysis

Where possible, we based our power analyses on the effect sizes found in earlier work. In particular, the effect size of the intuition impairment in patients with depression compared to healthy controls was $d = 0.71$ (H1; Remmers et al., 2015); the within-subjects effect size of the fluency manipulation in a student sample was $d_z = 0.5$ (similar to H2a; Topolinski & Strack, 2009a, Experiment 1); and the within-subjects effect size of the affect induction in a student sample was $d_z = 1.19$ (similar to H3a; Topolinski & Strack, 2009a, Experiment 8). We did not have any prior information about the size of the proposed interaction effects (H2b and H3b), and thus we considered here a smaller effect size of $d = 0.35$. Based on these assumptions, we conducted a series of a priori power analyses using GPower (Faul, Erdfelder, Buchner, & Lang, 2009), focusing on the difference between two independent means (H1), the within-subjects effect of a repeated measures ANOVA (H2a and H3a, assuming a correlation of $r = .5$ between the repeated measurements), and the within-between-subjects interaction effect of a repeated measures ANOVA (H2b and H3b, again assuming a correlation of $r = .5$ between the repeated measurements). To detect each of these effects with a probability of 80% and an alpha error probability of 5% (two-sided), the following sample sizes (per group) are required: 33 (H1), 34 (H2a) 34 (H2b), 8 (H3a), and 34 (H3b). Thus, we conclude that 35 participants per group may represent an acceptable sample size given prior findings.

Appendix B: Procedure of the Judgment of the Semantic Coherence Task

Introduction Phase. The first computer screens introduced subjects to the intuition task and explained that the task was about intuition. Participants were informed that the task was not about right or wrong decisions or about finding a solution (i.e., typing in the correct solution word) but rather about intuitive gut reactions in response to the presented stimuli. Letting participants type in a solution word served us to distinguish between intuitively detected but unsolved trials (being indicative for intuition; see Remmers et al., 2015 and Topolinski & Strack, 2009a for detailed description) and explicitly solved trials (being indicative for insight and not intuition). The introductory phase also included the presentation of exemplary coherent and incoherent word triads (e.g., DEEP SALT FOAM; coherent triad, common denominator: SEA) not reappearing later in the task. Next, subjects underwent a practice block in which they were asked to react within 2000 ms and to indicate whether presented exclamation marks appeared on the right or left side of the screen by pressing the respective keyboard keys. The same keys, namely S and L on the keyboard (German QWERTZ keyboard layout), later served as reaction keys for the coherence judgments. Keyboard button assignment was randomly assigned for each participant and remained the same for each participant once assigned during the entire experimental task. Hereby, it was manipulated whether the left (S) or the right (L) keyboard button indicated a coherence or incoherence judgment.

General Intuition Block. To measure the general ability to intuitively detect semantic coherence subjects performed the JSCT according to Bowers et al., 1990 (see also Topolinski & Strack, 2009a; Remmers et al., 2015, 2017). Thus, in this block, all subjects performed the JSCT in which only the coherence of the triads was manipulated (coherent vs. incoherent word triads). A total of 36 triads were presented in this part to test the ability to detect semantic coherence (18 coherent, 18

incoherent, re-randomized order for each subject, stimulus material see Bolte et al. 2003; Topolinski & Strack, 2009a).

Fluency Block. To investigate the effect of processing fluency on coherence judgments, an experimental manipulation established in basic research was applied. Methodologically equivalent to Topolinski and Strack (2009a, Experiment, 1), the figure-ground contrast was manipulated as a means to alter the fluency with which stimuli are processed. For this, triads were presented in blue, red or green letters. High-fluency triads had a high figure-ground contrast (against the white background) by manipulation of the RGB (red, green, blue) components. An RGB combination of R = 255, G = 0 and B = 0 results, for example, in a red triad with a strong contrast, whereas the combination of R = 255, G = 200, B = 200 yields a light red colour and hence low contrast against the white background. In line with the procedure of Topolinski & Strack (2009a; but see also Reber, Winkielman, & Schwarz, 1998; Unkelbach, 2007), we designed a red high-contrast (thus high-fluency) triad by assigning a random value between 100 and 120 for the B and G component, and by assigning 255 to the R component. A red low-contrast (thus low-fluency) triad was designed by assigning a random value between 200 and 220 for the B and G components. This was one for the other colours, too. Deriving from the stimulus pool of Bolte et al. (2003), 36 triads were presented. Using a 2 (high vs. low fluency) x 2 (coherent vs. incoherent) intra-individual factorial design, 4 experimental conditions resulted: 9 coherent triads with high figure-ground contrast; 9 incoherent triads with high figure-ground contrast; 9 coherent triads with low figure-ground contrast; 9 incoherent triads with low figure-ground contrast. It should be noted that stimuli of the general intuition block and the fluency block are taken from the same stimulus pool, but are randomly selected anew for each participant ensuring that no triad is seen twice by an individual on the one hand and that whether a triad is presented in the intuition or the fluency block is a matter of randomization and not preselected by the study team.

Valence Block. To investigate the effect of positive valence on coherence judgments, subjects are presented with positive (e.g., LUCK CHILDREN MEADOW; common denominator: GAME) and negative (e.g., SULFUR GLUE BLACK; common denominator: PITCH) word triads. Just like in the other two blocks, subjects' task is to decide whether a presented triad is coherent or incoherent. Taken from the stimulus pool of Topolinski and Strack (2009a; Experiment 8), 48 triads were presented to each subject. Using a 2 (positive vs. negative) x 2 (coherent vs. incoherent) intra-individual factorial design, 4 experimental conditions resulted: 12 positive coherent triads; 12 positive incoherent triads, 12 negative coherent triads, 12 negative incoherent triads).

Appendix C: Preparatory Analyses and Exploratory Follow-up Analyses

Table C.1

Preparatory Analyses and Exploratory Follow-up Analyses

	Patients (n = 35)		Controls (n = 35)		*t*-tests						
Variable	*M*	*SD*	*M*	*SD*	*ΔM*	*t*	*df*	*p*	*CI_low*	*CI_high*	*d*
General Intuition Block											
Discrimination Index	0.18	0.17	0.19	0.18	0.00	-0.12	68	0.90	-0.09	0.08	-0.03
A‘	0.65	0.13	0.65	0.14	0.00	-0.02	68	0.98	-0.06	0.06	-0.01
Number of missed trials	7.17	4.73	5.17	4.23	-2.00	1.86	68	0.07	-0.14	4.14	0.45
Number of solved trials	0.63	0.91	0.89	1.05	0.26	-1.09	68	0.28	-0.73	0.21	-0.26
Average reaction time per trial (in seconds)	1.11	0.15	1.04	0.20	-0.08	1.79	68	0.08	-0.01	0.16	0.43
Combined blocks											
Discrimination Index	0.17	0.11	0.20	0.10	0.03	-0.98	68	0.33	-0.08	0.03	-0.24
A‘	0.64	0.09	0.66	0.09	0.02	-1.07	68	0.29	-0.06	0.02	-0.26
Number of missed trials	15.90	10.76	10.85	8.79	-5.05	2.15	68	0.04	0.36	9.74	0.52
Number of solved trials	1.87	2.47	2.19	2.26	0.31	-0.55	68	0.58	-1.45	0.82	-0.13
Average reaction time per trial (in seconds)	1.02	0.20	0.93	0.19	-0.10	2.11	68	0.04	0.01	0.19	0.51

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Repetitive Negative Thinking and Interpretation Bias in Pregnancy

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Supplementary Materials: Materials [see Index of Supplementary Materials]

Abstract

Background: Repetitive negative thinking (RNT; e.g., worry about the future, rumination about the past) and the tendency to interpret ambiguous information in negative ways (interpretation bias) are cognitive processes that play a maintaining role in anxiety and depression, and recent evidence has demonstrated that interpretation bias maintains RNT. In the context of perinatal mental health, RNT has received minimal research attention (despite the fact that it predicts later anxiety and depression), and interpretation bias remains unstudied (despite evidence that it maintains depression and anxiety which are common in this period).

Method: We investigated the relationship between RNT, interpretation bias and psychopathology (depression, anxiety) in a pregnant sample (n = 133). We also recruited an age-matched sample of non-pregnant women (n = 104), to examine whether interpretation bias associated with RNT emerges for ambiguous stimuli regardless of its current personal relevance (i.e., pregnancy or non-pregnancy-related).

Results: As predicted, for pregnant women, negative interpretation bias, RNT, depression and anxiety were all positively associated. Interpretation bias was evident to the same degree for material that was salient (pregnancy-related) and non-salient (general), and pregnant and non-pregnant women did not differ. RNT was associated with interpretation bias for all stimuli and across the full sample.

Conclusion: Our findings highlight the need to further investigate the impact of interpretation bias in pregnant women, and test the effectiveness of interventions which promote positive interpretations in reducing RNT in the perinatal period.

Keywords

perinatal mental health, repetitive thinking, worry, interpretation bias, pregnancy

Highlights

- A tendency to make negative interpretations was investigated in pregnant women for the first time.
- Negative interpretation bias was associated with repetitive negative thinking.
- Interpretation bias extended to pregnancy related information for pregnant and non-pregnant women.
- Reducing negative interpretation bias in pregnant women could be useful.

Repetitive negative thinking (RNT) plays a role in the onset and maintenance of depression (Nolen-Hoeksema et al., 2008), and is transdiagnostic such that it is evident in a range of disorders, including anxiety (Ehring & Watkins, 2008). RNT refers to thinking that is negative, perseverative and difficult to control, whether about the past (rumination) or future (worry) (Samtani & Moulds, 2017). Perinatal depression and anxiety are common. One in four pregnant women report mental health problems (Howard et al., 2018), the most common being anxiety and depression, and they commonly persist into early motherhood. Given the role of RNT in predicting and maintaining both anxiety and depression, it is surprising that RNT in the perinatal period has only recently received research attention (e.g., DeJong et al., 2016; Moulds et al., 2018; Newby et al., 2019).

Consistent with the broader RNT literature, there is growing evidence that antenatal RNT predicts perinatal mental health problems. Schmidt et al. (2016) reported that RNT in the first trimester predicted depression and anxiety in the third trimester (Schmidt et al., 2016), and that RNT interacts with other factors (e.g., level of social functioning; O'Mahen et al., 2010; perfectionism; Egan et al., 2017) to predict postnatal depression. In another longitudinal study, RNT in late pregnancy (i.e., third trimester) predicted change in depression symptoms from the third trimester to 8 weeks postpartum, an association that was not moderated by initial levels of depression (Barnum et al., 2013). Building on correlational findings, there is experimental evidence that RNT maintains postnatal difficulties. In a sample of new mothers, RNT impaired problem-solving ability and reduced confidence in problem-solving capacity (O'Mahen et al., 2015). Similarly, in women with postpartum GAD, RNT reduced responsivity to infants – suggesting a key role for RNT in mother-infant bonding (Stein et al., 2012). Taken together, these findings highlight that RNT plays a key detrimental role in the perinatal context.

Interpretation bias – the tendency to draw negative conclusions from ambiguous information - is a transdiagnostic cognitive process evident across emotional disorders (Hirsch et al., 2016). Interpretation bias often focuses on an individual's core clinical concern. For example, individuals with panic disorder (Stopa & Clark, 2000) and social anxiety disorder (Amin et al., 1998) demonstrated a more negative interpretation bias for ambiguously threatening information which was central to their clinical problem (i.e., panic and socially-related material, respectively) relative to both individuals with other forms of anxiety, and non-clinical control participants. This content specificity is also evident in children who experience higher levels of anxiety specific to particular fears (e.g. social anxiety, separation anxiety, fear of spiders; Mobach et al., 2019). Relatedly, Everaert et al. (2017) hypothesized that the personal relevance of material may be key to observing interpretation bias, such that the material has to relevant the person themselves in order to be processed in a biased manner.

Interpretation bias is associated with different forms of RNT (Krahé et al., 2019) across the population, and individuals with GAD and depression demonstrate particularly high levels of this bias. There is evidence that targeting (i.e., reducing) a negative interpretation bias has the downstream effect of reducing RNT. For example, training individuals with GAD to interpret ambiguous information as benign (rather than negative) reduced worry frequency (Hayes et al., 2010). In addition, there is evidence that training in generating positive interpretations leads to reduced RNT and anxiety in individuals with high levels of RNT (Hirsch, Krahé, Whyte, Bridge, et al., 2020), as well as those with clinical anxiety and/or depression (Hirsch et al., 2018; Hirsch, Krahé, Whyte, Krzyzanowski, et al., 2020). Moreover, improvements in worry, rumination, anxiety and depression are mediated by decreases in interpretation bias, consistent with it being the mechanism of change (Hirsch, Krahé, Whyte, Krzyzanowski, et al., 2020).

To date, no research has investigated interpretation bias in the perinatal context. It is therefore unknown whether women in the perinatal period have a tendency to draw negative conclusions when presented with ambiguity - and if such a bias does exist - whether it is associated with levels of depression and anxiety, as well as RNT. Further, if such a bias is indeed present, it will be both theoretically and clinically informative to establish whether this mechanism also applies to pregnancy-related ambiguous stimuli (e.g., the outcome of a foetal scan) which would be particularly salient and personally relevant for pregnant but not non-pregnant women. This speaks to a wider conceptual question regarding the nature of interpretation bias underlying RNT: is it a general mechanism that applies to any ambiguity, whether or not it is personally relevant and salient? In order to answer this question, we recruited a sample of matched non-pregnant women and examined whether this general bias also operates for ambiguous material that is not likely to be personally relevant (i.e., is pregnancy-related). That is, if interpretation bias that is associated with RNT is reduced by lack of current personal relevance, pregnancy-related material would elicit a weaker bias in non-pregnant women with high

levels of RNT compared to pregnant women with high levels of RNT. Alternatively, if such an interpretation bias operates on ambiguously threatening material irrespective of current personal relevance, we would predict an association between RNT and this bias regardless of pregnancy status or personal relevance of the material (i.e., pregnancy-related versus general ambiguity).

In sum, extant findings confirm that interpretation bias and RNT are interrelated, and there is emerging evidence that RNT is a key cognitive process in the context of perinatal mental health. However, it remains unknown whether negative interpretation bias is associated with depression and anxiety in the perinatal period. Furthermore, the possibility that RNT is correlated with interpretation bias in this period has not been examined to date. Accordingly, our first goal was to investigate associations between interpretation bias, RNT (as a trait tendency, as well as specific types of RNT including depressive rumination and worry), as well as symptoms of psychopathology (anxiety, depression) in a community sample of pregnant women. We hypothesised significant positive relationships between RNT, interpretation bias, depression and anxiety symptoms.

Second, we were interested in whether interpretation bias associated with RNT emerges for ambiguous stimuli regardless of its current personal relevance. We recruited a sample of age-matched women who were not pregnant, and thus for whom pregnancy-related materials were not likely to be personally relevant. We then examined the association between levels of RNT and interpretation bias for pregnancy-related and general (non-pregnancy-related) materials in samples of both pregnant and non-pregnant women. This enabled us to establish whether interpretation bias underlying RNT operates on all ambiguously threatening material, irrespective of personal relevance.

Method

Participants

We recruited 140 pregnant and 107 non-pregnant female participants who were 25-40 years of age, fluent in English and based in the UK. Pregnant participants were eligible to take part if they were at least 16 weeks gestation, and had not previously experienced a stillbirth. Non-pregnant participants were eligible if they were not currently trying to fall pregnant, and had not experienced a stillbirth in the past. Participants were recruited through social media, online message boards, and the King's College London research circular. The final sample was comprised of 133 pregnant and 104 non-pregnant women[1]. See Table 1 for participant demographics.

1) Nine participants were removed from analysis with a score on the Recognition Test comprehension questions 2.5 standard deviations below the group mean. An additional participant was removed from analysis for having

Table 1

Demographic Characteristics

Baseline Characteristic	Pregnant sample (N = 133)		Non-pregnant sample (N = 104)		Statistical test and significance value
	M	***SD***	***M***	***SD***	t (235) = 5.04, p < .001
Age	32.64	3.68	30.12	4.0	
Nationality %	***n***	**%**	***n***	**%**	χ^2 (2) = 15.94, p < .001
British	123	92.5	77	74.0	
Other European	4	3.0	16	15.4	
World	6	4.5	11	10.6	
Highest level of education	***n***	**%**	***n***	**%**	χ^2 (4) = 4.61, p = .33
Secondary	26	19.5	13	12.5	
Bachelor	52	39.1	37	35.6	
Master	33	24.8	37	35.6	
Doctoral	7	5.3	7	6.7	
Other	15	11.3	10	9.6	
Marital status	***n***	**%**	***n***	**%**	
Single, never married	2	1.5	24	23.1	χ^2 (3) = 56.63, p < .001
In a relationship	30	22.6	46	44.2	
Married /domestic partnership	100	75.2	31	29.8	
Separated, divorced, widowed	1	0.8	3	2.9	
Number of children	***n***	**%**	***n***	**%**	χ^2 (3) = 24.63, p < .001
None	46	34.6	66	63.5	
One	65	48.9	19	18.3	
Two	16	12.0	14	13.5	
Three or more	6	4.5	5	4.8	
English as a native language	123	92.5	84	80.8	χ^2 (1) = 7.24, p = .007

Materials and Measures

Demographic Questions

Participants completed a number of demographic questions regarding age, nationality, level of education, relationship status, number of children and English fluency. Participants were also asked whether they were currently pregnant, and if they responded yes, asked to indicate number of weeks gestation, and whether they had previously experienced a stillbirth.

Interpretation Measures

Scrambled Sentences Test (SST) — This task was employed by Hirsch et al. (2018) and Hirsch, Krahé, Whyte, Bridge, et al. (2020), adapted from Wenzlaff and Bates (1998,

no grammatically correct sentences in the Scrambled Sentences Test. Seven pregnant and three non-pregnant participants were removed from analysis.

2000). Participants unscramble six words presented in a random order into a grammatically correct sentence of either positive or negative valence. Participants were given 20 sentences, equally divided between worry themes and depressive rumination themes, and asked to unscramble as many as possible in five minutes whilst holding a six-digit number in mind (which increased cognitive load; see Wenzlaff & Bates, 1998, 2000)[2]. An index of interpretation bias was created by dividing the number of grammatically correct positively unscrambled sentences by the total number of grammatically correct unscrambled sentences. Index scores range from 0 to 1, higher scores denote a more positive interpretation bias. The SST had good internal consistency $\alpha = .86$, which is comparable to that reported in a recent validation paper where two SST lists of worry and depression items were examined with $\alpha = .77$ and $\alpha = .92$ respectively (Krahé et al. 2020).

Recognition Test (RT) — This test was based on that used by Mathews and Mackintosh (2000). Materials included items related to two themes – pregnancy related and general (non-pregnancy) related. General materials were drawn from worry and rumination recognition test materials used by Hirsch, Krahé, Whyte, & Bridge, et al. (2020), while the pregnancy materials were developed for the current study from interviews with four pregnant women[3]. The RT has two phases: in the first, participants read 21 ambiguous scenarios and answered a comprehension question after each scenario. In the second section, after all scenarios had been read, participants were presented with the title of each scenario, followed by four statements presented in a random order. Participants rated how similar each statement was to the scenario they read on a 4-item Likert scale from 1 (*very different in meaning*) to 4 (*very similar in meaning*). Two of these statements resolved the previously read ambiguous scenario in either a positive or negative way, consistent with the story (targets). The remaining two statements were positively and negatively valenced, but were not realistic interpretations of the story (foils; included as filler items).

Twenty-one scenarios were equally split between worry and rumination themes, and themes relating to pregnancy. Worry and rumination items were a subset of those used by Hirsch, Krahé, Whyte, Bridge, et al. (2020). An interpretation bias index was created for each participant by subtracting mean ratings for negative targets from mean ratings for positive targets, with a higher score denoting a more positive interpretation bias. Pregnancy interpretation bias index (7 items), general interpretation bias index (14 items) and total interpretation bias index (including both pregnancy and general items) were computed. Split half reliability was high, Spearman-Brown coefficient for Negative Targets and Positive Targets respectively was .83 and .85.

2) See Appendix A in the Supplementary Materials for sample items.

3) See Appendix B in the Supplementary Materials for sample items.

Questionnaire Measures

Repetitive Thinking Questionnaire (RTQ-T [trait]) — The 10-item RTQ-T (trait) (McEvoy, Thibodeau, & Asmundson, 2014) measures trait repetitive negative thinking. Participants rate the extent to which each item (e.g., *'I have thoughts or images about all my shortcomings, failings, faults, mistakes'*) is true for them when they are distressed or upset. The RTQ possesses good internal consistency, convergent and divergent validity (Mahoney, McEvoy, & Moulds, 2012). Present sample Cronbach's α = .92.

Penn State Worry Questionnaire (PSWQ) — The 16-item PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) measures worry (example item: *'My worries overwhelm me'*). Participants rate the extent to which each item is typical of their experience. The PSWQ has good test-retest reliability (Meyer et al., 1990) and good convergent and discriminant validity (Brown, Antony, & Barlow, 1992). Present sample Cronbach's α = .83.

Ruminative Response Scale (RRS) — Depressive rumination was assessed using the 22-item measure RRS (Nolen-Hoeksema & Morrow, 1991). Participants rate the extent to which they engage in a range of responses when they feel sad, down or depressed (e.g., '*think about how alone you feel*'). The RRS has good internal consistency (Treynor, Gonzalez, & Nolen-Hoeksema, 2003) and test-retest reliability (Just & Alloy, 1997). Present sample Cronbach's α = .94.

Generalized Anxiety Disorder 7-item scale (GAD-7) — The 7-item GAD-7 (Spitzer et al., 2006) questionnaire measures anxiety symptoms over the past 2 weeks (example item: '*Feeling nervous, anxious, or on edge?*). The GAD-7 is a reliable and valid measure of anxiety in the general population (Löwe et al., 2008). Present sample Cronbach's α = .92.

Patient Health Questionnaire 9 — The 9-item PHQ-9 (Kroenke & Spitzer, 2002) measures depression symptoms in the previous 2 weeks. The PHQ-9 is a reliable and valid measure of depression severity (Kroenke, Spitzer, & Williams, 2001). Present sample Cronbach's α = .88.

Perinatal Anxiety Screening Scale — Pregnant participants completed the 31-item PASS (Somerville et al., 2014), which measures anxiety in antenatal and postpartum women. Participants indicate how often they experience each item (e.g., '*Fear that harm will come to the baby*') in the past month. The PASS has good reliability and validity (Somerville et al., 2014). Present sample Cronbach's α = .95.

Edinburgh Postnatal Depression Scale (EPDS) — The 10-item EPDS (Cox, Holden, & Sagovsky, 1987) was used to assess depression symptoms in pregnant participants. It possesses a high level of test-retest reliability (Kernot, Olds, Lewis, & Maher, 2015),

and good validity (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009). Present sample Cronbach's α = .89.

Procedure

The survey was hosted on the Qualtrics platform. Participants were asked to complete the survey in one sitting, at a time they could be free from distractions. Both groups of participants completed the same core survey (questionnaires, SST, RT), pregnant participants completed two additional pregnancy-specific questionnaires (PASS, EPDS). The survey took 35-40 minutes to complete. Upon completion participants received a £5 Amazon voucher. The study was approved by the King's College London Research Ethics Committee (approval number: HR-17/18-5735). Participants provided consent electronically.

Results

Mean questionnaire scores by group are presented in Table 2.

Table 2

Descriptive Statistics for Questionnaires and Bias Measures by Group

	Pregnant group (*N* = 133)		Non-pregnant group (*N* = 104)		
Measures	***M***	***SD***	***M***	***SD***	***t*-test and significance value**
Questionnaire					
RTQ	29.78	9.53	30.14	9.44	t (235) = 0.29, p = .77
GAD7	7.04	5.32	6.84	6.22	t (202.894)[a] = 0.26, p = .79
PHQ9	8.09	5.66	7.56	6.41	t (206.795)[a] = 0.67, p = .51
PSWQ	52.16	14.02	53.57	14.90	t (235) = 0.75, p = .46
RRS	45.61	13.24	51.53	14.60	t (235) = 3.27, p = .001
PASS	30.23	18.25	–		–
EPDS	9.26	5.77	–		–
Interpretation bias measures					
RT pregnancy items	0.42	0.78	0.36	0.77	t (235) = 0.57, p = .57
RT general items	0.68	0.66	0.60	.73	t (235) = 0.85, p = .39
RT all items	0.59	0.65	0.52	0.68	t (235) = 0.82, p = .42
SST	0.72	0.20	0.69	0.23	t (235) = 1.17, p = .24

Note. PSWQ = Penn State Worry Questionnaire; RRS = Ruminative Response Scale; RTQ = Repetitive Thinking Questionnaire; GAD7 = Generalised Anxiety Disorder Questionnaire; PHQ9 = Patient Health Questionnaire; PASS = Perinatal Anxiety Screening Scale; EPDS = Edinburgh Postnatal Depression Scale; RT = Recognition Test; SST = Scrambled Sentences Test.
[a]Equal variances not assumed.

Mean scores on questionnaire measures (RTQ, GAD7, PHQ9, PSWQ) did not differ between groups (*p*s > .05), except on the RRS, where the non-pregnant group reported significantly higher levels of rumination, $t(235) = 3.27$, $p = .001$, $r = .21$.

Is There an Association Between Interpretation Bias and Repetitive Negative Thinking, and Anxiety and Depression in a Sample of Pregnant Women?

To examine whether levels of RNT, worry and rumination were associated with a more negative interpretation bias in pregnant women, we examined correlations between the RNT measures and the behavioural measures of interpretation bias (SST, RT pregnancy items, RT general items, and all RT items collapsed)[4] (see Table 3 for correlations by group). Trait repetitive thinking (measured by the RTQ) was significantly negatively correlated with SST index ($r = -.61$, $p < .001$). Anxiety (measured by the GAD7; $r = -.63$, $p < .001$), worry (measured by the PSWQ; $r = -.67$, $p < .001$), depression (measured by the PHQ9; $r = -.62$, $p < .001$), and depressive rumination (measured by the RRS; $r = -.72$, $p < .001$) were also significantly negatively correlated with the SST.

Table 3

Correlations Between RNT and Interpretation Bias Measures (RT, SST) in Pregnant and Non-Pregnant Participants

	RT index			
Questionnaires	**Pregnancy items**	**Worry items**	**All items**	**SST index**
Pregnant group				
RTQ	-.24**	-.25**	-.27**	-.61**
GAD7	-.14	-.24**	-.22*	-.63**
PHQ9	-.24**	-.29**	-.30**	-.62**
PSWQ	-.16	-.24**	-.23**	-.67**
RRS	-.09	-.21*	-.18*	-.72**
Non-pregnant group				
RTQ	-.18	-.22*	-.22*	-.56**
GAD7	-.12	-.12	-.13	-.61**
PHQ9	-.15	-.18	-.18	-.68**
PSWQ	-.23*	-.24*	-.26**	-.64**
RRS	-.25*	-.21*	-.24*	-.66**

Note. RTQ = Repetitive Thinking Questionnaire; GAD7 = Generalised Anxiety Disorder Questionnaire; PHQ9 = Patient Health Questionnaire; PSWQ = Penn State Worry Questionnaire; RRS = Ruminative Response Scale; RT = Recognition Test; SST = Scrambled Sentences Test. *$p < .05$. **$p < .01$.

4) In the pregnant sample, the two interpretation bias measures, the RT (all items) and the SST were significantly correlated ($r = .33$, $p < .001$).

For the Recognition Test (RT), trait repetitive thinking (RTQ) was significantly negatively correlated with RT index (all items) (r = -.27, p = .002). Anxiety (r = -.22, p = .01) and worry (r = -.23, p = .008), depression (r = -.30, p = .001), and depressive rumination (r = -.18, p = .04) were also significantly negatively correlated with RT. To investigate bias specificity, we calculated the RT index for general and pregnancy-related items separately and examined correlations between both of these indices and self-report measures. The RT index for general items was significantly negatively correlated with RNT (r = -.25, p = .003), anxiety (r = -.24, p = .005), worry (r = -.24, p = .005), depression (r = -.29, p = .001), and depressive rumination (r = .21, p = .02). For the RT index comprised of pregnancy items, there was a significant negative correlation between RNT (r = -.24, p = .006) and depression (r = -.24, p = .006). No other associations were significant.

Does Interpretation Bias Associated With RNT Emerge for Ambiguous Stimuli Regardless of its Current Personal Relevance?

To examine whether interpretation bias associated with RNT emerges for ambiguous stimuli regardless of its current personal relevance, we examined interpretation bias for pregnancy-related and general stimuli in samples of pregnant and non-pregnant women. We conducted a 2 group (pregnant vs. non-pregnant) x 2 RT material type (pregnancy-related vs. general) mixed model ANCOVA with repeated measures on the second factor and interpretation bias as the dependent variable. To examine whether trait RNT was associated with interpretative bias irrespective of group, RTQ-trait scores were included as a covariate. There was no significant main effect of group, $F(1, 234)$ = 0.52, p = .47, η_p^2 = .002. There was no significant main effect of material type, $F(1, 234)$ = 3.60, p = .06, η_p^2 = 0.02, however this effect approached significance, but with a small effect size. Examination of the means suggested that regardless of group (pregnant vs. non-pregnant), when RTQ was included in the model as a covariate, the RT positivity index was higher for general items (M = 0.64, SE = 0.04) than for pregnancy-related items (M = 0.40, SE = 0.05). There was no interaction of group and material type, $F(1, 234)$ = 0.06, p = .81, η_p^2 < .001. Trait repetitive negative thinking (RTQ) was a significant covariate, indicating that trait RNT had a significant relationship with positivity index ratings (as measured by the RT) regardless of group or material type, $F(1, 234)$ = 14.92, p < .001, η_p^2 = .06[5].

5) We re-ran the ANCOVA with RRS ratings included in the model as a covariate alongside RNT. The effects remain as described above and the RRS was not a significant covariate in the model (p = .36). However, we interpret this result with caution given significant group differences on RRS scores between the two groups at baseline (Field, 2009).

Discussion

We sought to establish whether there are associations between negative interpretation bias, RNT and symptoms of depression and anxiety in the perinatal period. Furthermore, if an interpretation bias is present, we sought to examine whether pregnant and non-pregnant women exhibit similar levels of interpretation bias for both general (likely to be personally salient for both groups) and pregnancy-related (likely to be only salient for pregnant but not pregnant women) ambiguous stimuli. Clarifying this would speak to the question of whether interpretation bias is lower for non-personally relevant information. In pregnant women, we found negative associations between two behavioural measures of interpretation bias, RNT, and psychopathology symptoms; that is, the more negative one's interpretation bias, the higher their levels of RNT and symptoms of depression and anxiety. Regarding personal relevance, pregnant and non-pregnant women did not differ in their negative interpretation bias, irrespective of material type (pregnancy-related or general). Rather, trait RNT predicted interpretation bias regardless of pregnancy status or personal relevance of material focus.

It is noteworthy that mean scores on the self-report measures were relatively high in the current sample. Importantly, however, (with the exception of the RRS), the pregnant and non-pregnant groups were nonetheless matched. Thus, whilst our findings emerged in the context of high levels of psychopathology and RNT for a community sample, the fact that our groups were comparable nonetheless renders our between-group comparisons meaningful. That said, we acknowledge that the pregnant participants reported significantly lower levels of depressive rumination relative to their non-pregnant counterparts.

Our findings are theoretically informative, demonstrating that a bias to negatively interpret ambiguous stimuli also extends to women in the perinatal period, and that this bias is associated with psychological symptoms and RNT. Moreover, the bias is not influenced by personal relevance such that it was elicited by both pregnancy-related and general non-pregnancy-related material for women irrespective of pregnancy status. This suggests that the tendency to generate negative interpretations for those with higher levels of RNT may be applied to whatever ambiguity an individual encounters; the negative interpretation then has the potential to trigger further negative thoughts which may encompass other ambiguity and as such trigger new bouts of RNT which can then be perpetuated via further negative interpretations (Hirsch & Mathews, 2012; Hirsch et al., 2016). Furthermore, if these findings are replicated in those suffering from generalised anxiety disorder, it may help explain how these individuals end up worrying about so many new topics as soon as they encounter them, given that negative interpretations will trigger and maintain worry about a wide range of topics.

These results also have implications for the prevention of perinatal depression and/or anxiety, and suggest the potential clinical utility of offering interventions which effectively reduce cognitive biases, including cognitive behavioural therapy (CBT) and antide-

pressant medication. In addition, the findings suggest the potential utility of offering CBM-I targeting interpretation bias to vulnerable pregnant women (i.e., those with a history of psychopathology) in order to reduce RNT and associated psychological symptoms in the antenatal period. Given the generalised (i.e., rather than pregnancy-specific) nature of interpretation bias observed in our sample, such preventive interventions could utilise CBM-I materials employed in our previous work (e.g., Hirsch et al., 2018; Hirsch, Krahé, Whyte, Bridge, et al., 2020) to train pregnant women to generate positive interpretations, without the need for adaptation. However, if multi-session CBM-I training is undertaken, ensuring personal relevance of materials is likely to increase engagement and prevent attrition. In addition to potentially reducing RNT and psychological distress, given evidence that RNT predicts postnatal depression (e.g., Egan et al., 2017; O'Mahen et al., 2010) and predicts increases in depression from the last trimester of pregnancy to 28 weeks postpartum (Barnum et al., 2013), a further possibility that awaits testing in future research is that reducing antenatal RNT may prove effective in reducing the likelihood of suffering from postnatal depression and anxiety.

The study has some limitations. First, we cannot rule out the possibility that some participants in the non-pregnant group were trying to conceive, had recently miscarried, or were unknowingly pregnant at the time of participation. Whilst possible, given our large sample, we reason that the number of such participants is likely to be a very small proportion of the sample, and as such, do not expect that they would influence our findings. Second, framing the pregnancy-related scenarios in the first-person (common practice in the interpretation literature) may have inadvertently resulted in them being processed as personally relevant/salient by non-pregnant participants, despite the lack of relevance of the content (i.e., pregnancy) to their real day-to-day lives. Future studies which include self-relevant, non-self-relevant (presented in the first person) and non-self-relevant (referring to other) scenarios are needed to clarify this issue (see Wisco & Nolen-Hoeksema, 2010, for this distinction). Third, although our pregnant and non-pregnant samples were matched on levels of trait RNT and worry, groups differed on levels of self-reported rumination. Furthermore, mean levels of worry were higher than those reported in the general population, with a community sample of adults scoring 42.67 on the PSWQ (Startup & Erickson, 2006), compared to 52.78 in the current sample. Thus, we acknowledge that our sample may not be representative of the general population. Critically, however, this difference does not prevent us from answering our key research question. Fourth, whilst we checked that non-pregnant participants were not currently trying to fall pregnant, it is possible that for some of them, pregnancy may have in fact been personally relevant (e.g., if a close family member was pregnant). However, if this were the case it is likely that it only applied to a sub-group of the non-pregnant sample, and as such is unlikely to account for the current findings.

In any case, such limitations are balanced by notable strengths; for example, we conducted PPI with pregnant women to ensure that our pregnancy-related materials were

relevant to the concerns of pregnant women, and thus maximise the ecological validity of the results. Furthermore, our findings are broadly replicated across two measures of interpretation bias, and demonstrate associations with different forms of repetitive negative thinking, as well as anxiety and depressed mood in pregnant women.

An interesting direction for future research in this area would be to investigate the possibility that pregnancy – a period characterised by uncertainty and ambiguous information for many women - exacerbates interpretation biases which were present prior to falling pregnant. For example, prospectively examining a sample of women of child-bearing age and re-assessing them during pregnancy would establish whether pre-existing biases are amplified during pregnancy, as well as shed light on the extent to which interpretation biases potentially interact with other cognitive processes (e.g., the tendency to attend to threat), as well as with life events more broadly.

In sum, this study is the first to investigate the interrelationship of negative interpretation bias, RNT, depression and anxiety in the perinatal period, and found positive associations between all of these variables. For pregnant women, interpretation bias was evident to the same degree for both material that was likely to be salient (pregnancy-related) and material that was general, and did not differ from that of non-pregnant women. Our finding that trait RNT is associated with interpretation bias for all ambiguous material, and across the full sample, underscores the need for novel interventions to target negative interpretations and reduce RNT in those at risk of developing clinical disorders characterised by unhelpful RNT. Given the wider impact of perinatal mental health problems on children, partners and the unborn child, we consider pregnant women a priority for RNT-focused preventive interventions.

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Supplementary Materials

The Supplementary Materials contain the following items (for access see Index of Supplementary Materials below):

- Appendix A: Example of materials in Scrambled Sentences Test
- Appendix B: Example of a pregnancy specific materials in the Recognition Test

Index of Supplementary Materials

Hirsch, C. R., Meeten, F., Gordon, C., Newby, J. M., Bick, D., & Moulds, M. L. (2020). *Supplementary materials to "Repetitive negative thinking and interpretation bias in pregnancy"* [Appendices]. PsychOpen. https://doi.org/10.23668/psycharchives.4428

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Visual Triggers of Skin Picking Episodes: An Experimental Study in Self-Reported Skin Picking Disorder and Atopic Dermatitis

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Abstract

Background: Skin Picking Disorder (SPD) is a new diagnosis with limited information available about triggers of picking episodes. Itch can be induced via audio-visual stimuli and the effect of contagious itch is stronger for those affected by atopic dermatitis. We examined if picking-related visual stimuli can trigger the urge to pick skin in self-reported SPD. We compared itch and the urge to pick in a sample of AD and/or SPD-affected to controls without either.

Method: Urge to pick skin and/or scratch when viewing 24 itch-related, picking-related or neutral online pictures was assessed in adult females, who self-report skin-picking (SPD-only, n = 147) and/or atopic dermatitis (AD-only, n = 47; AD+SPD, n = 46) as well as in skin healthy controls (HC, n = 361).

Results: All participants reported a stronger urge to pick for picking-related pictures compared to neutral content ($F[1, 597] = 533.96$, $p < .001$, $\eta p2 = .472$) and more itch for itch-related pictures compared to neutral stimuli ($F[1, 597] = 518.73$, $p < .001$, $\eta p2 = .465$). SPD-all (SPD-only & AD+SPD) reported stronger urges to pick for picking-related vs. other stimuli compared to the AD-only and HC group ($p < .001$, $\eta p2 = .047$). Likewise, AD-all (AD-only & AD+SPD) reported significantly stronger itching for itch-related vs. other stimuli compared to SPD-only and HC ($p = .001$, $\eta p2 = .019$).

Conclusions: Analog to visual provocation of itch, the urge to pick can be triggered by visual stimuli. Treatments for SPD and AD may profit from addressing visual stimuli.

Keywords

skin picking, excoriation disorder, body-focused repetitive behaviors, contagious itch, visual stimuli

Highlights

- Contagious itch can be induced with visual stimuli (videos or static pictures).
- This effect is especially strong in individuals self-reporting atopic dermatitis.
- The urge to pick can also be induced with visual stimuli (picking-related pictures).
- This effect is especially strong in individuals self-reporting skin picking disorder.
- Treatment for skin picking disorder may profit from addressing visual stimuli.

Skin Picking disorder (SPD) has recently been included as official diagnosis in the Diagnostic and Statistical Manual of Mental Disorders (DSM). DSM-5 characterizes SPD as recurrent skin picking resulting in lesions of the skin and repeated attempts to decrease or stop this behavior. Additionally, for a diagnosis of skin picking disorder, skin picking must cause clinically significant distress or impairment in important areas of functioning (American Psychiatric Association, 2013). Many people indulge in picking behavior from time to time, however, people with SPD feel a strong urge to manipulate their skin and feel unable to resist this urge or to stop (American Psychiatric Association, 2013).

Clinical experience suggests that skin picking episodes can be triggered in various different ways (Mansueto et al., 1997; Neziroglu et al., 2008). However, mostly self-report studies of triggers for skin picking episodes have been published. In a clinical sample emotional triggers such as general anxiety, general stress, interpersonal rejection, a sense of emptiness, and teasing were reported (Neziroglu et al., 2008). In terms of visual stimuli, skin imperfections were most commonly mentioned (80%), including pimples, scabs, scars, and mosquito bites. Regarding somatosensory triggers, itchiness (40%), the feeling of something being underneath the skin surface (32%), and a "right feeling" sensation (40%) were described. The most common environmental triggers were looking in the mirror and checking one's skin (52%; Neziroglu et al., 2008). In a German nonclinical sample (Bohne et al., 2002; $N = 133$), students reported cutaneous triggers to be pimples (93.2%), insect bites (63.9%), scabs (57.1%), itching (45.9%), inflammation (34.6%), warts (13.5%), healthy skin (18.0%), moles and scars (9.8%). Participants with SPD reported the feel (55%) and sight (26.7%) of the skin as the most common triggers to picking behavior (Odlaug & Grant, 2008). Finally, Houghton et al. (2018) investigated sensory processing in people affected by body-focused repetitive behaviors (BFRBs; e.g., hairpulling, skin picking, nail biting) via the Adult/Adolescent Sensory Profile (Brown et al., 2001). Participants with clinical BFRBs reported increased sensory sensitivity including visual stimuli compared to subclinical BFRBs and healthy controls. In summary, many of these triggers indicate visual perception of one's skin (e.g., when looking in the mirror) to be one of various factors within the cycle of urge to pick and picking behavior.

One fMRI study examined visual symptom provocation in SPD (Schienle, Ubel, & Wabnegger, 2018). For pictures with skin irregularities, disgust, tension and urge to pick ratings were significantly higher in the SPD-group. However, the same was true regarding disgust and urge to pick for pictures without skin irregularities. Furthermore, when looking at skin imperfections, SPD-patients showed greater activation in the left insula and in the amygdala with stronger insula-putamen coupling compared to matched controls. These brain regions are linked to visual disgust elicitation, process salience and the affective significance of stimuli.

Whereas experimental studies examining mechanisms underlying the urge to pick in SPD are mostly lacking, some exist for pruritus, especially pruritus associated with atopic dermatitis (AD). AD presents several similarities with SPD. AD patients suffer from a cutaneous hyperreactivity to environmental triggers resulting in a chronic inflammatory skin disease (Leung, 2013). Pruritus is the cardinal symptom of AD provoking the desire to scratch for relief from this unpleasant sensation but leading to skin damage and other negative consequences (Mochizuki et al., 2014; Ständer & Steinhoff, 2002). However, the mechanical stimulation of the skin may provoke inflammation, which again exacerbates itch (itch-scratch-cycle; Mochizuki et al., 2017). Due to its negative impact on quality of life, most patients measure the severity of their AD by intensity of pruritus rather than visible skin damage (Ständer & Steinhoff, 2002). Against this background, Verhoeven et al. (2008) proposed a biopsychosocial model of itch in patients with chronic skin diseases: internal vulnerability factors (e.g., personality) interact with external environmental factors (e.g., stressors). Meanwhile, cognitive (e.g., illness cognitions), behavioral, and social factors are mediating and/or moderating factors to trigger a skin disease and enhance symptoms of itch. Contagious itch (CI) can therefore be a cognitive psychological factor causal in pathological itch (Verhoeven et al., 2008).

Itch sensations can be evoked through mechanical, electrical, thermal and chemical stimulation of free nerve endings in the skin (Leknes et al., 2007; Murota & Katayama, 2017). Apart from methods manipulating the skin to induce itch (e.g., histamine and allergen solutions), non-skin-manipulating methods also lead to itch sensations (Leknes et al., 2007). For example, itch can be induced with audio-visual stimuli. Niemeier, Kupfer, and Gieler (2000) held two different lectures ("itch lecture", "relaxation lecture") for participants with and without self-reported skin disease. Self-reported itch sensation after the lecture as well as the number of scratch movements during the "itch lecture" (slides with pictures of fleas, allergic reactions etc.) were significantly higher compared to the "relaxation lecture". However, there was only a trend with regard to the experience of itching sensations when comparing participants with and without skin conditions. Ogden and Zoukas (2009) replicated these results with college students without assessing skin conditions using purely visual stimulation (e.g., videos of lice, person scratching head) without audio. In 2011, Papoiu et al. investigated whether exposure to visual cues of itch (5-minute video of people scratching their left forearm vs. people sitting idle)

can induce or intensify itch in AD patients and healthy controls. Itch intensity increased slightly in healthy volunteers and significantly in AD patients. The latter also scratched more frequently while watching the itch video. Schut et al. (2015) identified depression as an additional significant predictor of induced itch. Furthermore, agreeableness and public self-consciousness were significant predictors of scratching in AD-patients. Palani et al. (2018) asked healthy participants to watch videos picturing a demonstrator scratching in four body regions with and without sound and a control video with neutral content. Results showed CI to be body-region dependent, with the craniofacial region being the predominant site for participants to experience itching sensations after watching the video compared to arm, chest, and back.

These studies on CI used a lecture or video material to induce itch. Lloyd et al. (2013) tested whether static images (i.e., visual cues alone) were able to induce CI. They used neutral (e.g., butterflies or healthy skin) or itch-related pictures (e.g., fleas or skin conditions). Healthy participants reported higher itch intensity for itch-related pictures compared to neutral pictures, and scratching frequency when viewing the pictures was significantly higher for itch-related pictures. Furthermore, more scratch movements for the "skin response" picture type (e.g., scratching an insect bite) were found. Lloyd et al. (2017) tested whether a history of pruritic skin conditions moderates the CI effect when looking at static pictures. Itch-related pictures again caused higher self-itch. Furthermore, participants with a history of pruritic skin conditions gave higher self-itch ratings when viewing "skin response"-images. In summary, somatosensory perception in the absence of somatosensory stimulation (i.e., CI) can be induced via the presentation of sounds, pictures or videos (Schut et al., 2015) and is enhanced in individuals suffering from chronic itch-related skin conditions.

In the present study, we test if this type of effect (i.e., CI) can be replicated with other types of stimuli and reactions – specifically, with visual stimuli triggering the urge to pick one's skin. We investigated whether picking-related visual stimuli compared to other stimuli (itch-related, neutral) trigger the urge to pick in SPD-affected compared to persons without SPD. Comparably, we tested, whether itch-related visual stimuli compared to other stimuli (picking-related, neutral) trigger itch sensations in AD patients compared to participants without AD. Our investigation could experimentally present a pathological mechanism previously mainly self-reported as a relevant trigger for skin picking episodes in SPD.

Method

Design

In a quasi-experimental study (stimulus type [3] × group [4]), data was collected online with Enterprise Feedback Suite Survey. Following the guidelines of the German Psychological Society, all participants provided written informed consent prior to participation.

Procedure

The survey was disseminated in several recruitment waves, among others the newsletter of a German self-help group for skin picking and in forums focusing on AD and pruritus. After the initial data collection of SP affected individuals (N = 307; SPD: 74%, AD: 4%, HC: 22%, male gender was substantially underrepresented (9.5%). Given that it was unlikely that we would be able to recruit a sufficient number of male participants, we thenceforth exclusively targeted female AD-patients and healthy controls in the following recruitment waves. After an introductory text and informed consent (following the ethical guidelines of the German Psychological Society, see Appendix B5), sociodemographic information was assessed. Derived from DSM-5 criteria for SPD a three-question (criteria A-C) screening was conducted (KSSP, N = 601, α = .86; Mehrmann, Hunger, & Gerlach, 2017). As soon as participants reported feeling impaired due to SPD, they were allocated to the SPD group. Additionally, participants were asked about skin diseases (e.g., AD, psoriasis, lice). When answering positive regarding AD (current symptoms or symptoms in the past three months), they were allocated to the AD-group.

Materials

Visual Stimuli

Following a short explanation to German synonyms and difference between picking and scratching (see Appendix B4), every participant looked at 24 visual stimuli (500x759 pixel) in random order (see additional information in Appendix B1). The stimuli consisted of 24 static images of human skin sourced from Google images and one photo specifically taken for this project. Similar to the stimulus material used by Lloyd et al. (2017) eight pictures represented one of three stimulus types each: (1) picking-related images depicting pimples, scabs, or loosening skin flakes, (2) itch-related images with skin conditions (e.g., eczema, mosquito bites), and (3) neutral images with pictures of intact, healthy skin. For each stimulus type, two images of four different body parts (head, torso, arm/hand, leg) were included. After looking at each stimulus a minimum time of three seconds the participants could click to the next page and answer four questions on a 5-point Likert-type scale (0 = not at all, 4 = very strong): “How itchy do you feel?” (itch-self), “How itchy do you think the person in the picture feels?” (itch-other), “How strong is your urge to pick (not scratch)?” (urge-to-pick-self), “How strong do you think is the

urge to pick (not scratch) of the person in the picture?" (urge-to-pick-other). Given that participants were free to look at the pictures as long as they wished, we checked for differences between viewing times. However, there was no main effect of viewing times for stimulus-type, Pillai's trace $V = .002$, $F(2, 596) = .69$, *ns*, $\eta_p^2 = .002$; no effect for group, $F(3, 597) = 1.93$, *ns*, $\eta_p^2 = .01$ and no interaction effect for stimulus-type × group, Pillai's trace $V = .004$, $F(6, 1194) = .42$, *ns*, $\eta_p^2 = .002$.

Questionnaires

Several questionnaires were used to assess AD and SPD as well as general measures of psychopathology. AD or SPD specific questionnaires were only presented if participants screened positive for one or both of them.

mSPS-D — The modified Skin Picking Scale, German version (Mehrmann et al., 2017), is a translated and adapted version of the Skin Picking scale by Keuthen, Wilhelm, et al. (2001; Snorrason et al., 2012) and the Massachusetts General Hospital (MGH) Hairpulling Scale (Keuthen et al., 1995). Nine items measure frequency and intensity of picking as well as impairment due to skin picking on a 5-point Likert-type scale. Scores can range from zero to 36 ($n = 515$, $\alpha = .95$). Currently, there is no clinical cut-off score for the German version available.

mSPS-D-AD — To use a similar scale to explore the AD-sample, we modified the mSPS-D by exchanging the words "Picking" and "skin picking" with "scratching" and "atopic dermatitis" ($n = 105$, $\alpha = .89$).

SPIS-D — The Skin Picking Impact Scale by Keuthen, Deckersbach, et al. (2001) was translated into German (Mehrmann et al., 2017). A short version with four items (Snorrason et al., 2013) measures psychosocial impairment due to skin picking on a 5-point-Likert-type scale ($n = 515$, $\alpha = .97$). For the original version, Keuthen, Deckersbach, et al. (2001) propose a score ≥ 7 to determine clinical impairment.

SPIS-D-AD — Participants with AD symptoms answered an AD-adapted version (see above) of the SPIS-D items for psychosocial impairment ($n = 105$, $\alpha = .89$).

AD-scale — AD-affected answered a three-question scale on feeling itchy and actual scratching during the last two weeks as well as impairment due to AD via a 5-point Likert-type scale (Stangier, Gieler, & Ehlers, 2013; $n = 105$, $\alpha = .83$).

BSI-18 — The German short version of the Brief Symptom Inventory (Franke, 2000; Spitzer et al., 2011) is a self-report symptom scale assessing levels of psychological distress. Eighteen items with a 5-point Likert-type scale result in a global severity scale (GSI) ranging between 0 and 72 ($n = 598$, α [GSI] = .91).

Sample

Primary inclusion criteria were consent to study participation, age > 18 years, female gender and completion of the online survey. Altogether, 764 out of 1,406 participants met all primary inclusion criteria. 163 participants were excluded during data processing, because they reported other skin conditions during the last three months, with symptoms that could be confounded with itch or the urge to pick, e.g. mycosis pedis, parasites. The final data set contained 601 participants. The four groups were represented as followed: n (AD_{only}) = 47 (7.8%), n (SPD_{only}) = 147 (24.5%), n (AD+SPD) = 46 (7.7%), n (HC) = 361 (60.0%). Post hoc tests showed the AD_{only}-group to be significantly older than the SPD_{only}-group (-5.05, 95%-CI [-9.77, -.34]).There was only a small negative correlation between age and the perception of itch (r = -.11, p = .04), or the urge to pick (r = -.16, p = .003) for the HC-group. See Table 1 for questionnaire-scores (see additional information in Appendix B2).

Table 1

Descriptive Statistics for All Questionnaires With Univariate Analysis

	AD_{only} (n = 47)		SPD_{only} (n = 147)		AD+SPD (n = 46)		HC (n = 361)				
Questionnaire	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***F***	***df1, df2***	η_p^2
Age	34.32	13.17	29.27	9.63	29.91	11.27	31.55	10.58	3.30*	3, 597	.016
mSPS-D	–	–	20.60	5.48	20.41	5.10	5.38	4.66[a]	565.01**	2, 509	.689
SPIS-D	–	–	10.59	4.19	6.85	4.60	0.74	1.88[a]	554.53**	2, 509	.685
mSPS-D-AD	17.21	7.24	–	–	21.57	5.56	–	–	10.54*	1, 91	.104
SPIS-D-AD	6.36	4.96	–	–	8.41	4.55	–	–	4.31*	1, 91	.045
BSI-18	13.81	9.93	18.41	11.64 [b]	16.26	10.29	8.14	9.41	40.07**	3, 595	.168

Note. SPD_{only} = Skin Picking Disorder; AD_{only} = Atopic Dermatitis; AD+SPD = Atopic Dermatitis and Skin Picking Disorder; HC = Healthy control; mSPS-D = modified Skin Picking Scale, German version; SPIS-D = Skin Picking Impact Scale, German version; mSPS-D-AD = modified SPS-D for AD; SPIS-D-AD = modified SPIS-D for AD; BSI-18 = German short version of the Brief Symptom Inventory.

[a] n = 319. [b] n = 145.

*p < .05, two-tailed. **p < .001, two-tailed.

Analysis

All participants were allocated to one of four groups (AD_{only}, SPD_{only}, AD+SPD, HC). Sociodemographic characteristics and questionnaires were tested using an ANOVA and we used the Bonferroni method as provided by SPSS to adjust for multiple comparisons in the post-hoc tests. In a repeated measures MANOVA, itch-other and urge-to-pick-other ratings were analyzed for stimulus type (itch-related, picking-related, neutral), followed by univariate ANOVAs and planned contrasts. In a repeated measures MANOVA itch-self and urge-to-pick-self ratings were analyzed for stimulus type (3) × group (4) with sepa-

rate univariate ANOVAs and planned contrasts (see additional information in Appendix B3). When sphericity was violated, the Greenhouse–Geisser adjustment was used.

Results

Manipulation Check (Urge-To-Pick-Other and Itch-Other Ratings)

A MANOVA revealed a significant effect of urge-to-pick-other and itch-other ratings for stimulus type, Pillai's trace $V = .92$, $F(4, 597) = 1714.56$, $p < .001$, $\eta_p^2 = .920$, indicating the experience of itch and the urge to pick varied based on picture content.

Urge-To-Pick-Other

In the univariate ANOVA a significant effect for stimulus type was revealed, $F(1.89, 1135.54) = 1027.02$, $p < .001$, $\eta_p^2 = .631$. Urge-to-pick-other ratings were significantly higher for picking-related stimuli ($M = 1.64$, $SD = .77$) than for neutral stimuli ($M = .27$, $SD = .37$), $F(1, 600) = 2344.64$, $p < .001$, $\eta_p^2 = .796$. Urge-to-pick-other ratings were also significantly higher for picking-related stimuli than for itch-related stimuli ($M = 1.41$, $SD = .95$), $F(1, 597) = 11.24$, $p = .001$, $\eta_p^2 = .018$.

Itch-Other

In the univariate ANOVA a significant effect for stimulus type was revealed $F(1.97, 1181.05) = 3465.76$, $p < .001$, $\eta_p^2 = .852$. Itch-other ratings were significantly higher for itch-related stimuli ($M = 2.34$, $SD = .67$) than for neutral stimuli ($M = .31$, $SD = .38$), $F(1, 600) = 6543.65$, $p < .001$, $\eta_p^2 = .916$. Itch-other ratings were significantly higher for itch-related stimuli than for picking-related stimuli ($M = 1.11$, $SD = .66$), $F(1, 597) = 1186.43$, $p < .001$, $\eta_p^2 = .665$.

MANOVA (Stimulus Type × Group; Urge-To-Pick-Self and Itch-Self Ratings)

The MANOVA revealed a significant main effect for group (Pillai's trace $V = .26$, $F[6, 1194] = 29.41$, $p < .001$, $\eta_p^2 = .129$), a significant main effect for stimulus type (Pillai's trace $V = .53$, $F[4, 594] = 169.78$, $p < .001$, $\eta_p^2 = .533$), and a significant interaction effect for stimulus type × group (Pillai's trace $V = .25$, $F[12, 1788] = 13.41$, $p < .001$, $\eta_p^2 = .083$).

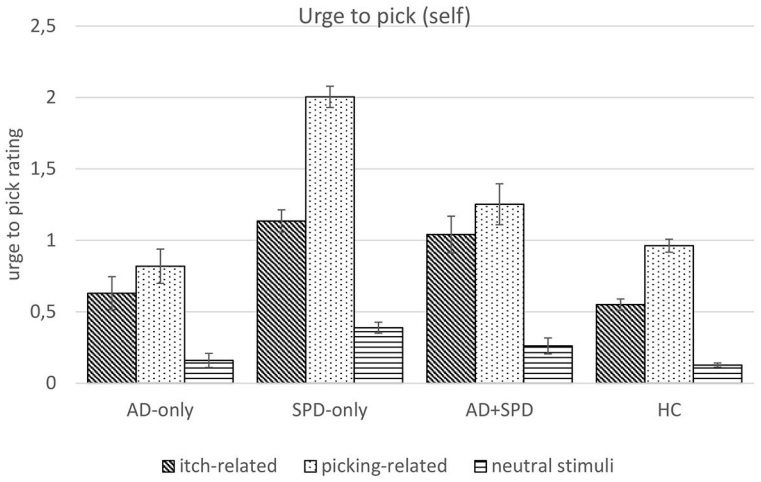
Urge-To-Pick-Self Ratings

Univariate follow-up analyses of urge-to-pick-self ratings again found a significant main effect for stimulus type, $F(1.96, 1172.76) = 304.54$, $p < .001$, $\eta_p^2 = .338$, and for group, $F(3, 597) = 42.47$, $p < .001$, $\eta_p^2 = .176$. Additionally, there was a significant interaction effect

for stimulus type × group, $F(5.89, 1172.76) = 24.21$, $p < .001$, $\eta_p^2 = .108$ (see Figure 1; additional tables on urge-to-pick-self and itch-self ratings in Appendix A**).**

Figure 1

Experienced Urge to Pick (0-4) by Group and Type of Stimulus



Note. SPD_{only} = Skin Picking Disorder; AD_{only} = Atopic Dermatitis; AD+SPD = Atopic Dermatitis and Skin Picking Disorder; HC = Healthy control. Error bars show standard errors.

All participants experienced a stronger urge to pick when looking at picking-related compared to neutral stimuli, $F(1, 597) = 533.96$, $p < .001$, $\eta_p^2 = .472$. They also reported a stronger urge to pick when looking at picking-related compared to itch-related stimuli, $F(1, 597) = 112.41$, $p < .001$, $\eta_p^2 = .158$ and when looking at itch-related compared to neutral stimuli, $F(1, 597) = 216.11$, $p < .001$, $\eta_p^2 = .266$.

To check whether participants with SPD reported a stronger urge to pick for picking-related stimuli compared to other stimuli, we compared this difference in SPD participants (SPD_{all}) with participants without SPD (AD_{only} & HC). Planned contrast were calculated merging the SPD_{only} and AD+SPD group (SPD_{all}, $n = 193$). The difference in urge-to-pick-self ratings for pick-related vs. itch-related and neutral pictures was significantly higher in SPD_{all} participants compared to participants without SPD (AD_{only} & HC), with a mean difference of 1.59 ($SE = .29$, $p = .001$, $\eta_p^2 = .047$). Likewise, the difference in urge-to-pick-self ratings for picking-related vs. neutral stimuli as well as for picking-related vs. itch-related stimuli was significantly higher in SPD_{all} participants compared to participants without SPD (AD_{only} & HC), with a mean difference of 1.11 ($SE = .18$, $p < .001$, $\eta_p^2 = .062$) and .48 ($SE = .16$, $p = .003$, $\eta_p^2 = .015$). When comparing urge-to-pick-self ratings from participants with SPD_{only} to individuals affected by both

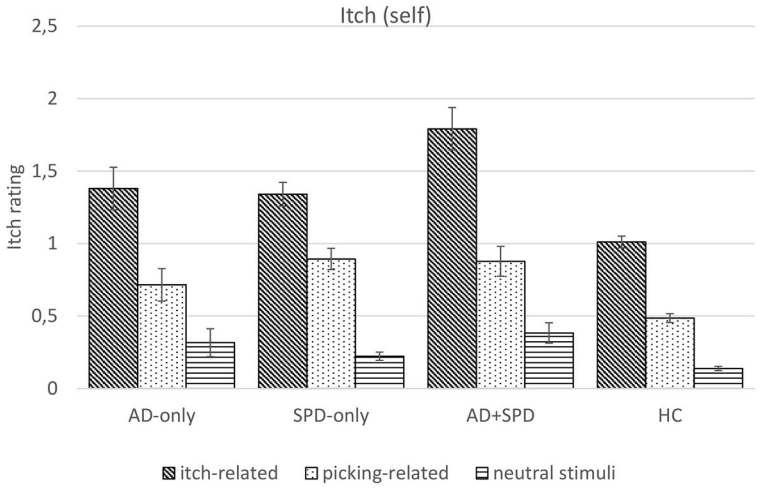
AD and SPD, the difference between picking-related vs. itch-related and neutral stimuli is significantly larger for the SPD_{only} group, with a mean difference of 1.28 (SE = .22, p < .001, η_p^2 = .055). For the group comparison SPD_{only} vs. SPD+AD the difference in urge-to-pick-self ratings between picking-related and neutral stimuli as well as between picking-related and itch-related stimuli was significantly higher for SPD_{only} with a mean difference of .62 (SE = .13, p < .001, η_p^2 = .037) and .66 (SE = .12, p < .001, η_p^2 = .050).

Itch-Self Ratings

There was a significant main effect on itch-self ratings for stimulus type, F(1.58, 940.90) = 391.95, p < .001, η_p^2 = .396, for group, F(3, 597) = 14.17, p < .001, η_p^2 = .066) and a significant interaction effect for stimulus type × group, F(4.73, 940.90) = 8.06, p < .001, η_p^2 = .039 (see Figure 2).

Figure 2

Experienced Itch (0-4) by Group and Type of Stimulus



Note. SPD_{only} = Skin Picking Disorder; AD_{only} = Atopic Dermatitis; AD+SPD = Atopic Dermatitis and Skin Picking Disorder; HC = Healthy control. Error bars show standard errors.

All participants experienced stronger itch-sensations when looking at itch-related compared to neutral stimuli, F(1, 597) = 518.73, p < .001, η_p^2 = .465. They also reported stronger itch-sensations when looking at itch-related compared to picking-related stimuli, F(1, 597) = 293.72, p < .001, η_p^2 = .330 and when looking at picking-related compared to neutral stimuli, F(1, 597) = 225.76, p < .001, η_p^2 = .274.

To check whether participants with AD reported greater perception of itch for itch-related versus other stimuli, we compared this difference in participants with versus

without AD. Planned contrast were calculated merging the AD_{only} and AD+SPD group (AD_{all}, n = 93). The difference in itch-self ratings for itch-related vs. picking-related and neutral stimuli was significantly higher in AD_{all} compared to without AD participants (SPD_{only}& HC), with a mean difference of 1.09 (SE = .32, p = .001, η_p^2 = .019).

Likewise, the difference in itch-self ratings for itch-related vs. neutral stimuli as well as for itch-related vs. picking-related stimuli was significantly higher in AD_{all} compared to without AD participants (SPD_{only} & HC), with a mean difference of .48 (SE = .20, p = .014, η_p^2 = .010) and .61 (SE = .15, p < .001, η_p^2 = .027).

Discussion

In the presented study, we investigated whether picking-related visual stimuli trigger the urge to pick in individuals affected by SPD compared to persons without SPD. Correspondingly, we tested, whether itch-related visual stimuli trigger itch sensations in individuals with AD versus without AD. Analog to the visual provocation of itch, we demonstrated that the urge to pick can also be triggered by visual stimuli. All participants experienced a stronger urge to pick looking at pictures with picking-related content compared to neutral stimuli. Furthermore, individuals with self-reported SPD_{all} reported a significantly stronger urge to pick when looking at these stimuli compared to the AD- and HC-group. Interestingly, the SPD_{only} group showed a significantly stronger reaction to picking-related stimuli than the participants with both AD and SPD. At the same time, the AD+SPD group reported more itch-sensations to itch-related stimuli compared to the AD_{only} group. Thus, for the comorbid group the transmission of the urge to pick was less prominent than the transmission of itch-sensations. Note that the burden of skin picking as measured by the SPIS-D was higher in the SPD_{only} group (M = 10.59, SD = 4.19) compared to the comorbid group (M = 6.85, SD = 4.60). On the other hand, the psychosocial impairment due to AD (SPIS-D-AD) was higher in the comorbid group (M = 8.41, SD = 4.55) compared to the AD_{only} group (M = 6.36, SD = 4.96). The combination of SPD with comorbid AD regarding visual symptom provocation clearly requires further investigation. Even though we disseminated the survey contacting many AD specific associations, online-groups and forums, it was difficult to acquire a larger AD-sample, which limits the generalizability of our results.

This evidence for visual transmission for the urge to pick supports SPD affected self-report of different visual cues acting as triggers for picking episodes (Bohne et al., 2002; Neziroglu et al., 2008; Odlaug & Grant, 2008). The results of our study document that visual stimuli may trigger specific experiences of somatosensory perception (itch and/or the urge to pick) in the absence of somatosensory stimulation.

Not surprisingly, we were also able to replicate visual transmission of itch (Niemeier et al., 2000; Ogden & Zoukas, 2009; Papoiu et al., 2011) with people reporting to experience more itch when looking at itch-related pictures compared to other pictures

(neutral, picking-related pictures). This effect was stronger for AD patients, who reported more self-itch when exposed to itch-associated skin pictures. This is again in line with previous findings on people suffering from a skin condition like AD to be more prone to visual transmission of itch than healthy controls (Papoiu et al., 2011; Schut et al., 2015).

When comparing transmission of itchiness with transmission of the urge to pick, overlapping concepts for the urge to scratch itchy skin vs. the urge to pick may be a problem. In the present sample, picking-related pictures gained significantly higher ratings for itch experience compared to neutral pictures. By presenting a short explanation including synonyms and an explanation of differences between picking and scratching, we tried to minimize the influence of this possible overlap effect. Likewise, stimuli may trigger both sensations at the same time. Furthermore, differentiating between the urge to scratch and pick may be even harder for people with both conditions (SPD and AD). Another limitation is that allocation to one of the four groups was conducted through self-report information and could not be validated by a clinician. There may have been be false-positive allocations to SPD and/or AD and conclusions on treatment of the two diagnoses need to be considered carefully. Overall, the AD_{only} sample and AD+SPD sample were underrepresented. Also, the self-reports on itch and urge to pick perception were not compared to behavioral measures such as actual scratching or picking and the urges to itch or scratch elicited were only on an average level. Finally, we recruited only female participants. Consequently, implementation objectivity, sample representativeness and external validity may be somewhat limited.

This is the first study to compare the effects of different visual stimuli as triggers for SPD compared to AD and healthy controls. Understanding the role of visual triggers for picking and/or itch episodes may help to improve treatment for both AD and SPD. In a meta-analytic review looking at efficacy of treatments for SPD (Schumer, Bartley, & Bloch, 2016) cognitive behavioral therapy (CBT) and habit reversal training (HRT) were highlighted as efficacious treatments compared to waiting list and pharmacological treatment. CBT/HRT includes assessment of picking behavior, psychoeducation, and strategies to reduce picking (e.g., HRT, relapse prevention). While HRT is a strategy designed for dealing with the overwhelming need to pick, stimulus control can be used to avoid typical trigger situations. Within stimulus control treatment, triggers are identified and then changed to reduce picking behavior (e.g., dimming the lights in the bathroom when standing in front of the mirror). This serves to strengthen alternative non-harmful behaviors. With this strategy individual visual trigger situations can be targeted specifically to prevent formation of an urge to pick (e.g., covering with clothing, limited mirror-time). Behavioral therapy for AD includes similar modules to SPD treatment. Among others, they also include techniques to reduce scratching, like HRT and stimulus control techniques (Scholz, 1999).

Further research on the transmission of itch and the urge to pick should consequently include additional (i.e., behavioral) measures for diagnoses and explore possible gender

differences. For example, it would be helpful to check if the urge to pick induced by visual stimuli actually translates into picking episodes, which could be assessed in a laboratory setting. Given that most AD patients report tactile triggers for their scratching rather than visual triggers, it may be also interesting to examine the sensation of touch in absence of a tactile stimulus in these two groups. This could be accomplished, by using the somatic signal detection task (SSDT; Lloyd et al., 2008). The SSDT allows studying perceptual processes related to physical symptoms by provoking illusory tactile experiences. The number of such illusory tactile experiences may be associated with symptom severity in both AD and SPD patients.

Within this online study, the transmission of itch and the urge to pick and scratch for those effected by SPD and/or AD could be elicited using visual stimuli. The transmission of the urge to pick can serve to guide the development and improvement of interventions developed to treat SPD in the future. The present findings help to understand the relevance of visual triggers for itch/scratch and picking behaviors in AD and SPD, respectively. Looking more closely at visual triggers will aid therapists when attempting to improve treatment components targeting the onset of skin picking episodes (e.g., stimulus control techniques, HRT).

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Appendices

Appendix A

Table A1

Urge to Pick Ratings (Self)

		Stimulus type							
		itch-related images		picking-related images		neutral images		Total	
Sample	***n***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
SPD_{only}	147	1.14	.95	2.00	.91	.39	.47	1.18	.65
AD_{only}	47	.63	.79	.82	.82	.16	.34	.54	.58
AD+SPD	46	1.04	.87	1.25	.97	.26	.38	.85	.64
HC	361	.55	.75	.96	.86	.13	.28	.55	.55
Total	601	.74	.85	1.23	.99	.20	.37	–	–

Note. SPD_{only} = Skin Picking Disorder; AD_{only} = Atopic Dermatitis; AD+SPD = Atopic Dermatitis and Skin Picking Disorder; HC = Healthy control. Scale ranging from 0 (= not at all) to 4 (= very strong).

Table A2

Itch Ratings (Self)

		Stimulus type							
		itch-related images		picking-related images		neutral images		Total	
Sample	***n***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
SP_{only}	147	1.34	.99	.89	.89	.22	.35	.82	.66
AD_{only}	47	1.38	1.01	.72	.77	.32	.66	.80	.72
AD+SPD	46	1.79	1.00	.88	.70	.38	.48	1.02	.63
HC	361	1.01	.96	.49	.58	.14	.28	.55	.55
Total	601	1.18	1.00	.63	.72	.19	.36	–	–

Note. SPD_{only} = Skin Picking Disorder; AD_{only} = Atopic Dermatitis; AD+SPD = Atopic Dermatitis and Skin Picking Disorder; HC = Healthy control. Scale ranging from 0 (= not at all) to 4 (= very strong).

Appendix B

B1

The 24 pictures applied as visual stimuli in this investigation were selected from a pretest with 48 pictures on a student sample (n = 17) to control for valence and arousal of the pictures:

In our pretest, we selected 48 pictures, four pictures of each body-part (head/face, torso/décolleté, hands/arms and legs/feet) for each of the three stimulus-types (itch-related, picking-related and neutral skin). In an online study (n = 17) we asked students to rate valence and arousal for each picture using the five-scale self-assessment manikin (SAM, Bradley & Lang, 1994). Out of the four pictures for each body-part category, we choose the two pictures, which had the lowest valence and arousal ratings.

The pictures will be provided by the first author upon request.

B2

An analysis with age as covariate showed a significant main effect for age with Wilk's $\Lambda = .981$, $F(2, 595) = 5.86$, $p = .003$, $\eta_p^2 = .019$. Including age as covariate did not relevantly change the results of the main tests as well as the post hoc tests (i.e., all previously significant results remained significant). Consequently, we decided not to include age as a covariate in the results presented.

B3

Initial exploratory analyses revealed a few outliers. However, there was no relevant change in the pattern of results when including vs. excluding outliers. Thus, results from the complete data set are reported. The assumption of normality was not met. Since the *F*-Test is relatively robust for violation of assumption, especially in samples with more than 40 subjects, the results of the MANOVA were reported (Lindman, 1974; Tabachnick & Fidell, 2013).

B4

Short explanation to German synonyms and difference between picking and scratching (German version):

Wichtige Vorabinformation

Skin Picking bzw. Dermatillomanie = Erkrankung, bei der Betroffene einen starken Drang verspüren ihre Haut zu bearbeiten.
Wird dem Drang nachgegangen, wird die Haut gezupft, gequetscht, an der Haut gepult und geknibbelt, was zu Hautschädigungen führen kann.

Kratzen, welches als Reaktion auf einen Neurodermitisschub erfolgt, fällt nicht unter Skin Picking.

Verwendete Synonyme im weiteren Verlauf:
Skin Picking, **Hautzupfen/-quetschen**, **Haut bearbeiten** und **knibbeln**.

Short explanation to German synonyms and difference between picking and scratching (translated version):

Important preliminary information

Skin Picking or Dermatillomania = Disorder, in which affected persons feel a strong urge to manipulate their skin.
If a person succumbs to that urge, the skin is plucked, squeezed, nibbled at and skin parts are removed, which can lead to skin damage.

Scratching, which occurs as a reaction to an episode of neurodermatitis, does not fall under skin picking.

Used synonyms in the further course:
***Skin picking,* skin plucking/squeezing, skin manipulation and nibbling.**

B5

Data collection for the research reported in this study started in December 2016. Unfortunately, the local ethics committee responsible for our faculty, at that time, had not yet started to accept research proposals. The first opportunity to apply for ethical review was not possible until May 2018. Given that the study was self-funded and no funds were available for outside ethical review, it was decided to follow the procedure commonly used at that time according to the ethical guidelines of the German Psychological Society. The following procedures were included in the implementation of the study: Research participants were provided with adequate and complete information regarding participation, followed by informed consent. Specifically, all participants were informed in advance of the type of pictures they were about to see and advised on possible reactions these pictures may elicit (itch, urge to pick, some disgust). Furthermore, all participants were advised that participation was voluntary and that participants were free to end participation at any time without having to give any reasons and without having to worry about any negative consequences. Furthermore, data was assessed anonymously and participants were advised in this regard. After having received this information, all participants provided informed consent prior to participation in the study.

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Politics and Education

Reflecting on Psychotherapy Practice for Psychologists: Towards Guidelines for Competencies and Practices

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Abstract

In 2017, the European Federation of Psychologists Associations made a statement on psychotherapy. It recognizes that psychotherapy is a "special competence" practiced by psychologists, and that psychologists practicing psychotherapy receive specific education, including supervision. The statement also stresses that they have demonstrated competencies in scientifically validated or established theories on human emotions, cognitions, and behavior, and on processes of development, as well as the application of these methods to achieve change. Moreover, the declaration recognizes that they are trained in the scientific application of the methods of change based upon these theories. Within the Standing Committee of Psychology and Health in collaboration with the S-EAC, the group on Psychotherapy is presently working on a conceptual framework and on guidelines for psychotherapy practiced by psychologists. This document is starting to define the necessary skills and competencies for European psychologists practicing psychotherapy. It also makes recommendations for basic training, for the development of practical skills and competencies, for continuing professional development, and for ethical decision making. It especially puts forward psychologists' scientific approach to psychotherapy.

Keywords

psychotherapy, competencies, specificities of psychotherapy practiced by psychologists, psychologists' scientific approach to psychotherapy

In Europe, the practice of psychotherapy among psychologists is diverse. As such, it is important to identify the common ground for the work of European psychologists practicing psychotherapy. The European Federation of Psychologists Associations (EFPA)

offers the possibility of obtaining a EuroPsy Specialist Certificate in Psychotherapy[1] for psychologists who meet specified requirements. This certificate can be awarded to psychologists - individuals who already possess a basic EuroPsy certificate and who meet the specified training and supervised practice criteria laid out by the specialist certificate. Also, in 2016, a reflection on the skills and competencies of psychologists practicing psychotherapy was launched in France, under the auspices of the French Federation of Psychologists and Psychology. A first working document was developed, which served as a basis to build upon the proposed guidelines. In 2017, during its general assembly, the European Federation of Psychologists Associations (EFPA) created the Psychotherapy group within the Standing Committee of Psychology and Health, which started an exploration around the practices of European psychologists practicing psychotherapy. At the time, the group included representatives from Portugal, Belgium, Cyprus, and France. One of the core principles specified is that the practice of psychotherapy by psychologists is based on scientific evidence. In its two year's work plan, the group focused on several topics relating to practice, such as skills and competencies, basic training, continuing professional development, and ethical decision making. The current paper presents the work on skills and competencies of this group so far. It is formulated in terms of expectations concerning European psychologists' practice of psychotherapy. This work will continue to be developed in the years to come.

Psychotherapy Definition: A Difficult Consensus to Reach

Working on guidelines for psychologists practicing psychotherapy is not simple. Indeed, such a reflection requires a clear definition of psychotherapy. Despite various descriptions of what constitutes psychotherapy provided by both researchers and professional psychologist associations, there is no consensus regarding its definition, especially as uniquely practiced by psychologists. Existing descriptions present a tendency to polarize psychotherapy, either highlighting the active psychological treatment components or emphasizing the therapeutic relationship and encounter. This split is often related to schools of thoughts, whose epistemological foundations diverge, especially from the point of view of human nature and development, which results in different underlying intervention objectives. Also, a chasm often seems to separate research and practice, which is problematic as it hinders achieving one complete and comprehensive definition of psychotherapy (Goldfried et al., 2014). Traditionally, the practice of psychotherapy by psychologists was part of a continuum of care, with, on the one hand, interventions promoting self-exploration, and on the other, therapeutic actions based on counseling

1) The S-EAC-PsyPT is an EFPA body functioning under the EAC (Europsy Awarding Committtee) who is responsible for the granting of the EuroPsy Specialist certificate for Psychologists specialized in Psychotherapy.

principles. For EFPA, the following definition of psychotherapy suggested by Norcross (1990) attained consensus in 2017 between Member Associations: "Psychotherapy is the informed and intentional application of clinical methods and interpersonal stances derived from established psychological principles for the purpose of assisting people to modify their behaviors, cognitions, emotions, and/or other personal characteristics in directions that the participants deem desirable" (EFPA, 2017; Norcross, 1990).

This definition served as a basis for drawing up the initial recommendations made in this paper, concerning the skills expected of psychologists practicing psychotherapy. The practice of psychotherapy in our profession is based on the acquisition and use of established evidence-based psychotherapeutic methods and techniques and scientific knowledge. Psychologists practicing psychotherapy stay informed about the most recent scientific developments concerning methods and techniques, as well as the effectiveness of the therapeutic approaches. The scientific approach to psychotherapy, as practiced by psychologists, is grounded in sound explanatory models of human behavior, emotion, personality, and development. This scientific approach includes the importance of deriving interventions on evidence-based data, as well as adjusting the intervention to the particular situation of the patient, taking into account life contexts, personal characteristics, culture, preferences and values (American Psychological Association [APA], 2006). In this group we believe that scientific investigation of our therapeutic approaches and techniques should be an aim, to ensure that individuals in need receive the best care possible for their problem and circumstances. The practice of psychotherapy by psychologists is overall characterized by a concern for the mental health and overall functioning of the patient, as well as by the rigor of its methods, resulting from scientific data and practical reasoning, as well as based on sound theoretical grounds (EFPA, 2005). The advanced skills and competencies outlined in this paper for psychologists practicing psychotherapy are at their infancy and the work is yet to be finished. In the coming years, this work will be expanded through a project group especially formed by EFPA, and competencies and skills of psychologists practicing psychotherapy will be further developed.

Psychological Assessment, Diagnosis, and Case Conceptualization Prior to Intervention

Psychologists' basic training places great importance to the thorough assessment of the mental state, psychopathological symptoms and problems, and the life situation of the patient(s). The practice of psychotherapy by psychologists always includes assessment of functioning and of the patient's context, for the case conceptualization and the formulation of hypotheses. Assessment can be carried out throughout the psychotherapy process according to patient's problems and demand (GGZ Standaarden, 2020). Assessment is a specific work methodology of the profession that is supported by the scientific literature

(APA, 2006). More specifically, psychologists practicing psychotherapy have extensive knowledge in the field of psychopathology, diagnosis, and its assessment using a variety of methods and tools. Included in their assessment are means to establish a historical account of difficulties and any previous therapeutic attempts (including medical and pharmacological interventions), contributing and maintaining factors, contextual factors, psychopathological symptoms and variables, and comorbid medical and psychological conditions. For these purposes, it is important that psychologists practicing psychotherapy possess a basic knowledge of psychopharmacology as well as the effects of medical problems and treatment on psychopathology. Based on their assessment, they first establish a case conceptualization where they evaluate the psychological and mental state of the patient, the symptoms and level of functioning within context and in relation to social influences and the person's environment. They establish a diagnosis when relevant (e.g., based on the DSM or ICD). They also assess the patients motives and needs for the therapy, their personal and external resources, as well as the subjective and environmental factors that could hinder the intervention. As a prerequisite to the treatment, psychologists practicing psychotherapy build an intervention plan in collaboration with the patient, which then allows both patient and therapist to be able to appraise the therapeutic progress. The case formulation constitutes a working hypothesis, in that based on new knowledge and a continuous assessment process during therapy, changes may be made to it and treatment goals modified accordingly. Progress is also continuously assessed and utilized to further guide the case conceptualization and therapy (Duncan et al., 2010).

An Expertise in Interviewing and Psychotherapeutic Prevention and Intervention Techniques

Psychologists practicing psychotherapy have an expertise in interviewing techniques, utilizing basic clinical skills, which help to be able to mobilize a patient to talk about their problem. The aim is also to collect valuable information during their assessment. Psychologists practicing psychotherapy consider the patient's right to self-determination, respecting the rules linked to the therapeutic framework, such as, for examples, neutrality and abstinence (EFPA, 2005). Psychologists practicing psychotherapy have a thorough knowledge of intervention techniques belonging to at least one psychological theoretical approach. They utilize a variety of techniques based on the needs of the patient and the context at hand. They work within the limits of a therapeutic framework and a contract, which can be negotiated with the patient.

Based on their theoretical approach, psychologists practicing psychotherapy possess an amalgam of psychotherapeutic prevention and intervention techniques and tools that can be used to achieve the aims and goals for each specific patient. In addition,

they possess skills to evaluate the effectiveness of the therapeutic process in a dynamic manner. They make changes in the direction of the intervention as needed, to be able to result in effective behavior change and alleviation of suffering in the patient(s) they serve.

A Comprehensive Understanding of the Patient's Difficulties

During their basic training, psychologists deepen their knowledge of the major psychological theories of human behavior, development, and psychopathology. Subsequently, they continue to deepen their knowledge in at least one psychotherapeutic theory, grounded in a substantial body of scientific knowledge, and recognized in its applications by the profession of psychologist. Psychologists practicing psychotherapy can justify and explain the interventions they suggest to the patient, based on their case conceptualization and theoretical grounding models. When the situation of the patient requires it and based on their psychotherapy training and their expertise, they may utilize psychological intervention techniques arising from other models than their preferred one, in accordance with the patient's needs and the empirical literature. They consider the limits of their competence and upon agreement of the patient refer to other professionals or theoretical models when needed (EFPA, 2005). They perceive the difference between the objectives of their own approach, knowledge and expertise, and the needs and demands of the patient. They are aware of the competences of other health care professionals and are trained to collaborate with other health care disciplines when indicated and agreed upon by the client.

Maintaining a Therapeutic Relationship and an Alliance

Scientific research on evidence-based therapeutic relationships has significantly developed over the last 30 years. Emphasis on the therapeutic relationship heavily influenced the training of practicing psychologists. Psychologists practicing psychotherapy are aware of the factors affecting the therapeutic relationship and their effectiveness as therapists, that allow the patients to reach their therapeutic goals (Barkham et al., 2017). Research demonstrates that certain intrapersonal therapist characteristics (e.g., self-relatedness) may interact with patient characteristics and pathology (Baldwin & Imel, 2013; Heinonen & Nissen-Lie, 2020). These can aid or alternatively hinder the therapeutic process. Psychologists practicing psychotherapy acknowledge these factors and attempt to capitalize on their strengths while aiming to improve on any of their identified weaknesses. They work on taking a step back from the interpersonal difficulties arising

in psychotherapy. They give themselves means to analyze these, such as being involved in supervision or peer consultations, or conduct research relating to factors affecting effectiveness (Milne, 2009; Wampold, 2017). They recognize their own contribution to the therapeutic relationship and consider variations in the alliance (Ackerman et al., 2001; Castonguay et al., 2006; Muran & Barber, 2010). Specific assessment techniques can be recommended to assess parameters of the therapeutic relationship and to monitor the patients experience of the therapeutic sessions and process (Gondek et al., 2016).

Self-Assessment and Professional Help in Difficult Situations

Psychologists practicing psychotherapy evaluate the effects of their interventions as well as the satisfaction of the patient. They recognize their own limits and engage in psychotherapeutic work for which they have demonstrated in depth knowledge and competency. When necessary, they refer to other professionals or approaches having the patients' needs and well-being as guides. In case of referring out a patient, they ensure a favorable transition to the continuation of treatment (EFPA, 2005).

Continuously learning and updating skills, knowledge, and tools, is an integral part of being a professional. Psychologists practicing psychotherapy are required to demonstrate this with continuing education practices. One area that has entered into the practice of assessment and therapy for which previous generations of therapists had not received training is the digitalization of health and mental health and the availability of new opportunities to utilize technology in therapists' repertoire of practices (Van Daele et al., 2020). Psychologists practicing psychotherapy should demonstrate flexibility and a drive for new learning and updating.

Maintaining Patients' Mental Health and Well-Being at the Center of the Psychotherapy

Psychologists practicing psychotherapy remain aware of the evolving needs of the patient. Their intervention is always carried by their professional ethics. They know their Code of Ethics and how to apply it. They constantly give themselves the means of improving and analyzing situations. The therapeutic process concludes for the benefit of the patients and the consolidation of their therapeutic achievements whilst ensuring that plans are made and resources are known for dealing with difficulties in the future (EFPA, 2005).

Conclusion

This paper presented an overview of skills and competencies drafted by the EFPA group on Psychotherapy. There seems to be a relative consensus between Member Associations of EFPA that the practice of psychotherapy by psychologists is based on scientific evidence and on practitioners' expertise. Psychotherapy, its scientific approach, and practice are at the heart of the identity of the profession of psychologists. In the next few years, the Psychotherapy project group of the EFPA Standing Committee on Psychology and Health will enlist experts from all around Europe to tackle issues related to psychotherapy as practiced by psychologists. In collaboration with the EuroPsy Specialist Certificate Awarding Committee, the work of the group will expand particularly from the point of development of competencies, training new professionals, professional parameters, and ethics.

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