



Universiteit
Leiden
The Netherlands

The social side of noise annoyance (De sociale kant van geluidhinder)

Maris, E.

Citation

Maris, E. (2008, December 17). *The social side of noise annoyance (De sociale kant van geluidhinder)*. Retrieved from <https://hdl.handle.net/1887/13361>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/13361>

Note: To cite this publication please use the final published version (if applicable).

CHAPTER 5 Combining the Results

(Un)Sound Management, a co-determinant of annoyance²⁰

5.1 INTRODUCTION

5.1.1 The central aim of this thesis

In the introductory chapter of this thesis, I have posed the statement that annoyance with man-made sound is the response to a social experience. The central aim of this thesis is to test this ‘social hypothesis of noise annoyance’ by showing that the social process between the person(s) operating the sound source and the person(s) being exposed to the sound influences the latter’s evaluation of the sound. In social scientific research, the perspective taken on noise annoyance commonly is psychological rather than social. Even though psychological models of annoyance may address attitudes about the social process (e.g., perceived misfeasance), the social process itself is not represented, and can therefore not be subject of study. In this way, possibly relevant information is easily overlooked, both in theory and in practice. The chapters following the introduction have described a series of experiments in which a social psychological model has been applied to study the presumed social side of sound. In this concluding chapter, I will integrate and discuss the experimental results, with regard to the central aim of the study.

5.1.2 What has been done?

Based on the social psychological model of noise annoyance (Stallen, 1999) and social psychological theories of procedural justice (e.g., Lind and Tyler, 1988; Greenberg, 1993; Thibaut and Walker, 1975), I have developed an experimental design to study the presumed causal relationship between the fairness of the sound management procedure and noise annoyance. Chapter 2 describes the pilot carried out to refine the experimental design.

The design is as follows: participants are asked to perform on a linguistic task while they are exposed to disturbing sound (of either 50 or 70 dB A (15 min Leq) sound pressure level). The experimenter manages the sound exposure in a fair, or less fair, manner. For instance: in the fair procedure conditions, participants are asked to ‘voice’ their preference for a certain sound type, while in the neutral procedure conditions they are not. Noise annoyance with this sound is assessed after 15 minutes of sound exposure. (In the pilot study, as an exception, annoyance is assessed after one minute of exposure, too).

Chapter 3 describes the ‘Fair experiment’, a refined replication of the pilot study. In this experiment, the effects of a fair and a neutral procedure on noise annoyance are contrasted. The main result shows that the fair procedure reduces noise annoyance relative to a neutral procedure when the sound pressure level (SPL) is high (70 dB), but not when SPL is low (50 dB).

Chapter 4 describes the ‘Unfair experiment’. It investigates the effect of unfair sound management on noise annoyance, relative to a neutral procedure. The main finding shows that the unfair procedure increases noise annoyance relative to a neutral procedure for both sound pressure levels (70 dB, as well as 50 dB).

In Chapter 5, the current chapter, firstly, I will bring together the findings of both experiments, and to a lesser extent the pilot study, and will integrate and discuss the results. I will draw conclusions with regard to the central hypothesis and aim of the thesis. Where relevant questions remain unanswered by the data, I will make theory-based speculations about potential answers. Next, additional results of the series of studies will be described. The meaning of the results, in the light of both the social psychological model of noise annoyance and the theory field of procedural justice, is subject of discussion. In conclusion, the strengths and limitations of the studies are considered, as well as the extent to which generalizations from the experimental findings to field settings can be made.

²⁰ Earlier versions of this chapter have been published: Maris, E., Stallen, P.J., Steensma, H., & Vermunt, R. (2006) *(Un)Sound management. Three laboratory experiments on the effects of social nonacoustical determinants of noise annoyance*, Paper presented at the 35th. International Congress and Exposition on Noise Control Engineering (Inter-Noise), December 3-6, Honolulu, Hawaii, USA; and Maris, E., Stallen, P.J., Steensma, H. & Vermunt, R. (2007). *Geluidhinder: Decibels of onrechtvaardige procedures? De bijdrage van Social (in)Justice Theory aan de verklaring van geluidhinder, Gedrag & Organisatie*, 20(4), pp. 445 – 460.

Some suggestions for further research on the social side of sound are given, and implications for practice of the current results are indicated.



FIGURE 5.1 The social side of the evaluation of sound.

5.2 THE MAIN RESULT

5.2.1 Exposure to man-made sound a social experience?

In both experiments, the manipulated differences in procedural (un)fairness have induced predictable differences in the level of noise annoyance expressed by the participants (relative to the neutral procedure). This implies that the way the participants thought, felt and behaved in response to the sound has been influenced by the fairness manipulation. This finding is a strong indication that exposure to man-made sound is a social experience, but a few critical questions need answering.

Does a procedure trigger the 'real or imagined presence of another person'? All of the participants had, upon their arrival in the laboratory, been shown to their cubicle by the experimenter. Once the experiment had started, imaginative interaction continued through the computer interface. In the Unfair experiment, the experimenter even entered the cubicle halfway the experiment to select the sound type. Moreover, taking part in an experiment does not make much sense without assuming the existence of a person awaiting the data. It is very unlikely that any of the participants doubted the presence of the experimenter.

Can we be sure that it was the experimenter's *presence*, real or imagined, that influenced the level of noise annoyance of the participants? This almost philosophical question is more difficult to answer. Effects of procedural and distributive fairness are considered social effects in the social psychological justice literature. Many, but not all of the items used to assess fairness judgments include a reference to a second party, or an activity that suggests the presence of a second party (Lind and Tyler, 1988, see Appendix, pp 243-247). In the current experiments, items measuring cognitions concerning the experimenter's efforts not to tax the participant, or their respect towards the participant

strongly correlate with the fairness manipulation and its perceived fairness. Even though exploratory mediation analysis (Unfair experiment) shows but a marginal mediation of the procedure effect by cognitions about the experimenter, the surprisingly constant average annoyance scores in the neutral procedure conditions suggests that non-social variations in the procedure do not translate into differences in annoyance. These findings sustain the social psychological definition of procedural fairness effects being *social* effects.

5.2.2 Social hypothesis confirmed

Considering the results of the experiments, it is concluded that being exposed to man-made sound is a social experience. The social hypothesis of noise annoyance has been confirmed: Annoyance with man-made sound is a response to a social experience. Noise annoyance is an evaluation of the sound *exposure situation*, which is considered explicitly as an interactive or social event.

5.3 ADDITIONAL RESULTS AND DISCUSSION

5.3.1 The dynamic pattern of the procedural (un)fairness effect

The dynamic pattern of the effect of the management procedure on noise annoyance differs between the Fair and the Unfair experiment. (For the readers' convenience, the results of the two experiments are shown side by side in Figure 5.2.) The effect of procedural *fairness interacts* with the effect of sound pressure level on noise annoyance, but the effect of procedural *unfairness is independent* of SPL. This may indicate that different mechanisms are at work in the Fair and Unfair experiment, and it makes curious what these mechanisms could be. The interactive result pattern suggests moderation, either of the procedure effect by the SPL, or of the SPL effect by procedure. The independent main effect of procedural unfairness suggests two direct relationships, between on the one hand side SPL and procedure, and on the other hand noise annoyance.

In the following section, to begin with, available theoretical explanations for an *interaction effect* of procedure on annoyance are discussed. Secondly, available theoretical explanations for an *independent main effect* of procedure on annoyance are discussed. Subsequently, the possibilities for integrating explanations, such that both dynamic patterns can be explained, will be explored.

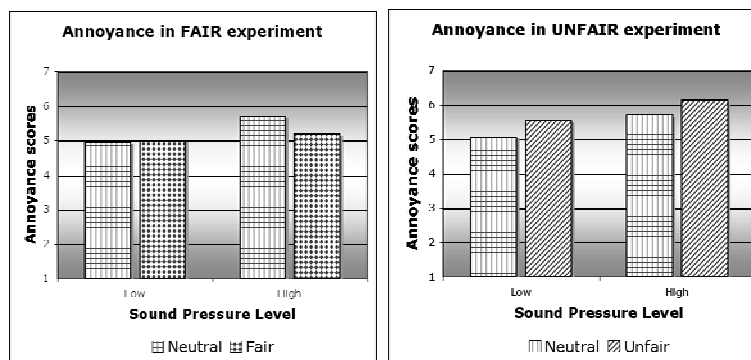


FIGURE 5.2. Noise annoyance after fifteen minutes of exposure. The left hand figure (Fair experiment, Chapter 3) shows a significant main effect of SPL and a significant interaction of SPL by procedure, the right hand figure (Unfair experiment, Chapter 4) shows two significant and independent main effects: one of SPL and one of procedure.

Interaction effect

The fair procedure decreases the level of noise annoyance in the 70 dB but not in the 50 dB SPL conditions (Fair experiment, Chapter 3). This interaction effect is in line with predictions. In this section, explanations for this interaction from two different theory fields will be discussed. The discussion starts with cognitive theory of stress and coping, continues with a social justice perspective, and ends with a comparison of both explanations.

Explanation: the Cognitive Theory of Stress and Coping

According to the cognitive theory of stress and coping, a person experiences psychological stress when the threat value of a situation exceeds its available coping resources, which include

physical, social, psychological, and material assets. The ‘primary appraisal’ of the threat value of a situation precedes the conditional ‘secondary appraisal’ of available coping resources. Only when a sense of threat to well-being is appraised, coping resources are considered. In other words, if no threat is encountered in the primary appraisal, coping resources do not have an effect on psychological stress (Folkman, 1984). By deduction, it is predicted that the stress-inducing effect of the appraised threat interacts with the stress-reducing effect of the coping resource. The link between this theory and the current research topic has been argued in Chapter 3: annoyance can be regarded an expression of psychological stress, and a fair procedure is regarded a (social) coping resource.

The interaction found in the Fair experiment can be explained by assuming that in the 50dB conditions no secondary appraisal has been triggered. Apparently, the threat value of 50 dB (primary appraisal) is too low to trigger secondary appraisal. In the 50 dB conditions, the fair management procedure, a social coping resource, is not taken into account, and hence it has no effect. The primary appraisal of the threat value of the 70 dB sound triggers the secondary appraisal of coping resources. Once the fair procedure is appraised, it can have its stress-reducing effect (relative to the neutral procedure), and thus decreases the level of noise annoyance.

Explanation from a Social Justice perspective

Explanations for interaction effects in social justice literature are much in line with the explanation above: they stem from the same idea that the effect of procedural fairness is triggered by a sense of threat. Although generally independent main effects of procedural fairness on outcome evaluation are reported (e.g., Lind and Tyler, 1988), research has shown interactions of fairness dimensions (e.g., distributive, procedural, interpersonal and informational). Sometimes, procedures have an effect only when outcomes are unfair. One study reports an interaction of the fair process effect and distributive fairness: the fair process effect is far stronger when the distribution of outcomes is unfair (Tepper, 2001). Based on the cognitive theory for stress and coping, Tepper argues that the unfair distribution of outcomes is perceived as a threat during primary appraisal, which triggers secondary appraisal of coping resources, i.e., the fair procedure. Vermunt and Steensma (2001, 2003, 2005) have theorized and shown that fair procedures can reduce stress. They conclude that a fair treatment reduces the threat value of an event, for instance by providing options for control. The effect of procedural fairness has also been found to be stronger when a person is actually experiencing stress (Vermunt and Steensma, 2003), or when they have been thinking about threatening things (Miedema, 2003, 2006).

An interesting question raised by Tepper’s (2001) explanation is whether in the Fair experiment the 70 dB SPL may have triggered secondary appraisal because it has been perceived as an unfair outcome. However, the distribution of SPL is not likely perceived as unfair relative to other participants, because all participants within each time slot have been exposed to the same SPL. Nevertheless, the outcome can have been perceived as unfair relative to the bogus hearing test of 60 dB, somewhat earlier during the experiment. No assessment has been made of the perceived fairness of the outcome. From the current data, it cannot be derived whether the fair process effect in the Fair experiment has been moderated either the *loudness* of 70 dB, or a perceived *distributive unfairness* of the 70 dB sample, in regard of the earlier 60 dB sample.

Conclusion

The findings in the Fair experiment, and the explanations described above, corroborate the idea that a fair procedure can be considered as a (social) coping resource, which can reduce the threat value of an event. The assumption that the appraisal of procedural fairness is conditional on a primary appraisal of threat has also been corroborated by the findings. However, it is unclear whether the sense of threat has been caused by the loudness of the sample, or by a perceived distributive unfairness.

Either one or the other, the interaction in the Fair experiment can be explained as follows: a fair procedure is a coping resource, which stress-reducing effect is conditional upon a primary appraisal of a sense of threat. This sense of threat may be due to loudness of the sound, or perceived distributive unfairness of the sound. For the purpose of discrimination in this discussion, I name this the ‘coping resource explanation’ of the fair process effect on noise annoyance.

Independent main effect

In field situations, the average annoyance level in a community often exceeds the level predicted by dosage-response curves. Can such excess annoyance be due to a reversed fair process effect: an effect of an inverted coping resource? This question motivated the Unfair experiment.

The results of the Unfair experiment show that the unfair procedure manipulation increased the level of noise annoyance in the 70 dB as well as the 50 dB SPL conditions. The strength of the effect is independent of SPL (Chapter 4). In this section, two explanations for this independent main effect of procedural unfairness will be discussed. First, the ‘coping resource explanation’, used to explain the interaction in the previous section, is applied, considering the unfair procedure as an inverted coping resource (taken into account during secondary appraisal). Secondly, an alternative explanation is explored, in which the unfair procedure manipulation has an effect on annoyance through primary appraisal, that is, by creating a sense of threat due to outcome unfairness. The latter explanation, I will name the ‘threat value explanation’.

‘Coping resource explanation’

The ‘coping resource explanation’ holds that an effect of procedure can be found only when secondary appraisal of coping resources is triggered by a sense of threat to well-being. In the Unfair experiment, an effect of the procedure manipulation is found in the 50 dB as well as the 70 dB SPL conditions. This finding implies that in both SPL conditions, a sense of threat to well-being has been appraised (primary appraisal). This finding contrasts with the data from the Fair experiment, which suggest that the 50 dB SPL does not have threat value. However, it was expected that both SPL conditions would have threat value to the participants in the Unfair experiment. All participants had, before being exposed to the experimental sound sample, spent some time motivating in writing why they believed nature, or radio sound to be least taxing (compared to aircraft sound) to them as background sound during a difficult reading task. By doing this, they had themselves labeled the aircraft sound as a threat to their well-being in the context of being engaged in a reading task. The ‘coping resource explanation’ for the main effect of the procedural fairness manipulation is that, during primary appraisal, the negatively labeled aircraft sound raised a sense of threat to all participants because of its content, and not its loudness. The primary threat appraisal triggers the secondary appraisal of coping resources. Procedural unfairness, as an inverse coping resource, increases the stress level (reversed fair process effect), and hence annoyance rises in both the 50 dB and the 70 dB SPL conditions (relative to the neutral procedure conditions).

One observation argues against this explanation: the average noise annoyance scores in the neutral procedure conditions are surprisingly similar to the scores in the neutral procedure conditions in the Fair experiment. Even though no statistical analysis can be done on data of two unrelated experiments, this observation raises doubt with regard to the threat induced by the presumed negative label of the aircraft sound in the Unfair experiment.

‘Threat value explanation’

In the section addressing the interaction effect, it is noted that a perceived distributive unfairness can be appraised as a threat. It is conceivable that, for the participants in the unfair procedure conditions, the aircraft sound was an unfair outcome, 50 and 70 dB SPL alike. They had been promised the sound type of their choice, and had indicated to choose nature or radio sound. The unfair procedure manipulation may have induced differences in perceived outcome unfairness. (Unfortunately, no measures of perceived outcome unfairness have been taken). Outcome unfairness alone can explain the main effect of the procedure manipulation on noise annoyance: In the unfair procedure conditions, the presumed outcome unfairness has threat value, which during primary appraisal leads to a sense of threat to well-being. This triggers the secondary appraisal of coping resources. The unfair procedure does not provide compensatory coping options, and the appraised threat value of the unfair outcome translates into a rise in stress in both SPL conditions. This rise in stress causes an increase in annoyance. This, I call the ‘threat value explanation’ for the main effect of the unfairness manipulation on noise annoyance.

The ‘threat value explanation’ can account for the main effect of the unfairness manipulation without assuming an effect of an inverted coping resource. Secondary appraisal of the procedure is not needed to explain the elevated annoyance levels (relative to the neutral procedure conditions). It is possible, still, that the unfair procedure causes an additional rise in noise annoyance in the unfair conditions. However, with the current data no discrimination can be made between annoyance caused by the presumed unfair outcome distribution, and annoyance caused by the unfair procedure. Practically, the presumed unfair outcome and the unfair procedure are too intertwined to be considered as separate concepts: one would not exist without the other. Therefore, in the remainder of this chapter, I will refer to the unfair procedure with both dimensions in mind.

An argument in favor of the ‘threat value explanation’ can be found in the absence of an interaction effect on top of the main effect of procedural unfairness. In the cognitive theory of stress

and coping, a coping resource moderates stress. Hence, it is expected that its effect grows stronger when stress increases. Likely, stress is higher in the high SPL conditions. The effect of the unfair procedure, however, is not stronger in the high SPL conditions (i.e., no interaction effect). This pattern suggests no moderation of stress by means of a coping resource, but instead additional stress due to a threat of some sort. (Note: the absence of an interaction effect could be due to a ceiling effect: annoyance levels in the high SPL, unfair conditions approach the top end of the measurement scale.)

Unfortunately, the data of the Unfair experiment does not allow for discrimination between annoyances due to primary or secondary appraisal processes. The question could have been answered if annoyance had been assessed shortly after the onset of the sound (like in the pilot study) as well as after 15 minutes of exposure. Finding the effect of procedural unfairness on annoyance after one minute of exposure already would be an indication that the effect is fast: a primary appraisal process, in support of the ‘threat value explanation’. Not finding the unfairness effect after only one minute, would be an argument for the ‘coping resource explanation’. (The data from the pilot study suggest that the fair process effect is depending on secondary appraisal, which is in line with the ‘coping resource explanation’).

Conclusion

Considering all of the above, at this point in the discussion of the results, no conclusive argument has been presented to choose either one or the other explanation for the effect of procedural unfairness on noise annoyance (Chapter 4). In the following section, the two explanations will be considered from a social justice perspective, and with regard to both procedure effects (fair and unfair) in combination.

Comparison of the two explanations

The interaction effect of the fair procedure (Chapter 3) can be accounted for by the ‘coping resource explanation’. The independent main effect of the unfair procedure (Chapter 4) can be accounted for by the ‘coping resource explanation’, as well as the ‘threat value explanation’. From a perspective of parsimony, it could be opted to discard the latter explanation. In the following section, I will argue the additive value of keeping the ‘threat value explanation’ beside the ‘coping resource explanation’.

The essential difference between the two explanations is that, in the ‘coping resource explanation’ the unfair procedure exerts its effect on noise annoyance during the secondary appraisal (as a negative coping resource), whereas in the ‘threat value explanation’ it exerts its effect during primary appraisal (as a threat value). This distinction is reminiscent of the two major explanations in social justice literature for why procedural fairness is generally much appreciated and related to higher outcome satisfaction. The *instrumental explanation* is similar to the ‘coping resource explanation’. It holds that fair procedures give more (indirect) control over the process and the related outcomes (Mikula, 2001, Thibaut and Walker, 1975). Similarly, in the cognitive theory of stress and coping, perceived control is considered a secondary appraisal of situational factors (Folkman, 1984). The *relational or group-value explanation* shares some characteristics with the ‘threat value explanation’. It holds that procedural fairness provides people with information about their status in a social group. A fair treatment signals a high status, which provides the group member with two vital coping resources: a social support system and a sense of self-efficacy (Tepper, 2001; Tyler and Lind, 1992). It follows that an unfair treatment signals a low status. Given the social needs of people, having low status has threat value. An unfair treatment can be a negative in its own right, and a threat to well-being.

The mediation of the unfair process effect by instrumental or relational concerns has been explored with three items in the Unfair experiment (Chapter 4). Although the results are inconclusive, they lean toward the relational end. The procedure induced strong differences in perceived respect (‘In your opinion, how respectful have I, the researcher, treated you?’), which did not translate into differences in noise annoyance. The item “The experimenter made an effort not to tax me unnecessarily with the sound” is a significant mediator according to the lenient Baron and Kenny (1986) criteria, but not when following the more accurate bootstrapping method (Shroud and Bolger, 2002). The correlation between the two relational concern items ‘respect’ and ‘effort’ is highly significant. No differences have been induced on the perceived control-item: ‘During the task, to what extent did you feel to have (had) control over the sound you were being exposed to?’, which discards instrumental concerns. Even though these results are far from conclusive, they signal that the exploration of relational aspects of procedural unfairness effects on noise annoyance may shed a new light on noise annoyance and procedural fairness research.

A common-sense argument in favor of retaining the ‘threat value explanation’ for the explanation of the unfair procedure effect is that the theoretical concept of a negative, or inverted, coping resource has little practical value. It is difficult to conceive what it is like to be having less than no access to a coping resource. The concept of the unfair procedure as a threat to social needs, on the other hand, is less hard to imagine.

I conclude that the ‘coping resource explanation’ and the ‘threat value explanation’ of effects of procedural fairness or unfairness on noise annoyance are complementary to each other. They are both rooted in the cognitive theory of stress and coping, but they address different contextual mechanisms that can increase or decrease the stress level, and hence the annoyance a person experiences in response to sound. The ‘threat value explanation’ cannot explain the interaction effect found in the Fair experiment, but has additional value in addressing the potential threat value of an unfair procedure with regard to social needs. Together they can do both.

5.4 IMPLICATIONS FOR THE MODEL OF ANNOYANCE

5.4.1 Surplus value of a social psychological model

In the introduction of this thesis, I have argued that the perspective commonly taken in social scientific research on noise annoyance is psychological rather than social. I have explained that I consider this a problem, because I believe that noise annoyance with man-made sound is a response to a *social* experience.

The results of the experiments described in this thesis confirm my belief: they show that the social process between the person(s) operating the sound source and the person(s) being exposed to the sound influences the latter's evaluation of the sound. Exposure to man-made sound can be considered a social experience.

To study this social side of noise, a model of noise annoyance that represents the social process between exposer and exposee is needed. As the experiments demonstrate, using such a model has the advantage of creating a link to social psychological knowledge, in particular knowledge on social justice. In this way, relevant information both for the theory of noise annoyance as well as the practice of annoyance abatement can be added.

5.4.2 Amendments to the social psychological model

In this section I will relate the above discussion to the social psychological model of noise annoyance (Stallen, 1999; see Figure 1.4 for the original model and Figure 3.1 for the simplified model used for the design of the current studies). First, I will relate the terminology used in the previous sections to the terminology used in the social psychological model of noise annoyance. Then, I will describe the amendments to the model that I think are required to account specifically for the current findings. In this manner, I intend to summarize the implications of the results for a social psychological model of noise annoyance. For clarification purposes only, a visual representation of the tentative amended model is included in addition to the verbal description of the suggested amendments (see Figure 5.3).

The equation of terminology starts with relating the two external process variables to the manipulations in the experiments. ‘Sounds at source’ becomes ‘SPL’, and ‘noise management by source’ becomes ‘(un)fairness of sound management’. Because the external variables have been manipulated orthogonally, the arrow connecting them is left out. The internal variables ‘perceived disturbance’ and ‘perceived control’ are equated to ‘primary appraisal of threat value’ and ‘secondary appraisal of coping resources’. The behavioral activity ‘coping with annoyance’ is not adopted in the amended model, because coping behavior has not been studied in the reported experiments. The same holds for ‘sensory disturbance’ and ‘other (non-noise related) attitudes’, which have not been addressed in these studies. Unidirectional arrows, for matters of simplicity, replace the two-directional arrows between the appraisal processes and ‘annoyance’. Finally, the response variable ‘annoyance’ is replaced by ‘noise annoyance’ in the amended model.

To (more clearly) account for the findings and their theoretical explanations, some amendments to the model are required. Firstly, the model does not clearly illustrate the theoretical assumption that ‘secondary appraisal of coping resources’ has an inhibiting effect on ‘primary appraisal of threat value’ rather than a direct effect on ‘noise annoyance’. The arrow from ‘secondary appraisal of coping resources’ to ‘noise annoyance’, is replaced by an inhibiting arrow to ‘primary appraisal of threat value’.

Furthermore, the model needs to illustrate that the threat reducing influence of coping resources depends on the appraised threat value. For this purpose, an arrow marked with an asterisk is inserted, going from 'primary appraisal of threat value' to 'secondary appraisal. The asterisk is added as a reminder that a higher threat value does *not increase the capacity* of coping resources, it just triggers secondary appraisal of the available coping resources.

The results of the Fair experiment suggest that the fairness of the sound management procedure can function as a coping resource. This mechanism is much in line with the original model by Stallen (1999) and the cognitive theory of stress and coping (Lazarus and Folkman, 1984). The activating arrow from '(un)fairness of sound management' to 'secondary appraisal of coping resources' illustrates this instrumental function of fair sound management.

The main effect of procedural unfairness on noise annoyance (Unfair experiment) has been explained by the assumption that the unfair procedure manipulation threatens social needs. The original model cannot account for this explanation. The relational function of procedural fairness, and specifically the suggested threat value of unfair management, is illustrated by an activating arrow connecting '(un)fairness of sound management' to 'primary appraisal of threat value'.

The data of the Fair experiment does not offer a clear-cut answer to the question whether procedural fairness moderates the threat value of the SPL, or whether the SPL moderates the threat-reducing effect of procedural fairness. In the social justice literature, it is quite common to consider a perceived outcome (i.e., SPL) as a moderator of the fair process effect (e.g., Folger, 1977; Tepper; 2001). In the sound literature, however, it is more common to consider a nonacoustical variable (i.e., procedural fairness) as a moderator of the effect of sound (e.g., Fields and Walker, 1975; Fidell et al., 2002; Miedema and Vos, 2003). The cognitive theory of stress and coping circumvents this problem by defining stress (the precursor of annoyance, in our model) not as an outcome, but as an ongoing relationship between the person and the environment. Stress arises when this relationship 'is appraised by the person as taxing or exceeding his or her resources and as endangering his or her well-being' (Folkman, 1984, p. 840). The appraisal process is supposed to be on-going, hence over time each variable is a moderator of the other. The primary appraisal of threat moderates the effect of coping resources, and vice versa. The amended model is in line with this idea.

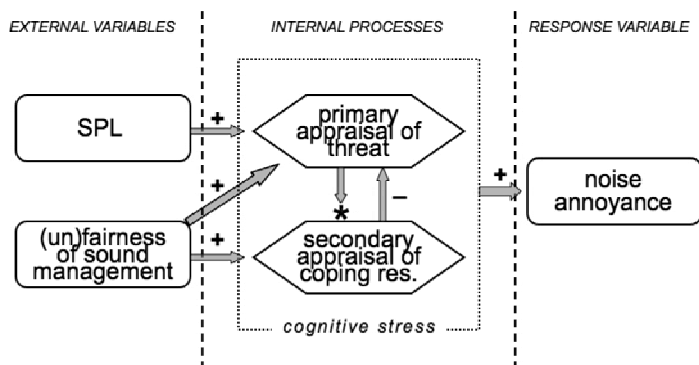


FIGURE 5.3. A visual summary of the findings and their proposed explanations. The independent variables SPL (sound pressure level) and the (un)fairness of the sound management are represented as external variables. The dependent variable, noise annoyance, is represented as the response variable. The reported effects of the independents on the noise annoyance are explained by assuming an internal process of increasing or decreasing levels of cognitive stress. Variations in cognitive stress are due to differences in primary appraisal of threat and secondary appraisal of coping resources. These differences are induced by the independent variables. For the original social psychological model of noise annoyance by Stallen, see FIG 1.4; for its simplified version used for the design of the experiments, see FIG 3.1.

The amended model, as noted before, is intended firstly and mainly to provide a visual summary of the findings and their proposed explanations. Secondly, this summary may facilitate discussion by contrasting the explanations with the original social psychological model of noise annoyance. Thirdly, the model may inspire future studies on the relation between fairness and noise annoyance.

5.5 FAIR VS. UNFAIR: OPPOSITES OR DIFFERENT CONCEPTS?

Fairness and unfairness, as they have been manipulated in the studies, may be distinctly different concepts, and not merely each other's opposite, or two positions on a fairness continuum. The notion that positive and negative are no simple opposites on a psychological level, is not new. A variety of theories and studies illustrate this asymmetry: winning is not the opposite of losing (Tversky and Kahneman, 1981; Harinck, Van Dijk, Van Beest, and Mersmann, 2007), satisfiers are not the opposite of dissatisfiers, and deprivation is not the opposite of gratification (Herzberg, Mausner, and Snyderman, 1959; Maslow, 1970).

Interestingly, an asymmetry similar to the one in the result pattern of the Fair and Unfair experiment is found in a recent noise annoyance survey (Schreckenberg, 2007). In the survey, the influence of positive and negative attitudes (towards the operator of the sound source) on noise annoyance is studied. The positive attitudes are found to have an annoyance reducing effect that is stronger with higher SPL. The negative attitudes are found to have an annoyance increasing effect, which strength is comparable for all SPLs studied. Possibly, positive attitudes function as, or are related to, coping resources, while negative attitudes are related to, or function as, threat increasing variables. This similarity in asymmetric results pattern suggests that the pattern found in the current studies may be more than a peculiarity of the present studies.

Therefore, it is advisable to be aware of, and investigate the possibility that fairness and unfairness may have differential effects. As a start, it would be good to discriminate explicitly between *fair* and *unfair* process effects in the scientific vocabulary. To the best of my knowledge, this is as yet not a common practice.

As a consequence of the differential effects of fair and unfair procedures, the impact of procedural unfairness could, at low threat levels (or low SPL), be much stronger than the impact of fair procedures. An unfair procedure may be a nuisance in itself, capable of creating noise annoyance at relatively low sound exposure levels, whereas a fair procedure may ameliorate annoyance due to moderate sound exposure.

5.6 VALIDITY, AND GENERALIZATIONS

Several issues of validity are being addressed in detail in the discussion sections of the Chapters 3 and 4. Here, I will refer to and summarize the major points.

5.6.1 Experimental population

The data has been gathered among students only. Students may be more sensitive for procedural (un)fairness than the average public because they may have a higher need for autonomy compared to the average adult (Avery and Quiñones, 2004). This peculiarity of the experimental population compels cautiousness in generalizing the findings to the general population. Notwithstanding, in the general public substantial variation in need for autonomy will be present, and hence the current findings will likely apply to a significant proportion of the general public. For people less sensitive for procedural (un)fairness, the strength of the procedural fairness effect may be lower. In addition, situational and individual differences may influence the value of fair procedures. It is known that people value voice more when the situation is uncertain, or when trust in authorities is low. Personality differences influence whether or not a situation is perceived as disturbing, and hence whether coping resources are appraised. Even though the strength of the effects may differ, the social psychological mechanisms influencing noise annoyance will not be different.

5.6.2 Generalizations from lab to field

Generalizations from the current findings to situations outside the lab may be restricted in several respects. Firstly, in the lab, participants are well aware that their exposure will not last longer than the course of the experiment. In field situations, people often are far more concerned about their sound situation than the participants in the lab. The social effects of procedural fairness can be stronger in field settings than the current findings suggest: if people are more concerned, their level of threat, stress of perceived outcome unfairness is higher, and hence a procedural fairness effect can be stronger.

Secondly, outside of the lab, people may not be very attentive to the sound management of operators of the noise source. However, when annoyance problems get media attention, the policies of the sound source often become subject of discussion, are paid attention to in public debates, protests, and media. Together, these sociological processes have been found to exert a significant influence on people's ideas about the fairness of sound management (Wirth and Bröer, 2004; Bröer, 2006, 2007).

It is a question whether effects of social processes on evaluations of noise can be replicated when a real person to interact with is lacking altogether (e.g., when the noise source is an institution). There is, however, evidence that people have a strong tendency to attribute social meaning to situations (e.g., Heider and Simmel, 1944; Klin, 2000). Other studies have shown that it is common for users of mass media to form so-called parasocial relationships with media figures (like celebrities, but also cartoon characters, or even magazines), in which the user responds behaviorally and cognitively to the media figure as though in a typical social relationship (e.g., Giles, 2002; Horton and Wohl, 1956; Cohen, 2004).

In sum, it is important to consider differences between laboratory and field settings, but it seems warranted to make careful generalizations from the current findings to field settings. Although it cannot simply be assumed that the social psychological processes will be identical in the field, results from survey studies confirm that social variables like trust and attitudes towards the source play a significant role (Guski, 1999). Experiences with e.g. community consultation and transparent communication around Heathrow airport (Flindell and Witter, 1999) and Sydney airport (Southgate, 2002), illustrate the practical value of fair noise management.

5.7 ADDITIONAL REMARKS

5.7.1 Suggestions for further research

The finding that noise annoyance has a social side raises more specific, and new questions. For instance: how precisely do social processes relate to (nonacoustic) individual difference variables? Does procedural fairness influence people's attitudes towards the source, or does it make people less (or more) attentive to the sound? Do relational or instrumental concerns, or both, mediate the procedure effect on noise annoyance? More research, also of a qualitative nature (e.g., Pedersen, Persson Waye, Hallberg, 2004), is needed for an in-depth exploration of the social psychology of noise.

An interesting question that can be addressed with an experimental design similar to the one applied in this thesis, is whether the effect of procedural fairness continues to grow stronger with increasing SPL, or not. If secondary appraisal is either triggered or not, then it can be predicted that for higher SPL, the fair process will show an independent main effect, rather than an interaction. This could be studied by studying the fair process effect for a larger number of SPL-conditions. The effect of procedural (un)fairness for extreme SPL's could be another interesting research focus. Can an unfair procedure transform a benign sound into noise? If such studies are carried out, it is advisable to include measures of perceived distributive fairness.

In another vein, it would be interesting to see what happens if the annoying sound is natural rather than man-made. Do procedural fairness effects occur when the experiment is carried out at a location with a lot of annoying, naturally occurring sounds, or sounds over which the experimenter has no control? If the experimenter plays a recording of natural sounds on an audio installation, is it then perceived as man-made, or natural? And, do procedural, and other nonacoustical variables then influence noise annoyance?

Future research could address the effect of other procedural and distributive fairness characteristics on noise annoyance. In addition, influences of other dimensions of the social process could be studied: e.g., social comparison, social exclusion, or relative deprivation). The current experimental design could be improved by adding valid and reliable scales of instrumental and relational mediators of fairness effects.

In field situations, the 'person operating the sound source' often is not an individual, but a company or institution. Field studies are needed to investigate whether the relationship between a noise exposed person and an institution is comparable to the relationship between experimenter and participant. Knowledge in the domain of para-social relations may be a useful in this respect (e.g., Giles, 2002; Horton and Wohl, 1956; Cohen, 2004). Two other studies are of interest in this respect. The first investigates the relationship between public policy and the cultivation of trust (Breeman, 2006), the second examines how trust and acceptance of the general public are affected by decision making procedures (i.e., "voice") in the context of the implementation of a new technology (Terwel, Harinck, Ellemers, and Daamen, 2007).

Finally, physiological research is needed to investigate whether, and under which conditions, a reduction in verbalized annoyance indicates a reduction of physiological stress. Several studies point out that a reduction of reported annoyance can also indicate that people suppress their annoyance (Fields and Walker, 1982), or compensate by adjusting their aims (Staples, 1997; Tafalla, Evans, and

Chen, 1988). One study reports a negative correlation between expressed annoyance and physiological stress levels, suggesting that a suppressed expression of annoyance results in an increase of physiological stress (Miyakawa et al., 2004).

5.7.2 Implications for practice

The present studies provide scientific proof of what many a worker in the practice of noise annoyance abatement knows by experience: unsound management can be a source of dissatisfaction (e.g., when it is perceived as mis- or malfeasance, procedural unfairness) that worsens noise annoyance issues. Having this proof has practical implications.

Firstly, it can be used to create a sense of urgency needed to raise the funds and mobilize the people necessary to address this side of the noise issue. The research shows that the sound management procedure is a predictable source of systematic nonacoustic differences, and this makes some nonacoustic influences manageable. Individual differences in reactions to noise seem to be less relevant when one focuses on management procedures.

Secondly, the clarified link with social psychology may inspire new, nonacoustic ways for abating or preventing excess noise annoyance. In particular, the social justice literature provides a substantial body of tips and tricks for fair management. But also other knowledge on the management of social relationships, for instance mediation techniques, may be of use when dealing with environmental nuisances.

Thirdly, the data suggest that valuable information can be gained by a regular investigation of people's evaluation of the sound management. This information can help notice resistance at an early stage, and react to it in a constructive manner.

Fourthly, the Fair experiment shows that the social process instigated by the operators of the source can be a form of social support when the exposed perceives that the operator is receptive to their needs (e.g., public consultation, procedural fairness).

Last but not least, noise annoyed citizens and organized groups can possibly benefit from taking a *social* perspective in their negotiations with policy makers in urban planning, officials from airports and other noise-producing enterprises. Annoyance due to nonacoustic aspects of a noise problem really is annoyance just the same. It requires due consideration and a respectful solution.

5.7.3 Value of the reported research

“Working out improved social relationships between airports and their neighborhoods is an important aspect of noise alleviation” (Goodman and Clary, 1976, p.467). Nevertheless, limited use is being made of the existing knowledge of nonacoustical variables that influence the relationship between acoustical metrics of unwanted sound and noise annoyance, yet. In a recent review of the modeling of noise and its effects it is suggested that “[a]lthough there is some insight in other factors, such as noise sensitivity, that influence noise annoyance beside noise exposure, this knowledge is currently not developed sufficiently to form the basis for policies targeted at such nonacoustical factors aimed at reducing noise annoyance through nonacoustical measures” (Miedema, 2007, p. 53). This thesis shows that consideration of the social side of sound in noise annoyance research can help work out the social relationship between exposer and exposee. Application of a social psychological model of annoyance creates the possibility to draw from the extensive social psychological literature. This can further the theoretical understanding of noise annoyance, including the development of existing knowledge on nonacoustic factors. Social scientific research on noise annoyance needs to address noise annoyance as a *social* problem. Being exposed to man-made sound is a social experience.