

**Group Identification and Participation in Community Adaptation Action: The
Mediating Role of Sense of Community Responsibility**

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Abstract

Climate change makes collective adaptation action increasingly important, but the participation numbers in such initiatives remain low. This study investigates the dynamics of group identification, sense of community responsibility (SOC-R), and participation intention in collective climate action. We hypothesized that group identification is positively related to participation intention (H1) and SOC-R (H2), and that SOC-R in turn is also positively related to participation intention (H3). Further, we hypothesized that the relationship between group identification and participation intention is mediated by SOC-R (H4). A correlational design was used to test these Hypotheses. The study was conducted using an online questionnaire, with a selective sample of 124 participants from the Oosterparkwijk neighborhood in Groningen (NL). The results showed that SOC-R was positively related to group identification and participation intention. Furthermore, the relationship between group identification and participation intention was indirectly mediated by SOC-R. These findings point towards an importance of SOC-R for participation in community adaptation initiatives. The implications of this in the context of collective climate action are discussed and future research is outlined.

Keywords: community adaptation action, group identification, sense of community responsibility (SOC-R)

Group Identification and Participation in Community Adaptation Action: The Mediating Role of Sense of Community Responsibility

Climate change confronts humanity with a major global challenge (Fritsche et al., 2018). According to the 6th IPCC report, at least 3.3 billion people are at risk due to the resulting natural disasters, water scarcity, and food shortages (IPCC, 2023). The report therefore calls for urgent action to reduce the negative impact and work towards the vision of a climate-resilient global community through sustainability and environmental protection, two goals that are also mentioned in the 17 Sustainable Development Goals of the United Nations (UNDP, 2023). To achieve these goals great efforts are needed from states and companies, but also from communities and individuals.

However, despite this threat, many people struggle to take action themselves, even when they have environmental concerns, demonstrating a gap between knowledge and actions (Blake, 1999). This might be because individuals feel that they alone have very little influence on climate change or that they lack the time or money to cause major changes. In fact, Fritsche et al. (2018) argue that large-scale crises resulting from collective behavior, such as climate change, can only be solved at a collective and not an individual level. In line with this, doubts are growing that focusing on individual behavioral change alone will be sufficient to meet climate goals (Peattie & Peattie, 2009). This underlines the importance of not only focusing on individual factors, but on collective climate action. In view of this, it stands to reason that investigating collective climate action is crucial to combat the threat that climate change poses (Jackson, 2009 as cited in Bamberg et al., 2015; Seyfang, 2009 as cited in Bamberg et al., 2015).

Such collective climate initiatives have already demonstrated their success several times (Esteves et al., 2021). Examples include the Transition Towns movement (Bamberg et al., 2015; Hopkins, 2008 as cited in Bamberg et al., 2015), an initiative that promotes

community-led climate projects with a focus on energy consumption. In the same line, there are local initiatives in which communities become active and invest for instance in sustainable energy generation opportunities (Middlemiss and Parrish, 2010; Seyfang and Smith, 2007). In addition to the aforementioned benefit of increased effectiveness of collective action, previous research suggests that it may also help to engage more people even when they are less concerned about sustainability issues (Sloot et al., 2018). Nevertheless, the number of participants in community-led climate actions has so far been low (Bomberg and McEwen, 2012). To get more people engaged in climate initiatives, it is therefore important to investigate what the psychological motives for participation in collective climate actions are (Sloot et al., 2019).

Accordingly, studies have already been carried out to investigate the motives for participating in collective initiatives. For example, based on previous research in the context of collective climate actions, both extrinsic and intrinsic motivators were found to be relevant (Juma et al., 2023; Sloot et al., 2019). Examples of extrinsic motivators include financial motives (Sloot et al., 2019), social contact (Bührle & Kimmerle 2021), and social recognition (Juma et al., 2023). Yet in the long term, intrinsic motivators, such as involvement in a community, in particular appear to encourage participation in collective initiatives (Sloot et al., 2019). Besides personal values and interests (Juma et al., 2023), several studies indicate that group identification plays a decisive role for engagement in community initiatives in general (e.g. Heath et al., 2017). Most importantly, it is also predicted that the same applies for participation in collective climate action (Fritsche et al., 2018).

Group Identification

Whilst there is no standard concept of group identification and the definition varies between different concepts (e.g. Henry et al., 1999; Klandermans, 2002), this paper defines group identification based on the study by Hogg et al. (2007) as a feeling of connectedness or

belonging to a group setting (Tajfel and Turner, 1979 as cited in Hogg et al., 2007; Turner et al., 1987 as cited in Hogg et al., 2007). According to the social identity theory, group identification is related to collective action because individuals act in line with the behavior of the group they are identifying with (Fritsche & Massen, 2021, Reicher et al., 2010; Tajfel & Turner, 1979 as cited in Fritsche & Massen, 2021). Thus, members of a group adjust their behavior with the norms and goals of the group (Ellemers et al., 1999, Fritsche et al., 2018, Sloot et al., 2019). In addition, when people identify with a group, they start to view the environment from the perspective of the group (Turner, 1982 as cited in Greenaway, 2024) and take more action to achieve group objectives (Haslam, 2004 as cited in Greenaway, 2024).

In fact, the positive influence of group or community identification on participation was shown for example by Van Vugt (2001), who demonstrated that it could help save community water resources. More general, Heath et al. (2017) emphasizes in their article on urban regeneration that group identification is important for commitment to helping the community and giving back. This is in line with research findings by Knight et al. (2010) and Haslam et al. (2009), which show that group identification is positively associated with active participation. Also, with regard to sustainability and climate protection, it has already been shown that identification with a group appears to be important for participation in community-led climate protection measures (Goedkoop et al., 2022, Sloot et al., 2018).

Despite these initial findings, psychological determinants that motivate people to participate in collective climate actions have not yet been widely researched (Rees & Bamberg, 2014; Van Zomeren et al., 2010). This work therefore contributes to the growing literature that aims to improve our understanding of the relationship between group identification and participation in community-led climate actions. As most studies in this area focus on climate change mitigation and climate protests, this study examines group

identification in the context of collective adaptation actions in communities. Due to potential differences (Castiglione et al. 2022; Wannewitz & Garschagen 2023), Wannewitz et al. (2023) point out the importance of investigating group identification in the context of climate adaptation in their study on collective adaptation action. Accordingly, this paper will examine whether the same findings can be found for collective adaptation measures as for climate change mitigation.

Sense of Community Responsibility

Besides group identification, we propose that sense of community (SOC-R) may be another important psychological determinant of collective climate action. It can be described as a sense of personal accountability for the overall welfare and prosperity of a community without direct personal benefit (Nowell & Boyd, 2014).

Although it is related to the concept of group identification, the theoretical framework is different (Nowell & Boyd, 2014). According to Nowell and Boyd (2014) being part of a community is both, resource and responsibility. It is a resource because humans generally seek to be part of a community and a responsibility, as people feel accountability for it (Bahl & Hagen, 2017; Lowe et al., 2016). Thus, the theoretical framework of SOC-R is based on individual opinions and belief systems. It is believed that individuals with elevated SOC-R scores strive for consistency between their personal opinions. More specifically, they strive for consistency in terms of their perceived responsibility for the community and their actual behavior and thus become in fact more engaged (Boyd & Nowell, 2017; Parti et al., 2020). To date, however, relatively little is known about the dynamics between SOC-R, identifying with a community, and participation in general (Nowell & Boyd, 2014).

A number of attempts have been made in this direction in recent years. Although the relationship between SOC-R and group identification is unknown, a relationship has been found across similar concepts such as sense of community (Nowell & Boyd, 2014) and

community identity (Yang et al., 2020). It has been suggested that SOC-R correlates with sense of community and participation in community-related activities in the context of substance abuse (Nowell & Boyd, 2014; Treitler et al., 2018). Similarly, a study by Yang et al. (2020) showed that SOC-R, community identity and altruistic behavior within the community are positively related. SOC-R was also found to be related to political engagement (Prati et al., 2020). Although altruistic behavior and political engagement are not identical with participation in collective action, this paper argues that it can be understood as a form of collective engagement. In addition, it is assumed that SOC-R can be applied in different contexts (Nowell & Boyd, 2014). Consequently, examining SOC-R in the context of collective climate action might be beneficial for a deeper understanding of the determinants for participation.

Initial attempts have been made to investigate the dynamics between SOC-R, sense of community and community participation. In a study by Deng et al. (2022), it was found that sense of community predicts community participation in residential communities and that this relationship is mediated by the SOC-R. Nevertheless, these relationships have not yet been sufficiently investigated. Furthermore, none of the studies measures collective climate action. Therefore, the present study addresses this lack of research by testing the relationship between SOC-R and participation in community adaptation action, and exploring whether a potential effect of group identification on participation in collective climate action can be explained through SOC-R.

In contrast to previous studies, this study does not measure sense of community or community identity, but group identification. Although similar, this is distinct from community identity and sense of community. Thus, this paper attempts to fill a research gap by examining the relationships and dynamics between SOC-R, group identification, and participation in community-led climate change adaptation initiatives (see Figure 1).

Hypothesis 1. Group identification is positively related to participation intention in community adaptation initiatives.

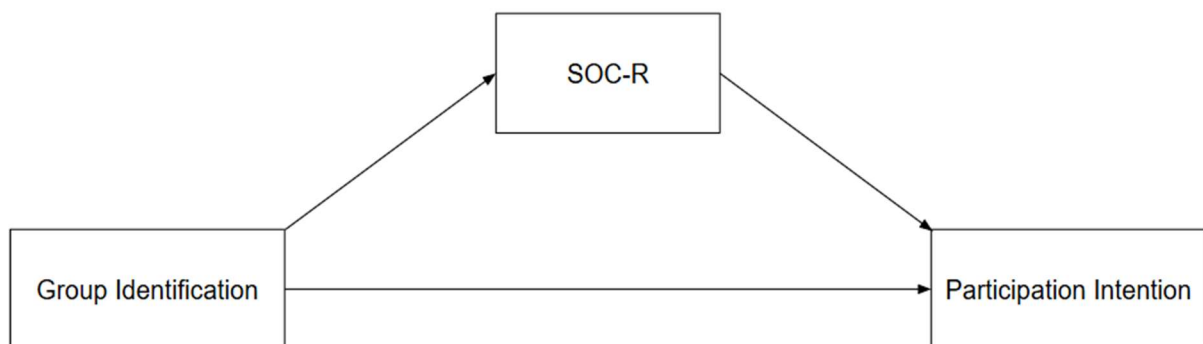
Hypothesis 2. Group identification is positively related to SOC-R.

Hypothesis 3. SOC-R is positively related to participation intention in community adaptation initiatives.

Hypothesis 4. The relationship between group identification and participation intention in community adaptation initiatives is mediated by SOC-R.

Figure 1

Graphical Representation of Research Model



Method

Participants

A total of $N = 124$ participants took part in this study. Cases in which the questionnaire was not completed, or the attention check was not passed were excluded from the analysis. All participants were at least 18 years old, besides no other demographic measures were assessed. The data was collected using a selective sample, with participants being residents of the Oosterparkwijk neighborhood in Groningen in the Netherlands. The Oosterparkwijk neighborhood was chosen because it often has gardens in the front or the back

of the houses, and it consists of private and rented houses, different rental prizes, as well as a mixed population in terms of Socio-demographics. Thus, it was assumed that the neighborhood was suitable for getting representative data for the general population. Access to a garden and being at least 18 years old were the only requirements for participation. Taking part in the survey was voluntary and the participants did not receive monetary compensation.

Procedure

Bachelor students approached households with garden in the Oosterparkwijk neighborhood and asked adults to fill in an online questionnaire about climate change adaptation. Prior to data collection, the survey was authorized by the Ethics Committee of Psychology of the University of Groningen. The streets were chosen using Google maps, to ensure that the houses provide access to a garden. Data collection took part during the weekdays after regular working hours in the afternoons and evenings, between 4.30pm and 8.00pm. Participants were presented a QR-code that led them to the online questionnaire and could choose between a Dutch and an English version of the questionnaire. Additionally, participants were able to choose between filling in the questionnaire in the presents of the bachelor students or alone. At the beginning of the questionnaire, participants had to give informed consent to continue with the questionnaire and were informed about the purpose of the research. Afterwards, a brief introduction was given to an initiative called NK Tegelwippen, which aims to create greener neighborhoods and make the Netherlands more climate-proof (for full information see Appendix B). It was also explained that participants could engage in the initiative by removing tiles in their front or backyard and replace them with greenery. Then, participants answered questions about participating in the initiative and the psychological motives of participating in the initiative. Participation intention was measured first, to ensure that it is not influenced by the other questions. Following

participation intention, questions about group identification, entitativity, norms, efficacy beliefs, SOC-R, and perceived discrimination were asked. An attention check was included in the scale about norms. Completing the questionnaire took about ten minutes. After completing the questionnaire, participants were presented with a link to the NK Tegelwippen website, where they could find more information about taking part in the initiative.

Measures

The created questionnaire comprised a total of 30 questions, compiled mostly from various existing questionnaires (see Table 5-11 in Appendix B). Only the subquestions on the constructs group identification, SOC-R, and community adaptation participation intention in the initiative were relevant for this study. An attention check was included in the questionnaire, asking participants to select “strongly agree” on a 7-point Likert scale (Likert, 1932).

Group Identification

To assess group identification, the single-item measure of social identification (SISI) was used (Postmes et al., 2012). Postmes et al. (2012) recommend SISI as a robust substitute for longer measures and reported good validity as well as good test-retest reliability ($r = .59$). The single item had a 7-point Likert scale format (Likert, 1932) from ‘strongly disagree’ to ‘strongly agree’ on the question: “I identify with the people in my neighbourhood”.

Sense of Community Responsibility

SOC-R was assessed using a scale that was established by previous research on that construct. The SOC-R scale was initially developed in relation to community collaboration (Nowell & Boyd, 2014) and consists of six items. It was subsequently also used in the context of community-based substance abuse prevention (Treitler et al., 2018) and in a modified form in respect to co-workers (Boyd & Nowell, 2017). Thereby it demonstrated consistently good psychometric properties and unidimensionality. Prati et al. (2020) further confirmed the

validity of the instrument through cross-cultural validation. Using the SOC-R scale for co-workers (Boyd & Nowell, 2017), they also obtained good psychometric properties when translated into Italian and used in a different cultural background. These results are particularly relevant considering the questionnaire's use in the Netherlands and its bilingual nature.

In this study, a shortened version of the modified version of the SOC-R scale for co-workers (Boyd & Nowell, 2017) from Prati et al. (2020) was used, which consists of questions such as “It is easy to put aside my agenda in favour of the greater good of my neighbourhood” (see Table 10 in Appendix B for all items). The scale measures SOC-R in respect to the local community and demonstrated a high internal consistency with Cronbach's $\alpha = 0.86$ (Prati et al., 2020). Adapted to the study, the term ‘community’ was replaced by ‘neighbourhood’ among two of the three chosen items. The items had a 7-point Likert scale format (Likert, 1932) from ‘strongly disagree’ to ‘strongly agree’.

Participation Intention

Community adaptation participation intention was assessed using four items with a 7-point Likert scale format (Likert, 1932) from ‘extremely unlikely’ to ‘extremely likely’ and included items such as “Based on this initiative, to what extent would you be likely to participate in this initiative” (see Table 5 in Appendix B for all items).

Study Design

The study had a correlational design with the independent variables group identification and SOC-R, and the dependent variable community adaptation participation intention. All three variables were assessed using the questionnaire as described above. The Hypotheses were tested quantitatively using the data collected from the questionnaire.

Results

To investigate the four Hypotheses regarding the relationships between group identification, SOC-R, and community participation intention in collective climate action, simple linear regressions and a mediation analysis were conducted. The data collected was analyzed using the statistical software Jasp (Jasp, 2024). The significance level was $\alpha = .05$ for all analyses. Out of the $N = 124$ participants, 27 participants were excluded because they did not pass the attention check. Another case was excluded due to limited data. For the analysis, thus $N = 96$ observations were included.

Before testing the Hypotheses, the internal consistency of the participation intention and SOC-R scales were checked. For the participation intention scale, Cronbach's alpha was $\alpha = .87$, indicating that the participation intention scale is reliable and thus comparable to the internal consistency of the scales reported in other related contexts. For the SOC-R scale, Cronbach's alpha was $\alpha = .64$, which is acceptable but indicates lower internal consistency than commonly found in different versions of the scale in other related contexts.

Assumptions

For testing the Hypotheses with simple linear regressions and a mediation analysis, it was assumed that the variables group identification, SOC-R, and participation intention were normally distributed. Further assumptions were linear relationships, and independent as well as normally distributed residuals with same variance.

Normal distribution could not be rejected for the participation intention variable, as shown by Shapiro-Wilk tests ($W = .98, p = .185$). The Shapiro-Wilk test indicated that group identification ($W = .92, p < .001$) and SOC-R ($W = .97, p = .027$) deviated from a normal distribution (for full descriptives see Table 1). For SOC-R, three outliers were identified (see Figure 8 in Appendix). Cook's distance did not show influential cases ($Di < .5$), hence no further cases were excluded from the analysis.

Table 1

Descriptive Statistics of Group Identification, SOC-R, and Participation Intention, and Correlations between Variables

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3
1. Group Identification	96	4.35	1.58	–		
2. SOC-R	96	4.59	1.06	.348***	–	
3. Participation Intention	96	4.40	1.29	.164	.365***	–

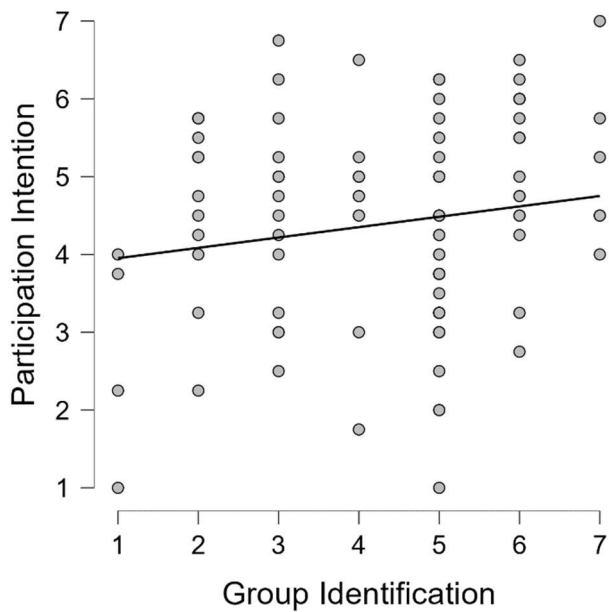
Note: Range of Likert scales = 1-7; *** $p < .001$

Homoscedasticity and linearity of the residuals were checked using residual scatterplots (see Figure 9-12 in Appendix A), whereby no violations were observed. Also, the residuals followed a normal distribution, which was observed using Q-Q plots of standardized residuals (see Figure 13-16 in Appendix A). Since not all assumptions were fully met, the results should be considered with caution.

Simple Linear Regressions

Descriptively, positive correlations between group identification and participation intention (H1), group identification and SOC-R (H2), as well as between SOC-R and participation intention (H3) were found (see Table 1). In order to further investigate the Hypotheses, simple linear regressions were conducted.

To test if group identification is positively related to participation intention (H1), a simple linear regression with group identification predicting participation intention was used (see Figure 2). A Wald t -test for the predictor revealed that group identification was only descriptively, but not statistically significant related to participation intention ($t = 1.61$, $p = .111$). Thus, the first Hypothesis was not confirmed.

Figure 2*Scatterplot with Regression Line of Group Identification and Participation Intention*

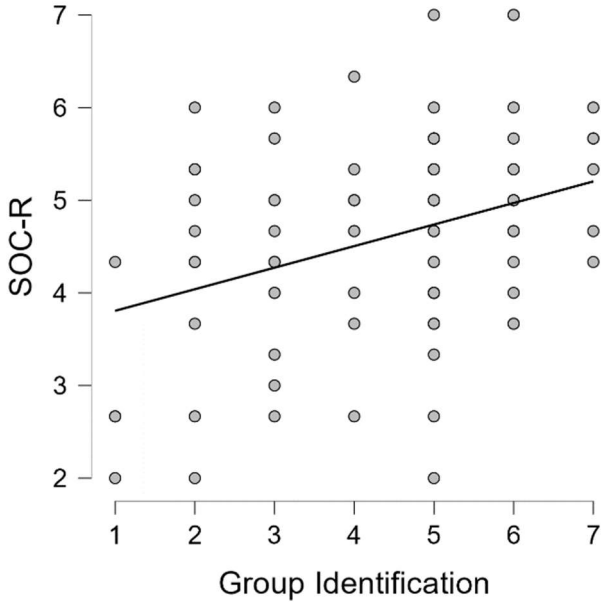
Note: $r = .164$; $r^2 = .03$; $p = .111$; $\beta = .13$; Intercept = 3.82.

Similarly, to test if group identification is positively related to SOC-R (H2), a simple linear regression was conducted (see Figure 3). Using a Wald t -test for the predictor, it was found that group identification significantly predicted SOC-R ($t = 3.60$, $p < .001$). Accordingly, the second Hypothesis was confirmed.

Again, a simple linear regression was run to determine if SOC-R is positively related to participation intention (see Figure 4). The Wald t -test indicates that SOC-R significantly predicts participation intention ($t = 3.80$, $p < .001$). Thus, the third Hypothesis was confirmed.

Figure 3

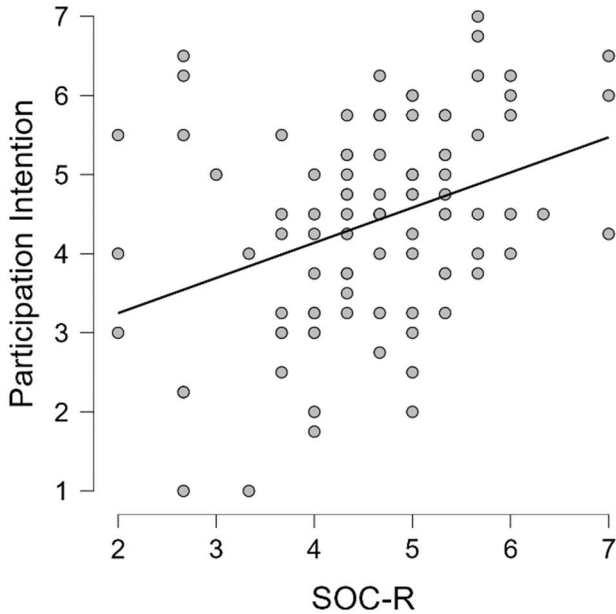
Scatterplot with Regression Line of Group Identification and SOC-R



Note: $r = .348$; $r^2 = .12$; $p < .001$; $\beta = .23$; Intercept = 3.57.

Figure 4

Scatterplot with Regression Line of SOC-R and Participation Intention



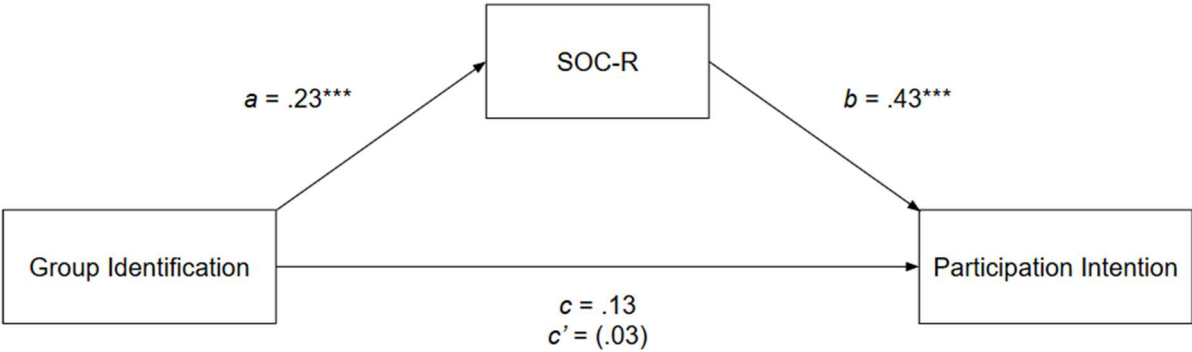
Note: $r = .365$; $r^2 = .13$; $p < .001$; $\beta = .44$; Intercept = 2.36.

Mediation Analysis

To test Hypothesis 4 whether group identification predicts participation intention and whether the direct effect would be mediated by SOC-R, a mediation analysis was conducted. As known from the results of H1, no significant effect of group identification on participation intention was found. When including SOC-R as a mediator, however, group identification was a significant predictor of SOC-R, as shown in the results of H2. SOC-R, in turn, was a significant predictor of participation intention as known from the results of H3. The relationships are displayed in Figure 5. Thus, the mediation analysis showed that SOC-R indirectly mediated the relationship between group identification and participation intention, partially confirming Hypothesis 4 (for direct, indirect, and total effect see Table 2).

Figure 5

Standardized Regression Coefficients for the Relationship between Group Identification and Participation Intention as Mediated by SOC-R



Note: *** $p < .001$; $a = .23$ with 95% CI [.11, .36]; $b = .43$ with 95% CI [.18, .67]; $c = .13$ with 95% CI [-.03, .29]; $c' = .03$ with 95% CI [-.13, .2].

Table 2*Results of SEM Mediation Analysis on Participation Intention*

Effect	β	(SE)	p	95% CI	
				LL	UL
Total Effect	.13	.08	.104	-.03	.29
Direct Effect	.03	.08	.682	-.13	.2
Indirect Effect	.1	.04	.012*	.02	.18

Note: $N = 96$. CI = 95%; * $p < .05$; LL = lower limit; UL = upper limit.

Exploratory Analysis

Since no significant positive relationship between group identification and participation intention was found, contrary to Hypothesis 1, we explored the relationships between group identification and the single items of the community adaptation participation intention variable. Interestingly, despite the high internal consistency of $\alpha = .87$, a correlation was found between group identification and item four of the participation intention variable. This item was about investing resources into the initiative ($r = .273$) (see Table 3 for all descriptives). A simple linear regression was run to test if group identification is a predictor of this participation intention item (see Figure 6). The Wald t -test indicated a significant positive relationship between group identification and the fourth participation intention item ($t = 2.75$, $p = .007$).

Since a significant positive relationship between group identification and the fourth participation intention item was found, we repeated the mediation analysis, but replaced the participation intention variable with that specific item. We had hypothesized that group identification would be related to participation intention and that this relationship would be mediated by SOC-R. However, group identification was not significantly related to participation intention, and thus, we only found an indirect mediation of SOC-R.

Table 3

Descriptive Statistics of Participation Intention Items and Group Identification, and Correlations Between Variables

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Group Identification	96	4.34	1.58	–				
2. Participation Intention 1 ^a	96	4.57	1.63	.054	–			
3. Participation Intention 2 ^b	96	4.19	1.68	.164	.793***	–		
4. Participation Intention 3 ^c	96	4.52	1.47	.098	.553***	.580***	–	
5. Participation Intention 4 ^d	96	4.31	1.25	.273**	.636***	.595***	.60***	–

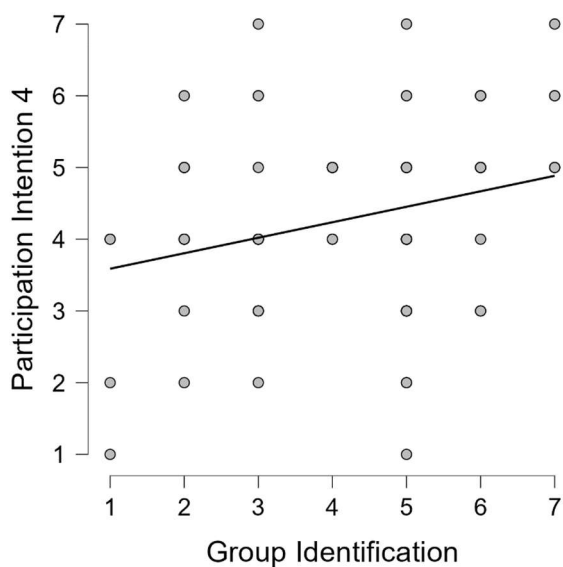
Note: Range of Likert scales = 1-7; ** $p < .01$, *** $p < .001$

^a the likelihood of participating in this initiative. ^b the likelihood of enrolling for this initiative.

^c the likelihood of seeking more information about this initiative. ^d the likelihood of investing resources in this initiative.

Figure 6

Scatter Plot with Regression Line of Group Identification on Item 4 of Participation Intention

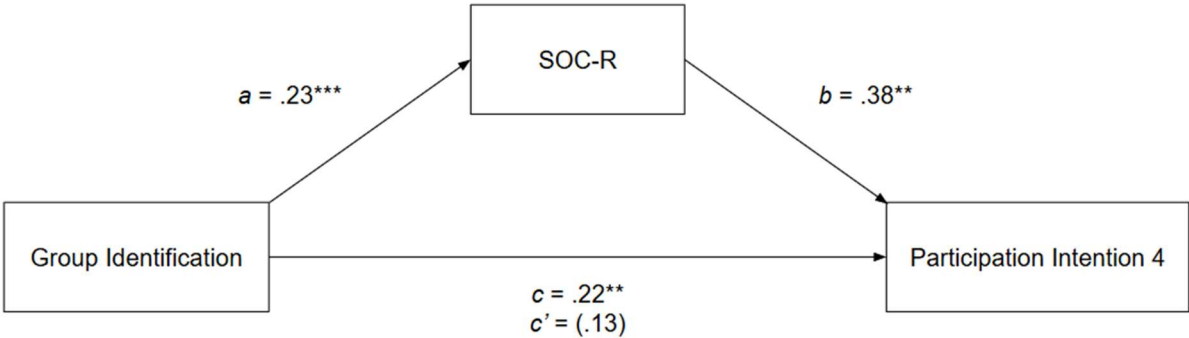


Note: $r = .273$; $r^2 = .07$; $p = .007$; $\beta = .22$; Intercept = 3.37.

When re-running the mediation analysis, an effect of group identification on the fourth item of participation intention was evident, as we explored before in the exploratory analysis. When adding SOC-R as the mediator to the model, group identification was still a significant predictor of SOC-R, as shown in the original mediation analysis and in Hypothesis 2. SOC-R, in turn, was a significant predictor of the fourth participation intention item. This relationship is displayed in Figure 7). Thus, the effect of group identification on the fourth item of participation intention was fully mediated by SOC-R (for direct, indirect, and total effect see Table 4).

Figure 7

Standardized Regression Coefficients for the Relationship Between Group Identification and Item 4 of Participation Intention as Mediated by SOC-R



Note: ** $p < .01$, *** $p < .001$; $a = .23$ with 95% CI [.11, .36]; $b = .38$ with 95% CI [.15, .61]; $c = .22$ with 95% CI [.06, .37]; $c' = .13$ with 95% CI [-.03, .28].

Table 4*Results of SEM Mediation Analysis on Item 4 of Participation Intention*

Effect	β	(SE)	p	95% CI	
				LL	UL
Total Effect	.22	.08	.005**	.06	.37
Direct Effect	.13	.08	.104	-.03	.28
Indirect Effect	.09	.04	.016*	.02	.16

Note: $N = 96$. CI = 95%; * $p < .05$, ** $p < .01$; LL = lower limit; UL = upper limit.

Discussion

This study investigated the relationship between group identification, SOC-R, and participation intention in community-led climate adaptation initiatives, in order to obtain a deeper understanding of the underlying psychological determinants for participation in collective action. To this end, it was analyzed whether SOC-R functions as a mediator between group identification and participation intention in a climate adaptation initiative called NK Tegelwippen, conducted in the neighborhood “Oosterparkwijk” in Groningen.

Hypothesis 1 regarding a positive relationship between group identification and participation intention was not confirmed. Descriptively, the effect points in the expected direction, yet it is not statistically significant. Accordingly, identifying with the community did not seem to play a decisive role for participation intention in the climate adaptation initiative. This was surprising as previous work suggested the importance of group and community identification on collective climate action (e.g. Goedkoop et al., 2022; Sloot et al., 2018). It might be noteworthy, however, that the proposed initiative was about climate change adaptation and not mitigation. As discussed in the introduction, there is a lack of studies investigating group identification in the context of collective climate change adaptation actions and whether adaptation differentiates from mitigation (Wannewitz et al., 2023). Future

work may disentangle whether potential differences between them may account for the decreased influence of group identification.

Another explanation could be that this study measured identification with the neighborhood, while Sloot et al. (2018), for example, measured identification with a community energy initiative. This is an important difference because for the energy initiative, the group norms and values are likely to be pro-environmental and thus, align with participation in an energy initiative. Although it is known from the last local elections that the population of the city Groningen is mainly pro-environmental (Coalitieakkord Gemeinde Groningen, Wikipedia contributors, 2023), it cannot be concluded that the norms of the Oosterparkwijk neighborhood align with participation in collective climate action. Furthermore, a study by Van Vugt (2001) suggests that identification with the community only leads to participation in community-led climate action when it is perceived that the community is threatened. Consequently, it might be that the relationship between group identification and participation intention in the initiative is not significant due to missing norms or threat perception.

In line with Hypothesis 2, group identification was positively associated with SOC-R. As predicted, participants with high group identification also perceived a stronger SOC-R. Thus, residents of the Oosterparkwijk neighborhood felt more responsible for their community when they identified more strongly with it. This is consistent with previous findings on the relationship between SOC-R and concepts similar to group identification, such as sense of community (Nowell & Boyd, 2014) and community identity (Yang et al., 2020). Nonetheless, demonstrating the relationship with group identification is important as the concept of SOC-R is relatively new and under-researched, but appears to be important in the field of community psychology (Nowell & Boyd, 2014).

As predicted in Hypothesis 3, a positive relationship between SOC-R and participation intention in community adaptation initiatives was found. Accordingly, residents who felt responsible for the well-being of the neighborhood also stated that they are willing to participate in the initiative. This aligns with previous research on SOC-R, which has found that it is related to participation in community action and engagement in collective action (Prati et al., 2020; Treitler et al., 2018; Yang et al., 2020). It also supports the suggestion that SOC-R can be applied to different community contexts (Nowell & Boyd, 2014), as to the authors' knowledge, it has not yet been applied to the context of community adaptation initiatives. Therefore, these findings are an initial indication that SOC-R may play a role for participation intentions of community-led climate adaptation actions.

Regarding Hypothesis 4, SOC-R appears to indirectly mediate the relationship between group identification and participation intention in community adaptation initiatives. This means, group identification was not directly related to participation intention in community adaptation but influenced participation intention in community adaptation initiatives only through SOC-R. This is in line with the results of Hypotheses 1-3. More specifically, it suggests that group identification per se does not play a significant role in participation intention in collective climate action. However, group identification is important for SOC-R, which in turn is related to participation intention in collective climate action. Thus, residents who felt connected to the Oosterparkwijk neighborhood perceived a higher responsibility to take care of it and were consequently more willing to engage in the initiative.

Overall, there is very limited literature on the dynamics between group identification, SOC-R, and participation in community initiatives. An initial study by Deng et al. (2022) found that the relationship between sense of community and participation in community activities is partially mediated by SOC-R. Unlike the current study, Deng et al. (2022) found a direct relationship between sense of community and community participation, while this study

only found an indirect relationship between group identification and participation intention. Interestingly, Deng et al. (2022) found this effect for a Chinese population, thus it is important to show that the results found for a western population indicate the same underlying pattern. Furthermore, Nowell and Boyd (2014) showed that a sense of belonging and connectedness to the community increases SOC-R, which acts as a motivator to participate in community action. Similar relationships were found for group identification, SOC-R, and participation intention. Thus, our findings are mainly in line with the results of previous research and support that SOC-R, at least indirectly, mediates the relationship between identification and belonging to a community and participating in community activities.

Given the unexpected results of a non-significant relationship between group identification and participation intention (H1), we further investigated it exploratorily. Interestingly, a closer look at the different types of participation intention addressed by the questionnaire could provide valuable insights into possible explanations of these findings. Although there was no positive effect of group identification on the global value of participation intention, a different picture emerged when analyzing the individual items. In fact, this revealed that there was no connection to participation intention in the form of activities which can be understood as individual or even household like tasks, such as removing tiles in the own garden or retrieving information about the initiative. In contrast, however, there was indeed an effect on participation intention in the form of investing resources into the initiative, such as donating money to the initiative. The latter refers to a broader and rather collective form of participation within the initiative. Thus, group identification might relate to participation intention for activities in a collective, but not in an individual sense, implying that the relationship could depend on the type of participation.

Based on this positive relationship between group identification and, we call it collective participation intention, we also repeated the mediation analysis exploratorily, but

replaced the general participation intention with the collective participation intention. In contrast to H4, group identification showed a direct effect on collective participation intention. Thus, residents of the Oosterparkwijk neighborhood strongly identifying with their neighborhood were more willing to invest resources into the initiative. However, this effect of group identification on collective participation intention was fully mediated by SOC-R. Accordingly, residents of the Oosterparkwijk neighborhood strongly identifying with their neighborhood were more willing to invest resources into the initiative, because their strong identification led to a high responsibility for their neighborhood, which in turn caused their willingness to invest resources. This mediation effect in the exploratory analysis is in line with the findings of Deng et al. (2022) regarding the direct effect. As discussed above, they found a direct effect of sense of community on participation in community action. However, their effect was only partially mediated by SOC-R, while we found that SOC-R fully mediated the effect of group identification on collective participation intention.

Limitations and Future Directions

Several limitations of this study need to be discussed. First, it is important to note that this study did not measure participation in community-led adaptation initiatives directly, but rather participation intention. Although intentions predict actual behavior (Sheeran, 2002, as cited in Sheeran & Webb, 2016), variation is possible, and therefore it must be taken into account that results for actual participation may differ. Furthermore, as this study has a correlational design, it is not possible to draw causal conclusions, and the direction of effect of the psychological factors is merely assumed. Investigating group identification, SOC-R, and participation in community adaptation initiatives as part of a longitudinal study would be beneficial to gain a better understanding of the direct effects and would allow the measurement of actual behavior.

In addition, it might be possible that the data was biased due to the methodology of this study. As participants were informed of the purpose of the study in advance, they may have given answers that they believed to be correct. Apart from that, it generally has to be taken into account that the Hypotheses were tested using self-reported data, which is subject to a number of biases such as social desirability. Also, it might be possible that mainly residents with strong opinions on climate change took part in this study so that their voices could be heard. Also, since only participants from one neighborhood in Groningen were included in the study, it is unclear if the results are generalizable to other neighborhoods, cities, or countries.

Furthermore, the study did not consider individual differences that might have influenced the outcomes, such as possible disabilities of participants that could impact the ability of engaging physically active in the initiative. Additionally, the initiative was based on removing tiles from the garden to achieve a greener and more climate proof neighborhood, but not all the gardens had tiles to remove, and some were already green. Those participants might have perceived the initiative as not applicable for them. Moreover, compared to some other studies on SOC-R (e.g. Deng et al., 2022; Yang et al., 2020), this study was about climate change adaptation, a rather political topic compared to general community engagement. It could be speculated that this have caused weaker effects.

It is also notable that, compared to other studies, the internal consistency of the SOC-R scale was low. This could be due to the reduction of subquestions compared to other versions of the scale by Nowell and Boyd (2014) and Prati et al. (2020). In studies using the whole SOC-R scale from Nowell and Boyd (2014), the internal consistency was higher, indicating that it might be beneficial to use the whole scale. However, also the bilingual nature of this study has to be considered. It is possible that different interpretations of the questions in the Dutch version may account for the lower internal consistency.

Another point to address is that both, the measurement of participation intention as well as the initiative itself may not have been perceived in a collective manner. As discussed in the exploratory analysis, the subquestions of the participation intention scale could partly be understood as individual or household activities. The NK Tegelwippen initiative in principle allows for different forms of participation, such as removing tiles or investing resources, and the questionnaire therefore aimed to capture this. However, this may have resulted in measuring individual rather than collective behavior.

Accordingly, it might be important to differentiate between individual and collective forms of participation intention. In fact, group identification seemed to only influence participation intention for collective, but not for individual activities. Future research is needed to verify whether different subscales for collective and individual participation intention are needed. Moreover, potential differences in the influence of group identification concerning these subscales could be further explored.

For future research, it would be interesting to investigate the effect of group identification and SOC-R on participation intention and actual participation in collective climate action with a longitudinal research design. In this way, the influence on actual participation and the connection between participation and the corresponding intention could be measured. At the same time, short- and long-term differences in the impact of psychological factors could be investigated. It has been theorized, for instance, that SOC-R might be more influential for community participation in the short-term, while sense of community is more important for long-term participation (Prati et al., 2018).

Furthermore, this study indicates that SOC-R is important for participation in community led adaptation action. This is in line with previous research, since SOC-R has already been successfully applied in various contexts (e.g., Deng et al., 2020; Treitler et al., 2018; Yang et al., 2020). Thus, the question of how SOC-R can be fostered becomes

important to utilize the theoretical findings in the concrete context of community-led climate change adaptation. Future research could therefore further investigate group identification and potential other underlying factors of SOC-R to gain a better understanding of what enhances SOC-R.

To apply the theoretical findings in the concrete context of community-led climate change adaptation, interventions that strengthen group identification and SOC-R could offer useful tools. For encouraging participation in collective climate action, strengthening residents' feelings of connection with their community, for example through community meetings, and appealing to residents' responsibility towards the community might be fruitful. It would be beneficial to explore such interventions and to test them in practice.

Conclusion

The current study presents an initial attempt to examine the role of SOC-R on participation in community-led climate change adaptation initiatives. The results demonstrated the link between group identification and SOC-R, between SOC-R and participation intention as well as the important role of SOC-R as a mediator between group identification and participation intention. Moreover, the study points to the possibility that a distinction may be drawn between individual and collective participation intentions. While SOC-R was related to both participation intentions, a direct effect of group identification was only found for the collective participation intention.

The study therefore contributes to the existing body of literature by providing a deeper understanding of the underlying mechanisms of participation. It highlights the importance of group identification and especially SOC-R and implies that interventions regarding these psychological determinants of participation can be effectively applied to the context of community-led climate change adaptation. This is particularly important given the threat that

climate change poses to humanity and the need for collective climate action (IPCC, 2023; UNDP, 2023).

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Appendix A

Figure 8

Boxplot with Outliers for the Dependent Variable SOC-R

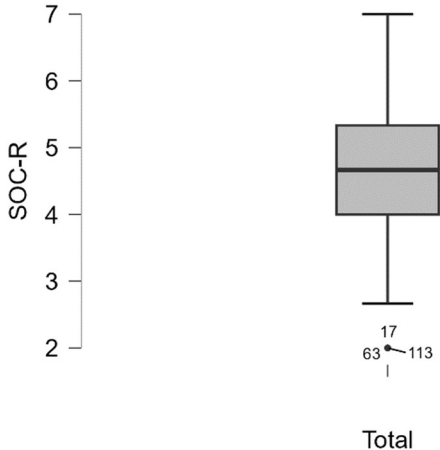


Figure 9

Residuals Scatterplot of Group Identification on Participation Intention

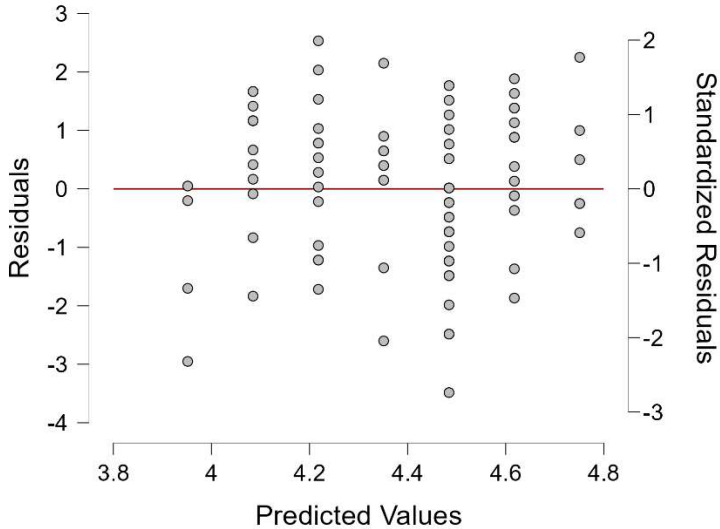


Figure 10

Residuals Scatterplot of Group Identification on SOC-R

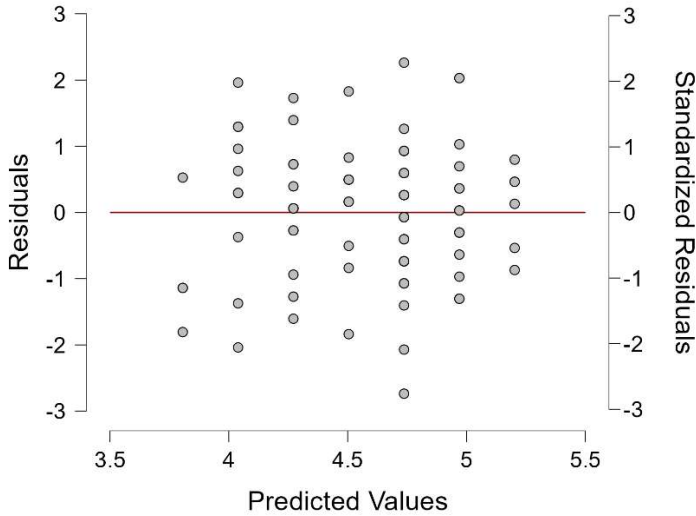


Figure 11

Residuals Scatterplot of SOC-R on Participation Intention

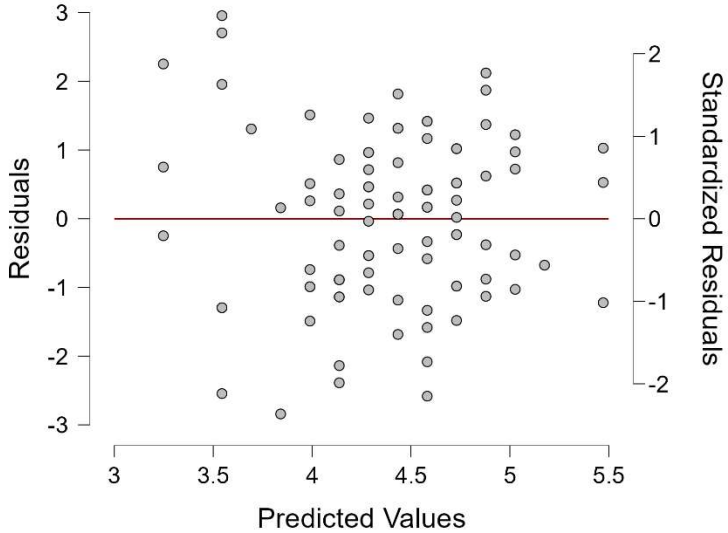


Figure 12

Residuals Scatterplot of Group Identification on Participation Intention 4

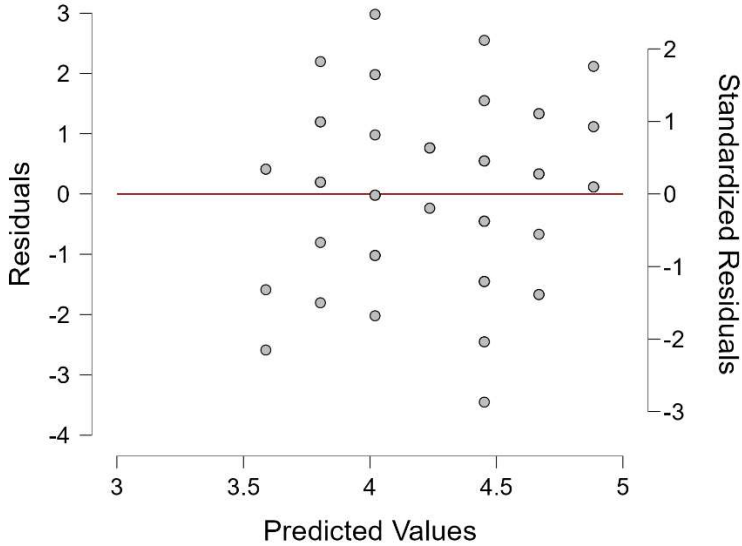


Figure 13

Q-Q Plot Standardized Residuals of Group Identification on Participation Intention

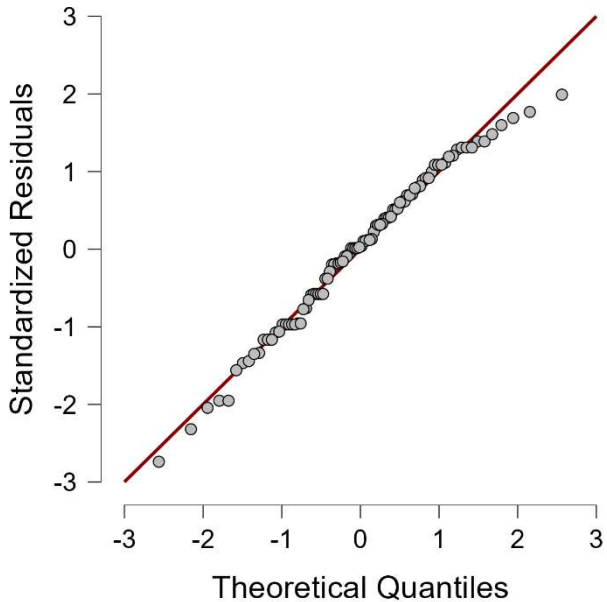


Figure 14

Q-Q Plot Standardized Residuals of Group Identification on SOC-R

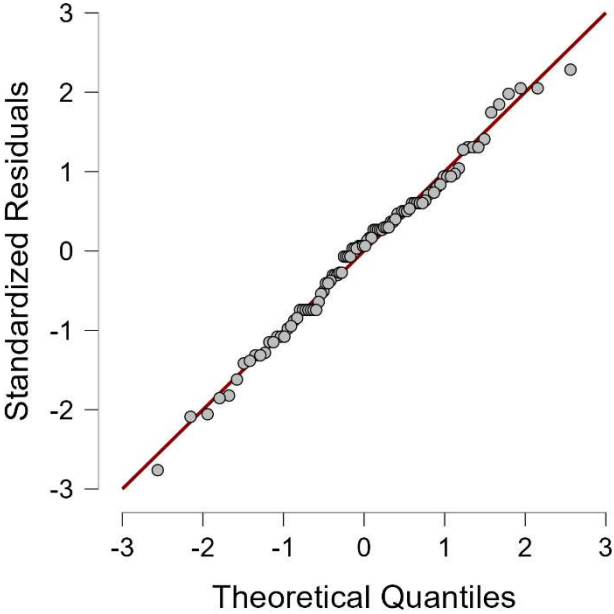


Figure 15

Q-Q Plot Standardized Residuals of SOC-R on Participation Intention

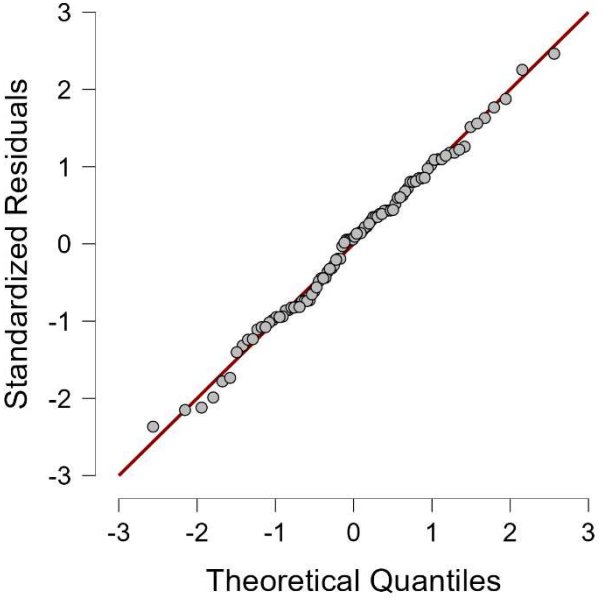
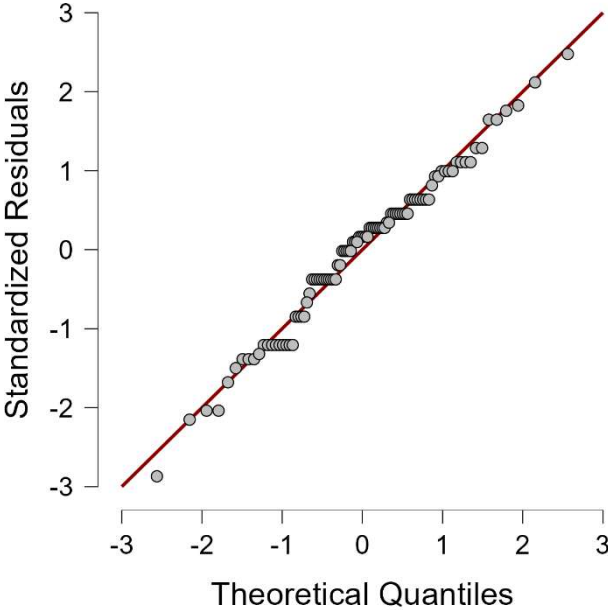


Figure 16

Q-Q Plot Standardized Residuals of Group Identification on Participation Intention 4



Appendix B

NK Tegelwippen Information



The NK Tegelwippen is a national initiative dedicated to creating greener neighbourhoods by encouraging the removal of tiles from household gardens. Aimed at making the Netherlands more climate-proof. This is because greener gardens are more effective at reducing the risks of both flooding and heat waves, due to higher rates of water retention and cooling effects.

Since 2021 municipalities have competed annually on the amount of tiles removed from the gardens. Alongside your neighbours, you can join the initiative by replacing your tiles with greenery such as grass, plants and trees. Each tile you remove will be added to the ‘tilecounter’ of your municipality. Your participation will not only help your municipality compete, it will also help combat the local risks caused by climate change.

More useful information on how to participate and tips for greening can be found on their website. (Provided at the end of the questionnaire)

Table 5*Participation Intention Scale*

Based on this initiative, to what extent would you be likely to...	1- Extremely unlikely to 7- extremely likely
...participate in this initiative	1 2 3 4 5 6 7
...enrol in this initiative	1 2 3 4 5 6 7
...seek more information about this initiative	1 2 3 4 5 6 7
...invest resources in this initiative	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Extremely unlikely; 2 = Moderately unlikely; 3 = Slightly unlikely; 4 = Neither likely nor unlikely; 5 = Moderately likely; 6 = Agree; 7 = Extremely likely

Table 6

Entitativity Scale

To what extent do you agree with the following statement?	1- Strongly disagree to 7- strongly agree
(‘We’ is referring to you and your neighbours)	
We feel like a group to me	1 2 3 4 5 6 7
We are alike	1 2 3 4 5 6 7
We see things much in the same way	1 2 3 4 5 6 7
We spend time interacting	1 2 3 4 5 6 7
We have been interacting for a while	1 2 3 4 5 6 7
We want to achieve the same goals	1 2 3 4 5 6 7
We strive for the same things	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree

Table 7

Norms Scale and Attention Check

To what extent do you agree with the following statements?	1- Strongly disagree to 7- strongly agree
People in my neighbourhood expect that I participate in such an initiative	1 2 3 4 5 6 7
People in my neighbourhood would participate themselves in such an initiative	1 2 3 4 5 6 7
People in my neighbourhood are doing something to help reduce the risk of climate change	1 2 3 4 5 6 7
This is an attention check. Please select ‘Strongly agree’	1 2 3 4 5 6 7
It is expected of me that I do my bit to help reduce the risk of climate change	1 2 3 4 5 6 7
People in my neighbourhood think that I should personally act to reduce the risk of climate change	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree

Table 8

Individual Efficacy Scale

To what extent do you agree with the following statement?	1- Strongly disagree to 7- strongly agree
I have the ability to participate in this initiative effectively	1 2 3 4 5 6 7
My participation will help accomplish the goals of this initiative	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree

Table 9

Collective Scale

To what extent do you agree with the following statement?	1- Strongly disagree to 7- strongly agree
Our neighbourhood has the ability to participate in this initiative effectively	1 2 3 4 5 6 7
The participation of our neighbourhood will help accomplish the goals of this initiative	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree

Table 10*SOC-R Scale*

To what extent do you agree with the following statement?	1- Strongly disagree to 7- strongly agree
One of the best things I can do to improve my neighbourhood is to be of service to my neighbours	1 2 3 4 5 6 7
It is easy to put aside my agenda in favour of the greater good of my neighbourhood	1 2 3 4 5 6 7
I feel like it is my duty to give to my community without needing to receive anything in return	1 2 3 4 5 6 7

Note: 7- point Likert Scale; 1 = Strongly disagree; 2 = Disagree; 3 = Somewhat disagree; 4 = Neither agree nor disagree; 5 = Somewhat agree; 6 = Agree; 7 = Strongly agree

Table 11*Perceived Discrimination Scale*

How often do these scenarios happen to you.	1- Never to 5- Always
You are treated with less respect than other people	1 2 3 4 5
You receive poorer service than other people	1 2 3 4 5
People act as if they think you are not as good as they are	1 2 3 4 5
People act as if they think you are dishonest	1 2 3 4 5
You are threatened or harassed	1 2 3 4 5

Note: 5- point Likert Scale; 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always