The Influence of Feedback on Self-Perceived and Physiological Stress in Public Speaking

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Abstract

There is not much known yet about different feedback forms in public speaking with regard to both physiological and self-perceived stress. The current study investigated this matter via a convenience sample of psychology students and acquaintances (N= 27, M age= 19.50 years, 74% female). Participants prepared and presented a presentation to either a supportive or unsupportive audience. During the whole experiment heart rate was being recorded to measure physiological stress and the Self-Assessment Manikin was filled in four times to measure self-perceived stress. According to the results, self-perceived stress measurements were not correlating with heart rate measurements. Furthermore, there was no effect found for the influence of feedback on self-perceived stress while presenting. The results suggest that different feedback forms did significantly influence physiological stress in public speaking, even though the study had a small power. However, future research has to look into psychological measurements of stress regarding feedback in public speaking.

Keywords: Feedback, Public Speaking, Heart Rate, Self-Perceived Stress

The Influence of Feedback on Self-Perceived and Physiological Stress in Public Speaking

In western societies, elementary school children are already taught to speak in public, by letting them present for their classmates. Public speaking is a skill that continues to be important throughout and even after their educational career. Through public speaking you can share your knowledge and ideas with e.g. peers, colleagues or business partners. Despite public speaking being a widely used skill, it can still create a lot of stress in the general population (Dwyer & Davidson, 2012). Stress can manifest itself in several physiological and psychological ways such as increased heart rate, dizziness, pain, nervousness, agitation, irritability, worrying, concentration problems and moodiness (Oldehinkel et al., 2011). Almost the same symptoms can be experienced when a person is feeling anxious; insomnia, concentration problems, fatigue, muscle tension and irritability (American Psychological Association, 2019). Despite the symptoms of stress and anxiety being similar, there is a difference between the two terms. Stress usually occurs due to the involvement of an external trigger, as opposed to anxiety, where a person can feel anxious in the absence of a trigger (Vera et al., 2020). In the current study we will focus on some of the acute symptoms that occur in response to an external trigger, and therefore we will focus on the term stress.

The construct of stress can be measured in multiple ways. Psychological stress responses can be measured by e.g. self-perceived stress questionnaires, behavioural coding or with structured interviews that assess a particular stressor (Crosswell & Lockwood, 2020). Stress can also be measured on a physiological level by measuring, e.g., heart rate or cortisol levels (Willhaus & Edgren, 2013). Past research has already examined the influence of different forms of feedback on cardiovascular reactivity in public speaking (Hilmert, Christenveld, & Kulic, 2002). In the current research we will focus on the influence of different feedback forms on both the physiological and psychological part of stress in public speaking, by measuring heart rate and self-perceived stress.

The multiple physiological and psychological symptoms that can be experienced when a person is feeling stressed were found to have an evolutionary purpose; to prepare man or animal to defend or escape, as a mean of survival in the struggle for existence (Cannon, 1915). This principle was first described as the 'fight or flight response'. Thus, acute stress is important for responding to threats (Allen et al., 2017). The feeling of threat is very common in public speaking. A situational factor that has significant influence on stress is the presence of other people (Hilmert et al., 2002). Two variables that are important concerning this situational factor are social-evaluation and uncontrollability. These variables are known to increase stress when performing a task in the presence of other people (Allen et al., 2016). The presence of people can not only increase stress, but can also decrease it. Performing a stressful task in the presence of, e.g., a friend, was shown to reduce cardiovascular response compared to the presence of unfamiliar people (Hilmert et al., 2002). In this case, the presence of the person showed a social support effect. The social support effect can be moderated by the behaviour of the audience. This is illustrated by several studies, where participants showed lower cardiovascular activity when they had to present in front of a positive audience compared to a negative audience (Lepore, Allen, & Evans, 1993; Hilmert et al., 2002).

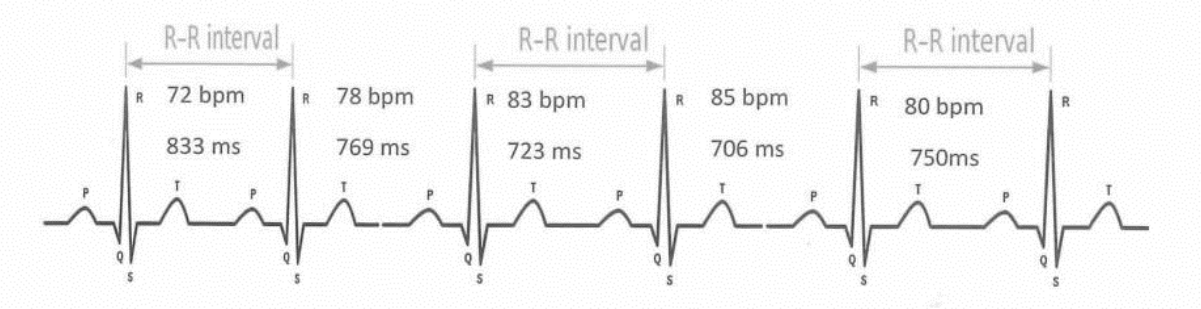
Lepore et al. (1993) and Hilmert et al. (2002) measured cardiovascular reactivity in response to an acute stressor in public speaking. Such cardiovascular reactivity is believed to be elicited by psychological processes (Van Praag, De Kloet & Van Os, 2004). The two major systems in our body that regulate stress are the hypothalamus-pituitary-adrenal axis (HPA-axis) and the autonomic nervous system (ANS). The HPA-axis slowly regulates a stress response, whereas the ANS quickly prepares a person to either fight or flight in a threatening situation. Heart rate is thus assessed via the ANS. Psychological processes have to be assessed by self-report methods. Increases in heart rate and self-perceived stress in

response to acute stress both represent the construct of stress. Therefore it is generally expected that these measurements correspond (Schlotz et al., 2008). The finding of a link between the major stress systems of our body and cortical and limbic structures supports the notion that heart rate and self-perceived stress would correspond in a stressful situation. Past research has nonetheless shown contradictory results regarding this matter. Many times associations between physiological and psychological stress were reported to be weak (Cohen et al., 2000; Hjortskov, Garde, Ørbæk, & Hansen, 2004; Lackschewitz, Hüther, & Kröner-Herwig, 2008; Schlotz et al., 2008). However, Oldehinkel et al. (2010) assessed the link between the ANS, HPA-axis and self-perceived stress through a social stress test and did find an effect. The results showed that self-perceived stress reflected ANS and HPA-axis activity, but only to a limited extent.

When focussing on the influence of the ANS on heart rate, heart rate variability (HRV) is often used as a measurement (Bertsch et al., 2012). HRV reflects the spontaneous changes in heart rate. In figure 1 there is a variability shown in the InterBeat Interval (IBI) of a heart rate measurement. Each IBI is slightly different as can been seen in figure 1. These changes in IBI are mainly caused by activity of the sympathetic and parasympathetic systems of the ANS (Kristal-Boneh et al., 1995). Previous experiments have shown a correlation between ANS activity and immediate changes in the IBI. The variability in heart rate will be lower under acute stress. Since the ANS quickly responds to stressful situations and the heart rate will show changes in IBI because of this, the focus in this experiment will be on HRV.

Figure 1

Example of an IBI that shows variability in heart rate



Note. Retrieved from "Genetic and Environmental Determinants of Blood Pressure: the role of Obesity and the Autonomic Nervous System," by T. Man, (2022), p. 61 (https://doi.org/10.33612/diss.255261014)

Several studies have investigated the influence of different feedback forms on heart rate in public speaking (Hilmert et al., 2002; Lepore et al., 1993). Besides, there is a broad theoretical framework on stress in public speaking (Allen et al., 2016; Kirschbaum et al., 1993; Oldehinkel et al., 2010; Vera et al., 2020). However, there is not much known about different feedback forms in public speaking with regard to both heart rate and self-perceived stress. In the current study we attempt to incorporate these two aspects and aim to build on past research by investigating whether there is a link between stress and different forms of feedback in public speaking. Regarding the research question three hypotheses were tested:

1. Low heart rate variability correlates with high self-perceived stress levels;
2. Unsupportive non-verbal feedback causes lower heart rate variability during public speaking than supportive non-verbal feedback;
3. Unsupportive non-verbal feedback causes higher perceived stress levels during public speaking than supportive non-verbal feedback.

For the first hypothesis it is expected that the self-perceived stress measurement via the SAM and the physiological measurement of stress via heart rate will correlate. These two measurements should represent the same construct and therefore a correlation is assumed, despite contradictory results of past research (Cohen et al., 2000; Hjortskov, Garde, Ørbæk, &

Hansen, 2004; Lackschewitz, Hüther, & Kröner-Herwig, 2008; Schlotz et al., 2008; Oldehinkel et al., 2010). The second hypothesis is focusses on a physiological symptom of stress, namely increased heart rate, that works via the ANS. It is assumed that heart rate will increase during the social stress test compared to the baseline measurement. Previous findings support this hypothesis (Oldehinkel et al., 2010). We expect heart rate to increase in general in comparison to the baseline measurement, since a social stress test is performed, but expect heart rate to increase the most for the participants in the unsupportive condition. The third hypothesis makes an assumption about the psychological processes in relation to stress. It is assumed that higher perceived stress levels will be reported by the participants in the unsupportive condition for the time during the social stress test, compared to the participants in the supportive condition.

The results of the study can extend results from past research about stress and feedback in public speaking. There are various practical implications. Investigating different forms of feedback and stress in public speaking can help us learn more about the factors that increase stress during public speaking and whether feedback would be a potential factor, so this can be taken into account when designing interventions to reduce stress in public speaking. Additionally, we can learn more about the part that an audience plays in stressful situations. This is not only important in public speaking, but in a wide variety of stressful situations. Stressful situations can lead to acute stress symptoms, but besides the acute symptoms there can also be long-term consequences of stress. Behavioural patterns and biological processes can be altered and there is an increased chance of cardiovascular diseases and mental illnesses (Vera et al., 2020). A social support system could possibly prevent such outcomes by decreasing heart rate and self-perceived stress, compared to no social support in stressful situations.

Methods

Participants

The sample in this study consisted of 32 adults. The participants were selected via a convenience sample. The largest proportion of participants was acquired via the SONA research pool of the University of Groningen, which is a pool of first year psychology students (N=30). The students could decide between several studies whether they wanted to participate and could earn credits by doing so for the course 'Praktische introductie in onderzoeksmethoden/ A practical introduction to research methods'. Besides the participants that were selected from the pool, the sample also included acquaintances of the researchers (N=2). Before the start of the experiment participants stated that they would voluntarily participate through an informed consent.

Procedure

Experimental Session

The experiment took place in a research room at the Faculty of Behavioural and Social Sciences of the University of Groningen. The duration of the experimental session was 1 hour in total. A timetable of the experiment is shown in table 1. Upon arrival the participants were welcomed by one researcher and filled in an informed consent form. Meanwhile, another researcher was sitting in the room to connect the heart rate band later on in the experiment and track the different phases while heart rate was being measured. Right after giving consent the participants filled in two questionnaires, a questionnaire about their self-perceived stress at that moment (the Self-Assessment Manikin) and a questionnaire containing bio-information. When these questionnaires were filled in we explained to the participants that we were going to measure their heart rate. We told the participants how the heart rate band needed to be put on and the participants then attached the heart rate band themselves in privacy. After putting on the heart rate band the baseline heart rate measurement was started, during which the participants had to relax while standing up for 2 minutes and consecutively,

sitting down for 2 minutes. Next, the participants were given instructions about the presentation via a standardised script (see appendix A for the full presentation script). The two researchers left the room and the participant had 15 minutes time to prepare for the presentation. After 15 minutes the two researchers re-entered and handed the participant the SAM to fill in for the second time. Shortly after, the research group entered the room as the audience and the participant was asked to wait in the hallway for one minute. When the minute was over the participant was brought back into the room and gave a 5 minute presentation. At the end of the presentation the participant filled in the SAM for the third time. After the presentation and questionnaire there was a rest period of 5 minutes. When the rest period was over the participant filled in the SAM for the fourth and last time. As the last step in the experiment we measured heart rate again, as the participant relaxed while standing up for 2 minutes and sitting down for 2 minutes. When the last step was completed the participants were debriefed, again this was done via a standardised script (see appendix B for the full debrief script). The experiment was approved by the Ethical Committee Psychology (ECP).

Table 1

Timetable of the different Phases of the Experiment

Phase	Duration
Welcoming	2 min.
Informed consent	2 min.
Putting on heart rate band	4 min.
SAM 1 and bio-information	1 min.
General experiment instructions	2 min.

Baseline measurement standing	2 min.
Baseline measurement sitting	2 min.
Presentation instructions	5 min.
Preparation time presentation	15 min.
SAM 2	1 min.
Audience enters	2 min.
Presentation	5 min.
SAM 3	1 min.
Rest period	5 min.
SAM 4	1 min.
Heart rate measurement standing	2 min.
Heart rate measurement sitting	2 min.
Debrief	4 min.
Remove heart rate band	2 min

Experimental Manipulations

Presentation Recording

While being instructed on the presentation, the participants were told that they would be recorded by a camera that was standing in the room. On the wall was a big screen which the camera image was projected on, so the participants would see themselves on the screen.

The camera was not actually recording, but it was switched on and pointed at the participants. The participants were told that the researchers would look at their recording later on to evaluate it. We told the participants that they would be judged on the overall performance of their speech as well as the content of their speech.

Feedback

There were two feedback conditions in the experiment, a supportive non-verbal feedback condition and an unsupportive non-verbal feedback condition. Participants were alternated between either the supportive- or unsupportive non-verbal feedback condition. In the supportive non-verbal feedback condition the audience acts supportive by looking interested, smiling friendly at the participant and clapping at the end of the presentation. In the unsupportive non-verbal feedback condition the audience does not act supportive by looking bored, yawning, looking around the room or at their phone and no clapping at the end of the presentation. When a participant would say that they were done before the end of the 5 minutes, the audience would respond in two different ways, depending on the condition. In the supportive non-verbal feedback condition the audience would act interested and ask whether a participant can elaborate on a certain topic or ask questions about the presentation to fill the 5 minutes. In the unsupportive non-verbal feedback condition the audience would simply say to the participant that they have to keep talking until they reach 5 minutes.

Social Stress Test

To conduct an experiment of use in our study, it was of critical importance that acute stress would be induced. The Trier Social Stress Test (TSST) is a valid and reliable test that can induce acute stress under controlled conditions (Kirschbaum et al., 1993). Past research has shown that social-evaluative threat and uncontrollability are the two psychological elements that induce the most stress in performance tasks (Allen et al., 2017), elements that are both incorporated into the TSST. The TSST consists of a speech task and a surprise

mental arithmetic task. The social stress test in our study is inspired by the TSST, but we solely incorporated the speech component of the TSST into our experiment and added two feedback conditions, because the current study focuses on public speaking only. We chose to inspire our experiment on the TSST, since the TSST is considered the golden standard in human experimental stress research (Allen et al., 2017)

Measures

Heart Rate (HR)

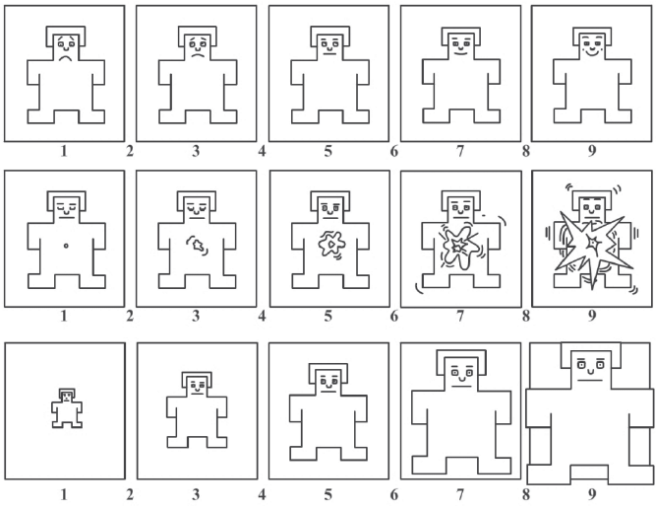
Heart rate was assessed by means of the H10 Polarband and measured with an InterBeat Interval (IBI). The Polarband works via a Bluetooth connection . The data were recorded using the Labstreaminglayer (LSL) protocol (https://labstreaminglayer.readthedocs.io/info/intro.html#) and saved in the open XDF format. While heart rate was being measured and stored via the LSL Labrecorder, we kept track of the different phases of the experiment by coding them with the keyboard of the computer. In past research the Polarband has scored near the golden standard as a reliable device for measuring heart rate (e.g., Buist, 2022).

Self-Perceived Stress

The participants rated their self-perceived stress on three items via a non-verbal pictorial assessment technique called the Self-Assessment Manikin (SAM) (Bradley & Lang, 1994). The three items, consisting of arousal, valence, and dominance, could be rated on a nine-point scale that represents five pictures (Figure 2). The lowest score for the three items represents the first number on the first picture, and the highest score of the three items represents the last number of the ninth picture. Self-perceived stress was measured four times: at the start of the experiment, before the presentation, after the presentation, and after the rest period.

Figure 2

Self-Assessment Manikin



Note. Pictorial self-assessment questionnaire used to measure Self-Perceived Stress on three different levels (from the top down); Valence, Arousal and Dominance, by illustrating five pictures on a nine point-scale. Retrieved from "Affective auditory stimuli: Adaptation of the International Affective Digitized Sounds (IADS-2) for European Portuguese," by A.P. Soares, A. P. Pinheiro, A. Costa, C. S. Frade, M. Comesaña, & R. Pureza, 2013, Behavior Research Methods, 45(4), p. 1170 (https://doi.org/10.3758/s13428-012-0310-1)

Analysis

An independent measures design was used for the experiment. A p-value smaller than .05 was considered statistically significant. The program R was used to calculate statistics (R core Team, 2013). First, the descriptive statistics on the bio-information and feedback conditions were calculated. Regarding heart rate, HRV was calculated by taking the root mean square successive differences (RMSSD) of the IBI. In the statistical analysis the RMSSD was used, that was corrected for the IBI; the corrected root mean square successive differences (cRMSSD). To test the first hypothesis we calculated the correlations between the different levels of the SAM and the cRMSSD. For the second and third hypotheses a linear

mixed effects model was used to calculate perceived and physiological stress for both of the conditions.

Results

Descriptive statistics

Of the 32 participants that participated in the experiment, 27 participants were included in the dataset for the statistical analyses. There were 5 participants excluded from the dataset because of technical problems that occurred while measuring the heart rate. Table 2 shows the descriptive statistics of the 27 participants that were included in the dataset for the statistical analyses. The distribution of sex was unequal with a total of 7 males versus 20 females. There were more participants in the unsupportive condition than in the supportive condition, because of the technical problems that excluded participants from the statistical analysis. None of the participants had a cardiac- or neurological condition that they knew of by which the heart rate data could be influenced.

Table 2

Descriptive Statistics Research Sample

Characteristic	N= 27[1]
Age	19.50 (19.00, 20.38)
Sex	
Male	7 (26%)
Female	20 (74%)
Condition	
Positive	15 (56%)
Negative	12 (44%)
Condition awareness	

Unaware	3 (12%)
Aware	22 (88%)
Unknown	2
Cardiac/ neurological condition	
None	27 (100%)
Other	0 (0%)

[1]Median (IQR); n (%)

Manipulation checks

Feedback conditions

Most participants (88%) experienced the condition that they were in while presenting, as they told us in the debrief.

Trier social stress test

Presenting caused significantly more physiological stress in comparison to the baseline measurement for both conditions (Mean = -1.87, p = 0.033), table 3. HRV during the presentation (Median = 3.17) was lower than in any other period of the experiment, except for the period where the audience entered the room.

Table 3

Linear mixed effects model of the HRV with a period x condition interaction, controlling for age and gender

		cRMSSD	
Predictors	Estimates	p	df
(Intercept)	7.40 (2.92 – 11.88)	0.002**	24.30
Period [Baseline Sitting]	-0.29 (-2.02 – 1.43)	0.738	161.00

Period [Preparation]	-0.43 (-2.16 – 1.29)	0.622	161.00
Period [Wait for audience]	-1.10 (-2.82 – 0.63)	0.211	161.00
Period [Presentation]	-1.87 (-3.60 - -0.15)	0.033*	161.00
Period [Rest]	0.18 (-1.54 – 1.91)	0.834	161.00
Period [Post Standing]	-1.76 (-3.48 - -0.03)	0.046*	161.00
Period [Post sitting]	-0.00 (-1.73 – 1.72)	0.996	161.00
Condition [Supportive]	-2.89 (-5.83 – 0.06)	0.054	48.34
Period [Baseline Sitting] x Condition [Supportive]	2.08 (-0.52 – 4.68)	0.116	161.00
Period [Preparation] x Condition [Supportive]	1.63 (-0.97 – 4.23)	0.217	161.00
Period [Wait for audience] x Condition [Supportive]	1.87 (-0.73 – 4.47)	0.157	161.00
Period [Presentation] x Condition [Supportive]	2.72 (0.12 – 5.32)	0.040*	161.00
Period [Rest] x Condition [Supportive]	1.72 (-0.88 – 4.32)	0.192	161.00
Period [Post Standing] x Condition [Supportive]	2.32 (-0.28 – 4.92)	0.079	161.00
Period [Post Sitting] x Condition [Supportive]	2.14 (-0.46 – 4.74)	0.106	161.00

Note. *p < .05. **p < .01.

Heart rate and self-perceived stress correspondence

The correlations between the cRMSSD and the different levels of the SAM were calculated, to test whether HRV and self-perceived stress measurements would correspond. No significant correlations were found between the cRMSSD and any of the three levels of the SAM, for the supportive and the non-supportive condition. In the supportive condition the correlation between the cRMSSD and valence was -.15. The correlation between the cRMSSD and arousal was .09 and the correlation between the cRMSSD and dominance was -

.015. In the non-supportive condition there was a correlation of .11 between cRMSSD and valence. For the correlation between the cRMSSD and arousal we found .03 and for the correlation between the cRMSSD and dominance we found -.04.

Table 4

Correlation table cRMSSD and the different SAM levels for the supportive condition

	cRMSSD	**Valence**	**Arousal**
cRMSSD			
Valence	-.15		
Arousal	.09	-.38**	
Dominance	-.15	.29*	-.54***

Note. *p < .05. **p < .01. ***p < .001.

Table 5

Correlation table cRMSSD and the different SAM levels for the unsupportive condition

	cRMSSD	**Valence**	**Arousal**
cRMSSD			
Valence	.11		
Arousal	-.03	-.39*	
Dominance	-.04	.28*	-.45**

Note. *p < .05. **p < .01.

Feedback and HRV

The non-supportive condition did not cause significantly more stress than the supportive condition over all the periods of the experiment. However, there is a trend visible

regarding the conditions (p=0.054) (Table 3). Considering the period of the presentation, an effect was found for interaction between condition and presentation. Participants showed significantly higher HRV in the supportive condition than in the non-supportive condition while presenting (p=0.040).

Feedback and self-perceived stress

A linear mixed effects model and a Wilcoxon rank sum exact test were used to see if there were differences between the means of the supportive and unsupportive condition for all three of the levels. We found a significant difference (P = 0.012) in mean between the two conditions for Dominance in the heart rate measurement standing phase. In the supportive condition (Mean = 6.42, SD = 1.16) participants felt more dominant than in the unsupportive condition (M = 5.07, SD = 1.49). However, there were no significant effects found for any of the other phases of the experiment and levels of the SAM.

Discussion

The results of the present study show that feedback forms can influence physiological stress in public speaking. There was no effect found for the influence of feedback forms on self-perceived stress. The measurements from the H10 Polarband and the SAM did not correspond.

The H10 Polarband had a high content validity. As was shown in past research, the H10 Polarband is an excellent instrument to measure heart rate (Buist, 2022). The data from the H10 Polarband showed a clear, normal heart rate for most of the participants and variation in heart rate during the different phases of the experiment. Heart rate would be higher during more stressful phases of the experiment, which is expected. Self-perceived stress was measured with the SAM. The SAM measures valence, arousal and dominance. However, valence, arousal and dominance are not necessarily the only terms that can represent the construct of self-perceived stress. Possibly other terms would be a better fit for measuring

self-perceived stress. The SAM therefore has low content validity. The generalizability and statistical power of the experiment are low, since the experiment consisted of a small sample size containing mainly female first-year psychology students. For this reason we don't know whether the results of the study would apply to other groups in the population.

SAM and Polarband correspondence

The results do not support the first hypothesis concerning the correlation between the self-perceived stress measurement via the SAM and the physiological measurement of stress via the H10 Polarband. A possible explanation can be that the SAM was an invalid instrument to measure self-perceived stress in the current study or that the SAM measures a different underlying construct. The SAM showed odd results, e.g., a difference in self-perceived stress between the two conditions in phases of the experiment where the conditions did not yet apply. Furthermore, the study had a low statistical power, which decreased the chance of finding an effect. Oldehinkel et al. (2010) did find a covariation between perceived stress and physiological stress, but had a much bigger sample size than in the current study. Another possible explanation for the lack of a correlation can be that the third SAM was given right after the presentation, whereas heart rate was also measured during the presentation. A correlation was calculated between the third SAM that was given after the presentation and the heart rate during the presentation. How the participant felt right after the presentation can differ from how the participant felt during the presentation, which could have decreased the chance of finding a correlation.

Feedback and HRV

For the second hypothesis concerning the influence of feedback on HRV during public speaking we do seem to have found support. The results suggest that an unsupportive audience will cause lower HRV than a supportive audience while presenting. This result is

supported by past research regarding feedback and cardiovascular responses (Lepore et al., 1993; Hilmert et al., 2002).

Feedback and self-perceived stress

The results of the study did not support the third hypothesis concerning the influence of feedback on self-perceived stress in public speaking. Except for dominance in the standing heart rate measurement phase, there were no significant effects for the influence of the conditions on self-perceived stress. It could be that a difference in mean was found between the two conditions for dominance because participants felt more confident about their performance afterwards when they were in the supportive condition. From the results it appears that the SAM was insensitive to differences in stress levels. Which could explain the lack of an effect for the other levels of the SAM and other phases of the experiment. Another possible reason for the lack of an effect can be the low statistical power of the study.

Strengths and limitations

It should be taken into account that there are various important strengths and limitations of the study. A strength of the study was that the feedback conditions were carried out well. Majority of the participants answered ‘yes’ to the question ‘did you experience the condition as supportive/unsupportive while presenting?’ that was asked in the debrief. Furthermore, we used standardised scripts for the presentation instructions and the debrief, which decreases the chance that differences in explanation could have influenced the results.

A limitation of the study was that participants knew that they were participating in an experiment. Some participants in the unsupportive condition would already think that the audience was unsupportive on purpose for the experiment while presenting, which could have decreased their stress. Furthermore, the results can be influenced because there was a different host and heart rate expert each session. Another limitation is that the participants could choose to speak either in Dutch or in English. When the choice would be to speak in

Dutch, this was the participants native language. When the choice would be to speak in English, this was not necessarily the native language of the participant. Speaking in another language then the native language could have increased stress.

Implications and directions for future research

Based on the results it seems likely that feedback is a factor that can influence physiological stress while giving a presentation. This result can be taken into account when designing interventions to practice with presentations, e.g. for people that deal with fear of failure/ performance anxiety. Since participants showed higher HRV in the supportive condition than in the non-supportive condition, it appears that the participants in the supportive condition did feel supported and felt less stressed because of the support. When looking into this feeling of being supported in a stressful situation from a broader perspective, it possibly could have great practical implications for a wide variety of stressful situations. Stress can make people vulnerable to mental illnesses. Not only psychologically, but also physically stress can have terrible consequences like e.g. cardiovascular problems. This study has made the influence of a support system under acute stress a bit more clear. Future research could expand these results to a broader perspective and look into the influence of a social support system in a wide variety of stressful situations in daily life, and how this social support system could prevent people from letting stressful situations cause mental- and physical illnesses. Another suggestion for future research based on the results of this study would be to investigate different instruments for self-perceived stress in the context of public speaking. Several studies have reported contradictory results regarding the use of the SAM in public speaking, so it may be possible that another instrument would be a better fit in a public speaking experiment.

Conclusion

The findings in the current study suggest that different feedback forms can influence heart rate in public speaking. During the presentation the heart rate of participants increased in both conditions, but heart rate increased significantly more in participants that were in the unsupportive condition. The different types of feedback didn't influence self-perceived stress while presenting according to the results. There were no significant differences in mean between the conditions for valence, arousal and dominance during the presentation. Moreover, the H10 Polarband and the SAM did not correlate on either valence, arousal nor dominance. The lack of effects for the hypotheses concerning the SAM could be caused by the low statistical power, low content validity or the lack of a possibility to measure self-perceived stress during the presentation. Future studies should take these limitations into account when designing and conducting their study. The current study expands results from past research and provides an insight in the role of feedback in public speaking.

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Appendix A

Presentation Instructions

We will ask you to prepare a 5 minute speech in the next 15 minutes that you will present to a small group. You will be able to draft your speech on paper that you can bring while presenting. When you are done, we will give you a short questionnaire to fill in. During the presentation a camera will record your presentation and the researchers will evaluate it later. The group will be evaluating your performance and the overall content of your speech, as well as timing it for you. We will tell you when the 5 minutes are complete. You must fill the whole 5 minutes. For the topic, you can talk about a personal topic, such as your experience as a student.

Appendix B

Debrief

What did you think about the experiment? (Small talk). We manipulated different things in this experiment. There were different conditions for the audience. There was a supportive and non-supportive condition. In your experiment the condition was supportive/non-supportive. Did you experience the audience as supportive/non-supportive while presenting? Another manipulation was that you were told that you were recorded, but this was not the case. We only told you this to induce stress. Therefore it is necessary to fill in the informed consent again, with now all the information. Finally we ask you not to communicate anything about the study to your fellow students, as they may participate in the study as well. We would like to thank you very much for participating in the study! If you want to take a look at your own heart rate right now, that is possible.