

Video Article

The Social Dimension of Stress: Experimental Manipulations of Social Support and Social Identity in the Trier Social Stress Test

Johanna U. Frisch¹, Jan A. Häusser¹, Rolf van Dick², Andreas Mojzisch¹

¹Institute of Psychology, University of Hildesheim

²Department of Psychology and Sports Science and Center for Leadership and Behavior in Organizations, Goethe-University Frankfurt

Correspondence to: Johanna U. Frisch at frischjo@uni-hildesheim.de

URL: <http://www.jove.com/video/53101>

DOI: [doi:10.3791/53101](https://doi.org/10.3791/53101)

Keywords: Behavior, Issue 105, Trier Social Stress Test, social identity, personal identity, social support, social-evaluative threat, psychological stress, social relationships

Date Published: 11/19/2015

Citation: Frisch, J.U., Häusser, J.A., van Dick, R., Mojzisch, A. The Social Dimension of Stress: Experimental Manipulations of Social Support and Social Identity in the Trier Social Stress Test. *J. Vis. Exp.* (105), e53101, doi:10.3791/53101 (2015).

Abstract

In many situations humans are influenced by the behavior of other people and their relationships with them. For example, in stressful situations supportive behavior of other people as well as positive social relationships can act as powerful resources to cope with stress. In order to study the interplay between these variables, this protocol describes two effective experimental manipulations of social relationships and supportive behavior in the laboratory. In the present article, these two manipulations are implemented in the Trier Social Stress Test (TSST)—a standard stress induction paradigm in which participants are subjected to a simulated job interview. More precisely, we propose (a) a manipulation of the relationship between different protagonists in the TSST by making a shared social identity salient and (b) a manipulation of the behavior of the TSST-selection committee, which acts either supportively or unsupportively. These two experimental manipulations are designed in a modular fashion and can be applied independently of each other but can also be combined. Moreover, these two manipulations can also be integrated into other stress protocols and into other standardized social interactions such as trust games, negotiation tasks, or other group tasks.

Video Link

The video component of this article can be found at <http://www.jove.com/video/53101/>

Introduction

As social animals¹, humans strive for belongingness². Hence, for humans the behavior of significant others as well as their relationships with them are of great importance, especially in unfamiliar and challenging situations. For example, in stressful situations supportive behavior of other people as well as positive social relationships can act as powerful resources to cope with stress^{3,4}. These social resources, however, interact in a complex way and are sometimes not effective stress buffers⁵ *per se*. In order to study the conditions under which supportive behavior and social relationships have an effect on stress reactions, two different manipulations are introduced that can be implemented in the Trier Social Stress Test (TSST)^{6,7} or the group version of the TSST (TSST-G)⁸. Both are standard protocols to induce high levels of psychological and physiological stress in the laboratory⁷. The TSST(-G) is framed as a simulated job interview, in which participants are supposed to convince two interviewers (*i.e.*, the selection committee) that they are the most suitable candidate for a job position. Additionally, participants have to perform a mental arithmetic task in front of the selection committee. In order to increase the social-evaluative threat, participants are told that a video of them will be recorded for an analysis of their nonverbal behavior and a voice frequency analysis^{6,7}.

Manipulation of social versus personal identity

To manipulate social relationships within the TSST(-G), different techniques to induce a shared social identity⁹—a feeling of “we”-ness—between protagonists in the TSST/TSST-G are proposed (compare Gockel *et al.*¹⁰, Häusser *et al.*¹¹). Specifically, the manipulation of a social identity consists of the following steps^{11,12}: (1) Participants are placed at the same table. (2) Throughout the experimental procedure participants are addressed as a group. (3) The initial letter of participants’ names is manipulated to be identical because people prefer letters constituting their own name¹³. This name letter effect can be linked to increased interpersonal attraction¹⁴. (4) Participants’ age and occupation are manipulated to be similar. (5) Participants are given T-shirts of the same color. (6) Participants work alone on a task in which they have to generate and write down ideas to improve the quality of life in their city (Task 1). Their ideas are put into a collective box and they are told that the group performance will be analyzed. (7) Participants are asked to think of similarities (*e.g.*, goals, wishes, and habits) between themselves and their fellow group members (Task 2). (8) A group picture is taken.

In order to induce a personal identity, the following means are taken: (1) Participants are seated at three individual tables. (2) Throughout the experimental procedure participants are addressed as individuals. (3) The initial letter of participants’ names is manipulated to be different. (4) Participants’ age and occupation are manipulated to be different. (5) Participants are given T-shirts of different colors. (6) Participants also work on Task 1. However, their ideas for improving the quality of life are put into individual boxes and it is emphasized that their individual performance will be analyzed. (7) Participants should think of things (*e.g.*, goals, wishes, and habits) that distinguish themselves from their fellow group

members. (8) An individual picture of each participant is taken. Importantly, in both conditions participants are not allowed to interact with each other in any form. Furthermore, please note that the realization of steps 3 and 4 requires the use of confederates and may therefore not be applicable in every study design.

Manipulation of supportive versus unsupportive behavior

To study the effects of (un)supportive behavior, an experimental manipulation of non-verbal behavior of the TSST-selection committee members (compare Taylor *et al.*¹⁵) is introduced. Importantly, only the non-verbal behavior of the committee is altered: In stark contrast to the standard version of the TSST⁶, in which the committee members are trained to communicate with the participant in an unresponsive neutral manner (*i.e.*, the committee members provide no facial feedback at all), the committee members now behave either supportively or unsupportively. However, the standardized verbal statements of the committee members and the procedure of the TSST are unchanged.

These two experimental manipulations can be applied independently of each other but can also be combined. In sum, the identity manipulation has been tested in our laboratory on 186 male and female healthy students and the manipulation of committee behavior on 90 male and female healthy students. In the present article, we describe the combination of both manipulations as conducted by Frisch *et al.*¹². Building on the social identity approach¹⁶, Frisch *et al.*¹² hypothesized that social support in a stressful situation will only be effective in buffering stress responses, if the provider and the recipient of support share a social identity. This hypothesis was tested using a 2 (social versus personal identity) × 2 (unsupportive versus supportive committee behavior) between-subjects design. In the first part of this experiment, a shared social identity (versus personal identity) was induced between three participants. In fact, there was only one real participant and the other two persons were confederates who pretended to be real participants throughout the study. The two confederates were used in order to assure a standardized committee behavior in the upcoming TSST. In this second part of the experiment, the TSST was introduced to the participants and they were told that one of them would have to serve as job applicant and the other two would constitute the committee. The two confederates were designated as members of the TSST-committee by using a bogus drawing of lots procedure. During the TSST, the non-verbal behavior of those two committee members was manipulated and they acted either supportively or unsupportively. The following protocol describes the procedure of this experiment¹² and the manipulations in more detail.

Protocol

Two studies^{11,12} that applied the described procedures have been approved by the ethics committee of the University of Hildesheim and were in line with the declaration of Helsinki.

1. Set-up

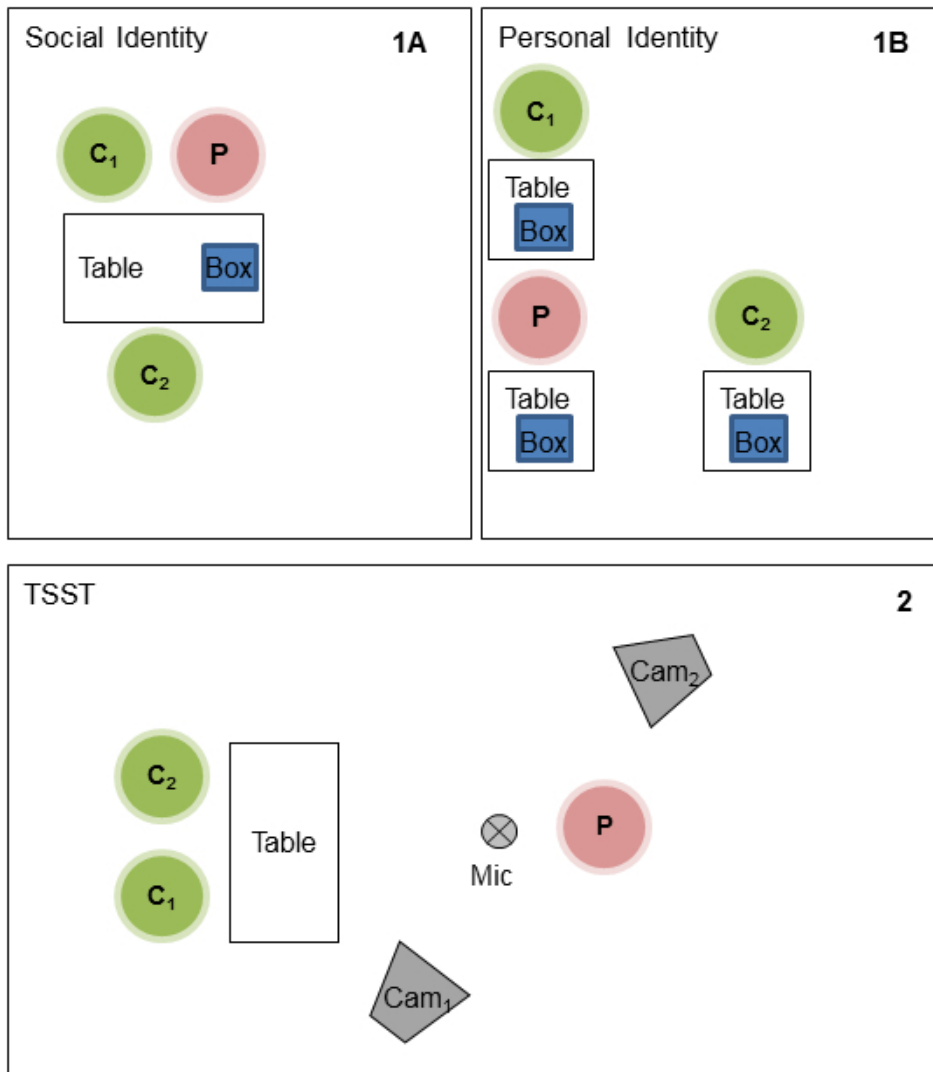


Figure 1. Sketch of the set-up in the two experimental rooms. P = real participant, C1/C2 = confederates, mic = microphone, cam = camera
[Please click here to view a larger version of this figure.](#)

1. Use two separate rooms. One for the manipulation of the social/personal identity, the preparation phase of the TSST and the recovery phase after the TSST (Room 1), and one for the speech and mental arithmetic task of the TSST (Room 2). The set-up of both rooms is illustrated in **Figure 1**.
 1. Place three chairs and one big table as depicted in **Figure 1** in Room 1A (social identity manipulation, preparation phase of the TSST, and recovery phase). Place a box for Task 1 (see below) on the table and provide three pens and some sheets of paper for Task 1 and Task 2.
 1. Provide nine T-shirts in three different colors—three T-shirts in each color (e.g., blue, green, and yellow). Provide three stick-on labels for the name tags.
 2. For the bogus lot drawing procedure, write “committee” on two small pieces of paper and fold them neatly. Write “applicant” on a third piece of paper and crumple it. Put the crumpled ball of paper and the two folded pieces of paper in a pouch.
 2. Place three chairs and three small tables as depicted in **Figure 1** in Room 1B (personal identity manipulation, preparation phase of the TSST, recovery phase). Place a box for Task 1 on each table. Provide the same additional materials as in the social identity condition.
 3. Place a table and two chairs for the committee members (the participant is standing) as depicted in **Figure 1** in Room 2 (speech and mental arithmetic task of the TSST).
 1. Provide the following items for the committee on the table in Room 2: Two pens and two sheets of papers for taking notes, two stopwatches, and two sheets with the solutions to the mental arithmetic task.

2. Install two video cameras (Cam 1 and Cam 2), one pointing towards the position of the participant, which is defined by the microphone (Cam 1), and one pointing at the committee (Cam 2). Attach the cable of the microphone to Cam 1 or to a laptop.
2. To assure a standardized behavior of the TSST-committee, use two trained confederates (one male and one female) who are of similar age as the studied population. Moreover, confederates need to be unfamiliar with the participants before the study since this may affect the level of identification.
 Note: If using more than two confederates, then it is important that the different confederates are of similar age, appearance, and attractiveness and that the assignment of confederates is balanced across the different conditions in order to assure that a particular set of confederates is not confounded with a specific experimental condition.
 3. Assess different indicators of the psycho-physiological stress response (e.g., cortisol, self-reported stress, heart rate) to test the stress reaction evoked by the TSST.
 1. Measure these stress indicators repeatedly before, during, and after the TSST in order to control for baseline differences, to examine the anticipatory stress response, the peak response level, and the recovery rate⁷.
 Note: For cortisol, four (minimum three¹⁵) measurement points are sufficient to cover these requirements (for an example of integration in the experimental procedure, see Frisch *et al.*¹²). However, more measurement points increase the resolution of the stress response and the number of necessary measurements also depends on the temporal dynamics of the selected stress indicator⁷ (e.g., heart rate can be measured continuously during the TSST).
 4. When measuring cortisol or any other physiological indicator of stress, apply the standard inclusion criteria¹⁷ for participants. Do not use participants for cortisol analyses who are pregnant, use hormonal contraception or other prescribed medication, smoke or suffer from psychiatric, endocrine, cardiovascular, or other chronic diseases. Moreover, have eligible participants refrain from consuming alcohol the day before the study, and eating meals, drinking caffeine, or exercising 2 hr before the beginning of the study. Furthermore, since cortisol follows a diurnal rhythm¹⁸, schedule experimental sessions at the same daytime.

2. Manipulation of Social/Personal Identity

1. Welcome participants (*i.e.*, one real participant and two confederates) to Room 1.
2. Place participants as depicted in **Figure 1**. In the social identity condition, seat the real participant and the confederates around one table. In the personal identity condition, seat the real participant and the confederates at individual tables.
3. Tell participants a cover story about the study (e.g., that in this study new tasks for assessment centers are tested) and obtain their informed consent for participation. Importantly, ask participants not to interact with each other during the session.
4. To induce a social identity, use the following means:
 1. Always address participants as a group (e.g., “You all will do ...”).
 2. Ask participants to introduce themselves (name, age, and subject of study). Have the real participant begin. Have the two confederates pretend to have a first name that has the same initial letter as the name of the real participant (e.g., John, Julia, Jim). Moreover, have the confederates declare to be at about the same age as the real participant and to be students.
 1. Form a group name out of the three first name initials (e.g., JJJ) and let each participant write it on a stick-on label. Tell participants that for reasons of anonymity they will not be addressed by their own names but by this group name throughout the experimental session.
 3. Ask participants to choose one out of three differently colored T-shirts. Tell them that wearing standardized clothes will help them to fully focus on the experiment. The real participant chooses first and the confederates each take a T-shirt of the same color. Ask participants (*i.e.*, the real participants and the two confederates) to wear this T-shirt until the end of the experimental session. Have participants place the label with the group name on their T-shirts.
 4. Instruct participants to think about ways to improve the quality of life in their city (Task 1). Have participants write each idea on a single sheet of paper and put it into the box on the table. Tell participants that the group performance will be evaluated. Let participants perform this task for 3 min.
 5. Instruct participants to write down as many similarities (e.g., goals, wishes, and habits) as possible that they think they share with their fellow group members (Task 2). Let participants perform this task for 3 min.
 6. Take a group picture (optional).
5. To induce a personal identity (alternatively to 2.4) use the following means:
 1. Always address participants personally (e.g., “Each of you will do ...”).
 2. Ask participants to introduce themselves (name, age, and subject of study). Have the real participant always begin. Have the two confederates pretend to have a first name with a different initial letter as the real participant (e.g., John, Kate, Peter). Have one confederate declare to be younger and the other to be older than the real participant. Have one confederate declare to be a student and the other to be an employee of the university.
 1. Have participants write down their respective first name initial on a stick-on label. Tell participants that for reasons of anonymity they will not be addressed by their own names but by their initials throughout the experimental session.
 3. Ask participants to choose one out of three differently colored T-shirts. Tell them that wearing standardized clothes will help them to fully focus on the experiment. The real participant chooses first. Each confederate chooses a different T-shirt color than the real participant and the other confederate. Participants have to wear this T-shirt until the end of the experimental session. Have participants place the label with the personal initial on their T-shirts.
 4. Instruct participants to think about ways to improve the quality of life in their city (Task 1). Ask participants to write each idea on a single sheet of paper and to put it into their individual box on the table. Tell participants that their individual performance will be evaluated. Let participants perform this task for 3 min.

5. Instruct participants to write down as many differences (e.g., goals, wishes, and habits) as possible that they think may distinguish themselves from the other two participants (Task 2). Let participants perform this task for 3 min.
 6. Take a picture of each participant (optional).
6. Use the group identification measure of Frisch *et al.*¹² (adapted from Doosje *et al.*¹⁹, see Table 1 for the items) to verify the success of the identity manipulation (*i.e.*, participants in the social identity condition should report higher levels of group identification than participants in the personal identity condition).

3. Trier Social Stress Test (Including Manipulation of Ccommittee Behavior)

Note: Step 3.2 and 3.3 (faked drawing of lots procedure) are not mandatory. In case of no prior manipulation of the relationship between the committee members and the participant (*i.e.*, the applicant), start with 3.1 and continue then directly with the TSST (3.4).

1. Explain the TSST briefly to participants as a task that is frequently used in assessment centers and requires one participant to take the role of an applicant in a job interview and two participants to act as a selection committee. Tell the participants that the selection committee will be evaluating the applicant and that a video of him/her will be recorded which will be used for a later analysis of his/her nonverbal behavior and a voice frequency analysis⁷.
2. Tell participants that the roles in this task will be assigned by lot. Let each participant draw a piece of paper out of the pouch on which his/her role will be indicated (either "applicant" or "committee"). Have the confederates always draw first and let them take the neatly folded lots on which "committee" is written (see above). Have the real participant draw last, so that he/she is always designated to be the applicant.
3. Hand out the sheet with the TSST-instruction to the committee members (*i.e.*, confederates) and tell them that they now have some time to prepare their roles. Note that these 'instructions' are part of the cover story, so the real participant believes that the two confederates are real participants.
Note: Since the confederates are already familiar with the TSST procedure, it is not important what these instructions actually entail (e.g., as a reminder for the confederates they may entail the exact wording of the verbal instructions of the committee).
4. Guide the two committee members to Room 2. Inform them now how they should behave in the upcoming TSST. Note that the confederates are not informed about the experimental condition earlier in order to avoid that the confederates' behavior during the identity manipulation is influenced in any way by whether the real participant is assigned to the supportive or unsupportive condition.
5. Go back to the real participant in Room 1.
6. Tell the real participant that he/she now has 3 min to prepare his/her speech. Tell him/her: "Imagine you have applied for your dream job and you are invited to a job interview. Please prepare a 5 min talk in which you aim to convince the selection committee that you are the most qualified candidate for this job. The committee would like to hear what qualifies you for the job. Please imagine that the committee members have already read your curriculum vitae and that therefore, you should not tell them anything about your professional skills and work experiences; rather you should focus on your personality. You may take notes during the preparation of the talk, but you are not allowed to use these notes during the job interview."
7. Guide the participant to Room 2, turn on the video cameras, leave the room, and wait outside.
8. For the speech task (5 min), have the committee members ask the participant to start with his/her speech. Note that the verbal instructions of the TSST-committee for the speech task of the TSST have been published elsewhere (see Birkett²⁰ and Kudielka *et al.*⁷).
9. For the mental arithmetic task (5 min), have the committee members introduce the mental arithmetic task to participants (*i.e.*, counting backwards from 2,043 in steps of 17). When the time is up, have the committee members thank the participant and tell him/her to leave the room. Note that the verbal instructions of the TSST-committee for the mental arithmetic task of the TSST have been published elsewhere (see Birkett²⁰ and Kudielka *et al.*⁷).
10. During the speech and the mental arithmetic task of the TSST, have the committee act either supportively or unsupportively. This supportive/unsupportive behavior starts about 20 sec after the commencement of the speech task to make this behavior look reactive and natural (see **Figure 2**).
 1. In the supportive committee condition, have the committee members show non-verbal affirmative signals throughout the TSST, for example, an open body posture (*i.e.*, arms are open and not crossed, legs are parallel and not crossed), tilting the head, leaning forward, and smiling.
 1. Have the committee members provide the participant with positive feedback by increasingly nodding and smiling as the task progresses. Have them exchange glances with each other indicating approval of the participant and his/her performance. Ensure that the committee members show these behaviors as a reaction to what the participant says or does (e.g., if the participant gives a correct number or if he/she says something positive about him-/herself in the speech task, the committee members will smile and nod).
 2. In the unsupportive committee condition (alternatively to 3.10.1), have the committee members show non-verbal negative signals throughout the TSST, for example, a closed body posture (*i.e.*, crossed arms and legs, leaning backwards), and frowning.
 1. Have them provide the participant with negative feedback (independent of the real quality of his/her performance) by sighing, rolling eyes, shaking the head, staring at the participant in disbelief, looking skeptically at their notes, and exchanging glances with each other indicating mutual resentment. Ensure that the committee members show these behaviors as a reaction to what the participant says or does (e.g., if the participant gives a wrong number or if he/she says something positive about him-/herself in the speech task the committee members will look at him/her skeptically, in disbelief, and shake the head).

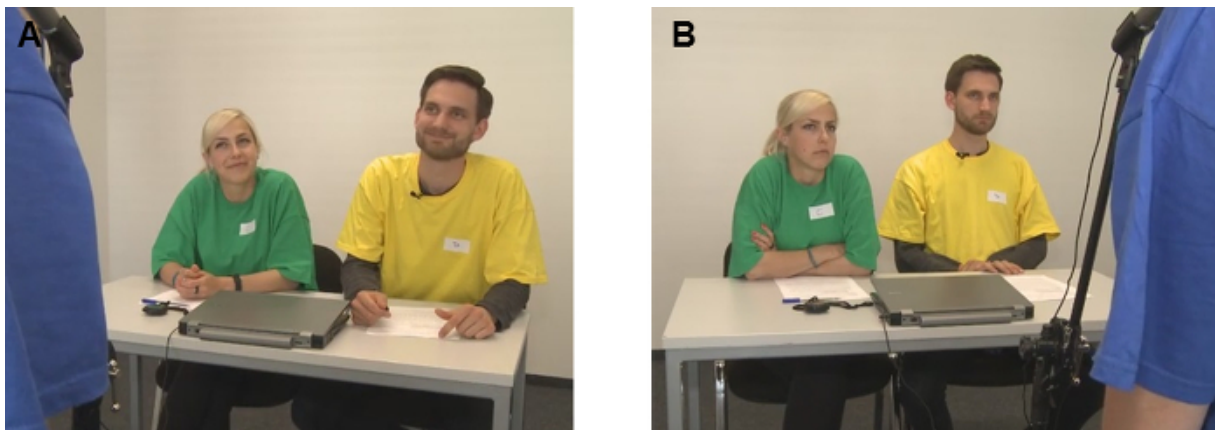


Figure 2. Picture of supportive and unsupportive committee. Example of the body posture and the facial expressions of the committee members during the TSST. A = supportive behavior, B = unsupportive behavior.

4. Resting Period

1. Wait outside Room 2 for the participant to open the door and guide the participant and confederates back to Room 1.
2. Hand out the manipulation check of committee behavior to the real participant. This questionnaire asks the participant how he/she perceived the committee members' behavior during the TSST (see **Table 2** for the items). Note that in order to keep up the role of the confederates as real participants, hand out a similar questionnaire to the confederates asking them how they evaluate their own behavior during the TSST. Note: This questionnaire is necessary in order to see if the manipulation of committee behavior was successful (*i.e.*, participants that faced an unsupportive committee should report that the committee was unsupportive whereas participants that faced a supportive committee should report that the committee was supportive).
3. Let participants rest and, if needed, take further samples of stress indicators under study.
4. Let participants fill in a suspicion check in which they are asked to describe what they think the aim of the study was.
 1. Exclude those participants who (a) suspected that the confederates were no real participants, (b) suspected the identity manipulation to aim at inducing a feeling of "we"-ness, (c) suspected the committee behavior to be scripted, or (d) guessed the aim of the study.
5. Thank, pay, and fully debrief participants. Include three important steps in the debriefing of participants (see also Kudielka *et al.*⁷):
 1. Clarify that confederates were used and explain to the participant that this was necessary to assure a standardized committee behavior. Assure the participant that the behavioral reactions of the two confederates in the TSST (especially in the unsupportive condition) were scripted and absolutely unconnected to his/her person or his/her performance during the TSST. It is advisable that the two confederates take an active part in this phase of the debriefing.
 2. Explain the TSST to the participant and tell him/her that it is designed to induce high levels of stress and that almost every participant reports high levels of stress and fails to perform well in the speech and mental arithmetic task. Tell the participant that the recorded video will not be analyzed but will be deleted instead.
 3. Explain the design of the study and the research question to the participant. Furthermore, ask participants not to share the details of this study with other people in order to prevent contamination of the pool of participants.

Representative Results

Two studies (Häusser *et al.*¹¹ and Frisch *et al.*¹²) showed the effectiveness of the identity manipulation on 186 healthy students (97 females, age range 18 to 35 years, mean (*M*) age = 22.40 years, standard deviation (*SD*) = 2.83 years). Moreover, Frisch *et al.*¹² tested the effectiveness of the committee behavior manipulation on 90 healthy students (49 females, age range 18 to 29, *M* = 22.00 years, *SD* = 2.31 years).

Manipulation of identity salience

The effectiveness of the identity salience manipulation was assessed by asking participants to indicate their group identification (see **Table 1** for the items and descriptive data) on 7-point Likert scales ranging from 1 = "not at all" to 7 = "extremely". In the Frisch *et al.*¹² study, it was found that participants in the social identity condition (*M* = 4.43, *SD* = 1.20) identified more strongly with the group than participants in the personal identity condition (*M* = 3.10, *SD* = 1.05), $t(1,88) = 5.58, p < .001$, Cohen's *d* = 1.18. Similar results were obtained in the Häusser *et al.*¹¹ study. In this study, the manipulation was applied to groups of four real participants who afterwards underwent the TSST-G⁵. The manipulation is the same as described above apart from two changes: (1) There is no round of introductions and (2) participants in both identity conditions cannot choose a T-shirt, but draw a lot with a color name and receive a T-shirt in this color. In the personal identity condition, all participants draw a lot with a different color (*i.e.*, blue, green, red, and yellow). The name of the color is then tagged on the T-shirt and acts as a "name" for the participant. In the social identity condition, one group member draws a lot for the whole group and all four participants receive a T-shirt of the same color. The name of the color is tagged on each T-shirt and acts as a "group name". Please note that a slightly different manipulation check was used that also included items assessing the perceived similarity between the participants. Again, participants in the social identity conditions (*M* = 4.12, *SD* = 1.01) identified more with their group than participants in the personal identity condition (*M* = 3.58, *SD* = 1.21), $t(94) = 2.38, p = .019$, Cohen's *d* = 1.10. In sum, the manipulation of identity salience was successful for (a) the application in groups with only one real participant and two confederates¹² and (b) for groups of four real participants¹¹.

Manipulation of committee behavior

In order to evaluate whether the manipulation of committee behavior was successful, two different methods were used¹². First, directly after the TSST, participants were asked to rate the supportiveness of the TSST-committee on 7-point Likert scales ranging from 1 = "not at all" to 7 = "extremely". Second, the behavior of the TSST-committee was videotaped and 23 independent and hypotheses-blind raters (*i.e.*, students) assessed the supportiveness of the committee on the same scale. Each rater saw four different videos (*i.e.*, one of each condition) that were shown in a counterbalanced order (see **Table 2** for the items and descriptive data).

For participant-rated perceived supportiveness, analyses revealed that in the supportive condition ($M = 3.41$, $SD = 1.35$) participants felt more supported than in the unsupportive condition ($M = 1.80$, $SD = 1.00$), $F(1,86) = 40.79$, $p < .001$, $\eta^2 = .32$ (manipulation of identity salience had no influence on perceived supportiveness). In line with this, for the supportiveness rated by the naïve students, it was found that in the supportive condition ($M = 4.58$, $SD = 1.18$) the committee was rated as being more supportive than in the unsupportive condition ($M = 1.53$, $SD = 0.69$), $F(1,22) = 135.11$, $p < .001$, $\eta^2 = .77$ (importantly, the manipulation of identity salience had no influence on perceived supportiveness). In sum, this method of manipulating the behavior of the TSST-committee can be seen as very effective.

Interaction of social identity and committee behavior

The aim of the Frisch *et al.* study¹² was to test the hypothesis that social support (*i.e.*, supportive committee behavior) only buffers the neuroendocrine stress response when a shared social identity between support provider and recipient is salient. To test this hypothesis, both of the described manipulations were applied. As predicted, the hypothesized pattern was observed for salivary cortisol (see **Figure 3**; for more details, see Frisch *et al.*¹²).

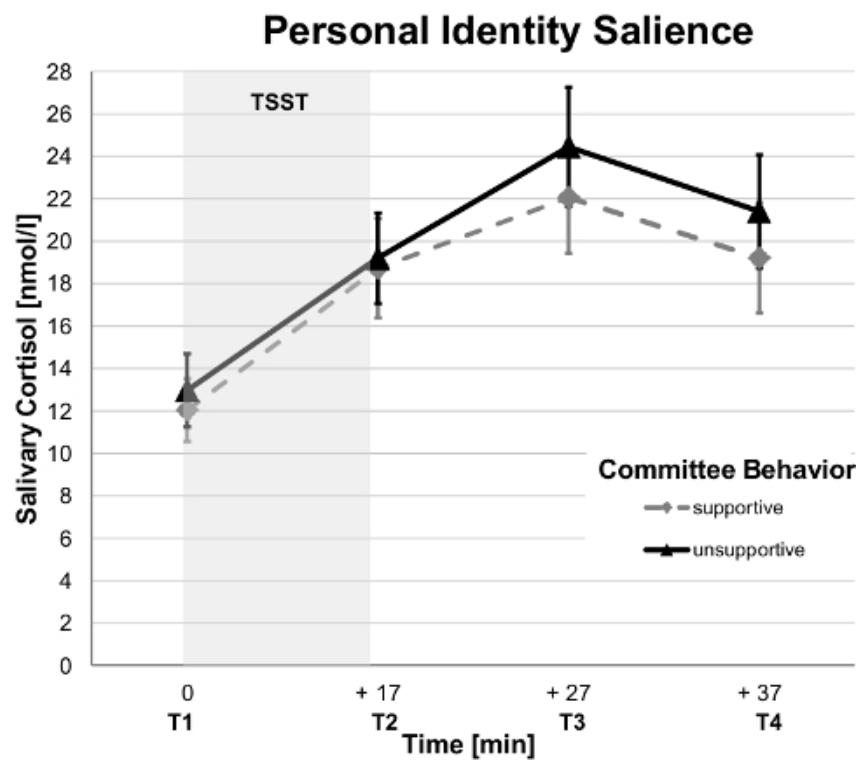
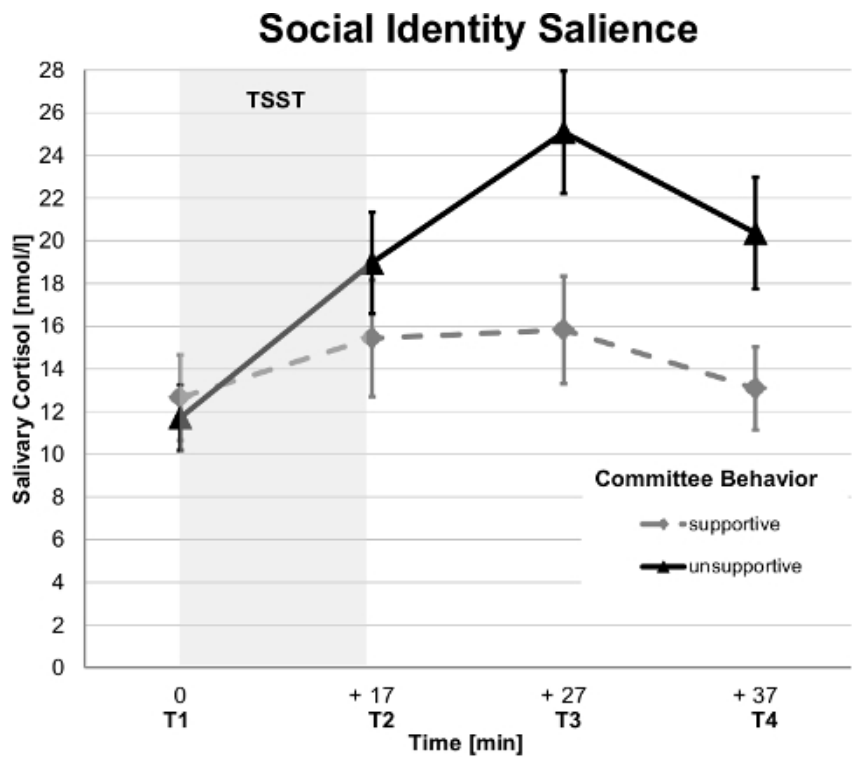


Figure 3. Interplay of identity salience and committee behavior (Frisch *et al.*¹²). Mean salivary (\pm standard error of the mean) cortisol concentrations as a function of identity salience, committee behavior and time. The x-axis represents the time elapsed since the beginning of the TSST (shaded area). This Figure is reprinted from *Journal of Experimental Social Psychology*, 55, Frisch, J.U., Häusser, J.A., van Dick, R., Mojzisch, A., Making support work: the interplay between social support and social identity, 154–161, Copyright (2014), with permission from Elsevier.

	Personal Identity		Social Identity	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Frisch et al. (2014)</i> (<i>N</i> = 90)				
1. I see myself as a member of this group.	3.72	1.85	5.32	1.41
2. I am glad to be a member of this group.	4.37	1.14	5.20	1.39
3. I feel strong ties with the other group members.	1.98	1.15	3.30	1.53
4. I identify with the other group members.	2.33	1.38	3.89	1.35
Social identification scale I ($\alpha = .85$)	3.10	1.05	4.43	1.20
<i>Häusser et al. (2012)</i> (<i>N</i> = 96)				
1. The other participants are representing a group that I identify with.	3.71	1.82	4.33	1.45
2. I feel that I share a lot of similarities with the other group members.	3.46	1.43	3.79	1.24
3. I feel that I am very different than the other participants. [R]	4.35	1.31	4.10	1.34
4. I feel that the other participants are similar to me.	3.25	1.33	3.65	1.31
5. I feel strong ties with other members of this group.	3.81	1.68	4.92	1.43
Social identification scale II ($\alpha = .83$)	3.58	1.21	4.12	1.01

Table 1: Manipulation check identity salience. Participants were asked to rate their agreement with the four/five statements¹⁹ on 7-point Likert scales ranging from 1 = “not at all” to 7 = “extremely”. The global identity scale was calculated in both studies by averaging all four/five items. [R] = reverse scored.

	Rating of participants (N = 90)				Rating of videos (N = 23)			
	I perceived the other participants as/they tried to...				The two committee members behaved/tried to...			
	Unsupportive committee behavior		Supportive committee behavior		Unsupportive committee behavior		Supportive committee behavior	
	M	SD	M	SD	M	SD	M	SD
1: ... supportive during the assessment center task	1.93	1.41	3.18	1.70	1.41	0.44	4.98	1.61
2: ... hostile during the assessment center task [R]	5.57	1.60	3.39	1.77	6.07	1.23	2.00	1.08
3: ... help me/the job applicant during the assessment center task	1.39	1.09	2.66	1.52	1.48	0.82	3.67	1.48
4: ... support me/the job applicant emotionally during the assessment center task	1.46	1.09	3.18	1.81	1.30	0.69	5.26	1.42
Committee behavior scale (α = .85)	1.80	1.00	3.41	1.35	1.53	0.69	4.98	1.18

Table 2: Manipulation check committee behavior. Participants as well as video-raters were asked to indicate their agreement with the four statements on 7-point Likert scales ranging from 1 = "not at all" to 7 = "extremely". The committee behavior scale was calculated by averaging all four items. [R] = reverse scored.

Discussion

This protocol describes two effective manipulations of (a) the relationship between different protagonists in the TSST (*i.e.*, between participants in the TSST-G¹¹ or between the TSST-committee and the participant¹²) and (b) the behavior of the TSST-committee¹².

The proposed manipulation of social identity has several strengths. First, it can be easily implemented before commencing the TSST. Hence, it does not alter the standard TSST protocol, which is important to reliably trigger stress responses. Second, although the manipulation is very minimal (*e.g.*, no verbal interaction, no common duty of group members), it still produces reliable differences in group identification. Third, it does not rely on creating new (rather meaningless) social categories, but aims to make a shared identity salient (in this case: being a student of a certain university). Fourth, by explicitly forbidding participants to talk to each other in both identity conditions, a high control of the experimental situation is achieved and the use of confederates is more feasible. Also, regarding the manipulation of the behavior of the (un)supportive persons, the described protocol guarantees high experimental control. The use of a detailed list of different (un)supportive non-verbal behaviors and trained confederates ensure a standardized behavior.

Nevertheless, four limitations of the proposed experimental manipulations and methods have to be considered. First, the success of the manipulation of the committee behavior highly depends on acting skills and thorough training of the confederates. The training of the confederates includes learning the procedure of the TSST and the exact wording of the verbal instructions of the committee. Furthermore, the confederates are provided with a list of the supportive and unsupportive behaviors and have to practice them several times. The practice sessions should include several full TSST-trials with dummy participants and video feedback should be used to analyze and improve the committee behavior. In our studies we used psychology students as confederates, but one might also consider using professional actors or drama students as confederates. Importantly, the behavior of the committee during the TSST should be as natural and as responsive as possible. Otherwise, participants might suspect that the committee members act a role instead of attributing the positive/negative behavior to be a reaction to their own performance in the TSST. At the same time, the behavior of the committee members should vary as little as possible across participants. Second, although participants in the social identity conditions reported stronger identification with the group than participants in the personal identity condition, the mean scores in the social identity condition were rather moderate. Considering how minimal the described

manipulation of identity was, this is not surprising. Intriguingly, even though manipulations were rather subtle, they still produced a strong buffering effect on the release of the stress hormone cortisol^{11,12}. Third, the proposed procedure contains deception of participants (*i.e.*, use of confederates, faked drawing of lots procedure, scripted behavior). Hence, it is very important that the experimenter fully debriefs the participants and explains why deception was necessary. Fourth, a related limitation is that these procedures only work properly when participants are naive. Therefore, participants should be told not to reveal any details of the study to other potential participants in order to reduce the risk of a contaminated participant pool.

In conclusion, the proposed manipulations are designed in a modular fashion. Depending on the research questions, one can apply either one or both of them. Although these manipulations have been introduced here in the context of the TSST, they can be transferred to other stress induction protocols, for example to the Socially Evaluated Cold-Pressor Test (SECPT)²¹, which in addition to social-evaluative stress also induces physical pain. More importantly, the manipulations can be integrated into many other protocols of standardized social interactions in the laboratory. For example, they could be used to investigate effects of supportive/unsupportive behavior and of social identity on trust games²², negotiations²³, or group decision-making (*e.g.*, hidden profile tasks^{24,25}). Hence, the proposed manipulations provide opportunities to examine the role of social identities and (un)supportive behavior in a wide range of different social situations.

Disclosures

The authors have nothing to disclose.

Acknowledgements

This research was supported by a grant (AZ: 76202-29-3/11) from the Ministry for Science and Culture of Lower Saxony (Germany) to Andreas Mojzisch and Jan Häusser.

References

1. Aristotle, Jowett, B., Davis, H.W.C. *Aristotle's Politics*. Clarendon Press, Oxford (1920).
2. Baumeister, R.F., Leary, M.R. The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychol. Bull.* **117** (3), 497-529 (1995).
3. Thorsteinsson, E.B., James, J.E. A meta-analysis of the effects of experimental manipulations of social support during laboratory stress. *Psychol. Health.* **14** (5), 869-886 (1999).
4. Uchino, B.N., Cacioppo, J.T., Kiecolt-Glaser, J.K. The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychol. Bull.* **119** (3), 488-531 (1996).
5. Frisch, J.U., Häusser, J.A., Mojzisch, A. The Trier Social Stress Test as a paradigm to study how people respond to threat in social interactions. *Front. Psychol.* **6** (14) (2015).
6. Kirschbaum, C., Pirke, K., Hellhammer, D.H. The 'Trier Social Stress Test'—a tool for investigating psychobiological stress response in a laboratory setting. *Neuropsychobiology.* **28** (1-2), 76-81 (1993).
7. Kudielka, B.M., Hellhammer, D.H., Kirschbaum, C. Ten years of research with the Trier Social Stress Test—revisited. *Social neuroscience: integrating biological and psychological explanations*. Harmon-Jones, E., Winkielman, P., Eds. Guilford Press, New York (2007).
8. Dawans, B., Kirschbaum, C., Heinrichs, M. The Trier Social Stress Test for Groups (TSST-G): a new research tool for controlled simultaneous social stress exposure in a group format. *Psychoneuroendocrino.* **36** (4), 514-522 (2011).
9. Tajfel, H., Turner, J.C. An integrative theory of intergroup conflict. *The social psychology of intergroup relations*. Austin, W.G., Worchel, S., Eds. Brooks Cole, Monterey, CA (1979).
10. Gockel, C., Kerr, N.L., Seok, D.-H., Harris, D.W. Indispensability and group identification as sources of task motivation. *J. Exp. Soc. Psychol.* **44** (5), 1316-1321 (2008).
11. Häusser, J.A., Kattenstroth, M., van Dick, R., Mojzisch, A. "We" are not stressed: social identity in groups buffers neuroendocrine stress reactions. *J. Exp. Soc. Psychol.* **48** (4), 973-977 (2012).
12. Frisch, J.U., Häusser, J.A., van Dick, R., Mojzisch, A. Making support work: the interplay between social support and social identity. *J. Exp. Soc. Psychol.* **55**, 154-161 (2014).
13. Nuttin, J.M. Narcissism beyond Gestalt and awareness: the name letter effect. *Eur. J. Soc. Psychol.* **15** (3), 353-361 (1985).
14. Jones J.T., Pelham B.W., Carvallo, M., Mirenberg, M.C. How do I love thee? Let me count the Js: implicit egotism and interpersonal attraction. *J. Pers. Soc. Psychol.* **87** (5), 665-683 (2004).
15. Taylor, S.E., Seeman, T.E., Eisenberger, N.I., Kozanian, T.A., Moore, A.N., Moons, W.G. Effects of a supportive or an unsupportive audience on biological and psychological responses to stress. *J. Pers. Soc. Psychol.* **98** (1), 47-56 (2010).
16. Haslam, S.A. *Psychology in organizations: the social identity approach.*, 2nd ed., Sage, London (2004).
17. Kudielka, B.M., Hellhammer, D.H., Wüst, S. Why do we respond so differently? Reviewing determinants of human salivary cortisol responses to challenge. *Psychoneuroendocrino.* **34** (1), 2-18 (2009).
18. Kudielka, B.M., Gierens, A., Hellhammer, D.H., Wüst, S., Schlotz, W. Salivary cortisol in ambulatory assessment—some dos, some don'ts, and some open questions. *Psychosom. Med.* **74** (4), 418-431 (2012).
19. Doosje, B., Ellemers, N., Spears, R. Perceived intragroup variability as a function of group status and identification. *J. Exp. Soc. Psychol.* **31** (5), 410-436 (1995).
20. Birkett, M.A. The Trier Social Stress Test protocol for inducing psychological stress. *J. Vis. Exp.* **19** (56), e3238 (2011).
21. Schwabe, L., Haddad, L., Schachinger, H. HPA axis activation by a socially evaluated cold-pressor test. *Psychoneuroendocrino.* **33** (6), 890-895 (2008).
22. Berg, J., Dickhaut, J., McCabe, K. Trust, reciprocity, and social history. *Game Econ. Behav.* **10** (1), 122-142 (1995).
23. Pruitt, D.G., Lewis, S.A. Development of integrative solutions in bilateral negotiation. *J. Pers. Soc. Psychol.* **31** (4), 621-633 (1975).

24. Stasser, G., Titus, W. Pooling of unshared information in group decision making: biased information sampling during discussion. *J. Per. Soc. Psychol.* **48** (6), 1467-1478 (1985).
25. Mojzisch, A., Schulz-Hardt, S. Knowing others' preferences degrades the quality of group decisions. *J. Pers. Soc. Psychol.* **98** (5), 794-808 (2010).