Risk Analysis, Vol. 41, No. 1, 2021 DOI: 10.1111/risa.13584

Kitchen Hygiene in the Spotlight: How Cooking Shows Influence Viewers' Hygiene Practices

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Poor hygiene when handling food is a major cause of foodborne illness. To investigate whether hygiene practices visible in television cooking shows influence viewers' kitchen hygiene, a study on the adoption of demonstrated hygiene behavior was conducted under controlled, experimental conditions. In a study ostensibly on cooking by following recipes participants (n = 65) were randomly assigned to one of three conditions, in which they watched a cooking video that differed only with regard to the hygiene behavior of the chef. In condition 1, the chef engaged in poor hygiene practices while preparing the dish, in condition 2 the chef's hygiene behavior was exemplary and in condition 3, the chef's hygiene behavior was not visible (control condition). After watching the video, participants were instructed to cook the recipe individually in the fully equipped laboratory kitchen. Cooking sessions were videotaped and experimenters blind to condition coded hygiene lapses committed by participants. The level of kitchen hygiene displayed in the cooking video significantly affected hygiene practices of participants cooking the recipe. Participants who had watched the cooking video with correct hygiene practices committed significantly fewer hygiene lapses than those who had watched the video with poor hygiene practices. From a risk communication perspective, TV cooking shows are well placed to convey knowledge of essential hygiene practices during food preparation to a broad audience. To facilitate behavioral change toward safer food-handling practices among viewers, visibly performing correct hygiene practices in cooking shows is a promising strategy.

KEY WORDS: Cooking; food safety; hygiene behavior; risk communication; television

1. INTRODUCTION

Home-cooked meals form an integral part of most peoples' lives, and are associated with beneficial health effects such as better diet quality and a moderate daily energy intake (Wolfson & Bleich, 2015). At the same time, the home environment has been identified as a primary location where foodborne illness cases occur (Byrd-Bredbenner, Berning, Martin-Biggers, & Quick, 2013; World Health Organization [WHO], 2002). Improper food-handling practices and unhygienic behavior in private kitchens contribute substantially to the spread and multiplication of pathogens causing foodborne infections (van Asselt, Fischer, de Jong, Nauta, & de Jonge, 2009). Observational studies show that consumers frequently violate basic food-handling recommendations such as hand washing after contact with raw chicken (Maughan et al., 2016; van Asselt et al., 2009).

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0272-4332/21/0100-0131$22.00/1

However, this is often not reflected in their self-reported hygiene behaviors, intentions, or risk perceptions (Byrd-Bredbenner et al., 2013; Redmond & Griffith, 2003). Although home cooking should generally be encouraged considering its beneficial effects, understanding how behavioral change toward safer food-handling practices may be facilitated should be a focus of risk communication research (Milton & Mullan, 2012).

Due to their reach and popularity (Mathiasen, Chapman, Lacroix, & Powell, 2004; Wolfson, Frattaroli, Bleich, Smith, & Teret, 2017), television (TV) cooking shows may play a role in shaping viewers' hygiene practices. Support for this assumption comes from research on media effects. Studies on how media may influence recipients' cognitions, emotions, attitudes, and behavior have proliferated since the advent of TV (Valkenburg, Peter, & Walther, 2016), which has led to an abundance of empirical studies and meta-analyses on media effects in domains as diverse as violence and aggression (Anderson et al., 2010; Huesmann, Moise-Titus, Podolski, & Eron, 2003), health behaviors (Snyder et al., 2004), and attention problems (Nikkelen, Valkenburg, Huizinga, & Bushman, 2014).

Of direct relevance to the current research question, several studies have shown that viewers tend to become more compliant with safety principles when exposed to televised or video-based content displaying safe behaviors, whereas exposure to (positive) portrayals of risky behaviors increases viewers' risk-taking inclinations and behaviors. For instance, students were more likely to wear masks and gloves in a laboratory setting when this behavior was demonstrated beforehand by a role model in a video presentation, compared to a video warning without a role model (Racicot & Wogalter, 1995). Similarly, after viewing TV safety demonstrations, children between the ages of five and eight years were less willing to take physical risks, as measured with pictorial child-relevant scenarios (e.g., jumping out of a swing) in which they could indicate the level of risk they would take (Potts & Swisher, 1998). With regard to health behaviors, exposure to video-based demonstrations tends to promote self-care and prevention behaviors among viewers compared to control groups in which the behaviors were not demonstrated (Albert, Buchsbaum, & Li, 2007; Janda, Stanek, Newman, Obermair, & Trimmel, 2002). Analogously to the demonstration of safe behaviors, media exposure to various types of risk-related behaviors, such as smoking scenes in movies (Pechmann & Shih, 1999), violence on TV (Huesmann & Taylor, 2006), and reckless driving in video games (Fischer et al., 2009), contribute to similar inclinations and behaviors in individuals (for a review, see Fischer, Vingilis, Greitemeyer, & Vogrincic, 2011).

Over the course of the last decades, a number of theories have been developed to explain the underlying mechanisms of media effects, among which social learning theory (Bandura, 1977) and the more comprehensive social cognitive theory (Bandura, 1986) appear particularly relevant in the context of this study (for a review of prominent media effect theories and exemplary meta-analyses of media effects, see Valkenburg et al., 2016). One major aspect of social cognitive theory, observational learning, describes how individuals learn behavior by modeling the behavior of others (Bandura, 1986). The principles of observational learning extend not only to real-life, interpersonal contacts, but also to media displays of behavior (Bandura, 2001). In line with Bandura's (1986) theorizing, research suggests that a high status or expert model promotes observational learning (Brewer & Wann, 1998; Buchanan, 2019), for which a professional chef demonstrating food preparation may be seen as a prime example. Indeed, preliminary evidence suggests that individuals tend to regard TV chefs as role models for food handling and report modeling certain hygiene behaviors after them (Woods & Bruhn, 2016). However, as studies from various countries have shown, TV chefs frequently fail to follow common kitchen hygiene recommendations (Borda et al., 2014; Cohen & Olson, 2016; Geppert et al., 2019; Maughan, Chambers IV, & Godwin, 2017). Consequently, integrating correct hygiene practices in cooking shows more frequently may serve to improve hygiene practices among viewers.

Although previous studies evaluated hygiene practices as seen in cooking shows as modeling behaviors (Cohen & Olson, 2016; Maughan et al., 2017), so far no study has directly assessed a causal effect of hygiene practices demonstrated by TV chefs in cooking shows on actual hygiene behavior among viewers. As self-reported measures of hygiene practices tend to show low correspondence with actual behavior (Byrd-Bredbenner et al., 2013; Redmond & Griffith, 2003), this study focused on the hygiene behavior of participants actually cooking a dish. After showing participants one of three cooking videos with varying hygiene standards, their hygiene behavior when cooking the demonstrated recipe was assessed under controlled, experimental conditions.

2. METHODS

2.1. Participants

Sixty-five individuals from the Cologne/Bonn metropolitan area in Germany (28 males, 37 females, M age = 48.30, SD = 15.36, age range: 20–76 years) volunteered to participate in a study ostensibly on cooking by following recipes. For the recruitment of participants, a market research company was commissioned to approach people in public spaces. Eligibility included participants' self-report of (1) watching cooking shows on TV at least occasionally, as well as (2) cooking meals at home at least occasionally. Participants were not aware that the study focused on hygiene behavior. The study complied with ethical principles and all participants gave written informed consent for video recording of the cooking session and anonymized analysis of the research data in accordance with the Declaration of Helsinki. Participants were reimbursed €75 (approximately $80 at the time) for taking part in the study, which took on average 2 hours and 40 minutes. In addition to the monetary reimbursement, participants could optionally take home the prepared dishes. However, in the case of severe hygiene lapses during preparation, participants were advised against eating the food.

2.2. Design and Procedure

Participants took part in the study individually and were randomly assigned to one of three conditions, in which they watched a cooking video that differed only with regard to the hygiene behavior of the chef. In condition 1, the chef engaged in poor hygiene practices while preparing the dish (for a list of committed hygiene lapses, see Table I), in condition 2 the chef's hygiene behavior was exemplary and in condition 3, the chef's hygiene behavior was not shown (control condition). Immediately after watching the video, participants were taken to the nearby kitchen that was equipped with common kitchen appliances and tools as well as all required cooking ingredients. After a 10-minute orientation on the kitchen and handling of appliances, participants were asked to cook the demonstrated recipe in the kitchen. The cooking sessions were videotaped from four different angles (see the Supporting Information) and one of two alternating experimenters coded hygiene lapses committed by participants. Following the recommendations for avoiding research bias, the two coders—like the participants—were blind to condition (i.e., double-blind research design) and were not the researchers themselves (Rosenthal, 1976). The two coders were already familiar with the specific coding scheme and instructions. One of them coded more than 30 hours of analogous material in a previous study on kitchen hygiene on a valid basis (Geppert et al., 2019). The second coder trained with the aforementioned material. On top of this established coding experience, internal pilot tests with staff were conducted with both coders, followed by a pretest of the full study design with five participants. As no adjustments to the procedure were required after pretesting, the five pretest participants were included in the final sample. The reliability of the codings was checked using the chance-adjusted Krippendorff's alpha coefficient. The coefficient was based on the agreement between both coders' ratings

Table I. Hygiene Lapses Visible in the Poor Hygiene Video

	Hygiene Lapse	Severity[a]
1	Hands not washed with soap under running water and then dried using a paper towel/hand towel after nonclean work with fresh chicken meat or raw egg	High
2	The same kitchen utensils—like knives and chopping boards—are used to cut raw chicken meat as well as foods to be eaten raw such as lettuce without being cleaned in-between	High
3	Hands not washed after contact with head hair	High
4	Dirty hands wiped on tea towel (after contact with raw chicken meat, lettuce, or raw egg)	Medium
5	Lettuce not washed	Medium
6	Use of chopping board to process foods and as work surface without thorough cleaning in-between	Medium
7	Adding cooked meat to lettuce by hand	Medium
8	Multiple use of the same spoon for tasting and stirring without cleaning in-between	Low–high[b]
9	Using fingers to take salt/spices from containers and seasoning with fingers	Low–high[b]

[a]Severity levels are based on the assumed effect of a certain hygiene lapse on the spread, survival, and multiplication of pathogens.
[b]Severity level varies between low and high depending on circumstances.

in the pretest. The value obtained for Krippendorff's alpha (0.794) confirmed that the ratings were reliable (Song et al., 2020).

The key dependent measure of interest was the hygiene behavior of the participants, operationalized as the number of hygiene lapses per minute cooking time. Hygiene lapses were assessed with a self-developed scoring sheet listing common violations of basic hygiene rules (see the Supporting Information). The scoring sheet was based on hygiene lapses previously observed in the context of TV cooking shows (Borda et al., 2014; Geppert et al., 2019; Maughan et al., 2017) and covered the key areas for safe food handling identified by the WHO (2006): keep clean, separate raw and cooked, cook thoroughly, keep food at safe temperatures (WHO also recommends to use safe water and raw materials, which was treated as a given in the context of our study). A draft version of the scoring sheet was reviewed by external experts in the field of food hygiene who were not involved in this study. Based on their suggestions, the scoring sheet was slightly revised.

After the cooking session, relevant participant characteristics such as cooking frequency and proficiency, attitudes and knowledge regarding kitchen hygiene as well as demographic characteristics were assessed with a paper-and-pencil questionnaire, and additional data unrelated to the present research question were collected. Subsequently, participants were fully debriefed, including information on the actual research question.

2.3. Cooking Video

The three versions of the cooking video showed a professional chef who presented the preparation of a dish in typical cooking show manner (e.g., speaking directly into the camera to the audience). The videos were produced by a film agency according to a storyboard developed by the study authors. The storyboard detailed preparation steps, verbal explanations and differences between the three video versions. The videos differed only with regard to the hygiene sequences, that is, specific behaviors that were hygienically relevant. For these sequences, the storyboard specified three alternative courses of action depending on the video version (i.e., poor/correct/control video). With regard to seasoning, for instance, the chef used a spoon to season the dish in the correct hygiene video; in the poor hygiene video, he used his fingers to season the dish after handling raw chicken; and in the control video, a close-up of the food being sprinkled with seasoning was shown (see Fig. 1).

A professional chef with TV experience was chosen to demonstrate the preparation of the dish to ensure an authentic impression of the videos that closely resembles typical TV cooking shows. For the same reason, the chef wore professional chef's clothing and worked in a professional kitchen environment. In line with social cognitive theory, the expert status of the chef may promote observational learning (Brewer & Wann, 1998).

Analogously to the development of the scoring sheet (see above), the hygiene behavior demonstrated in the videos was based on previous findings pertaining to the adherence to hygiene rules in TV cooking shows (Borda et al., 2014; Geppert et al., 2019; Maughan et al., 2017). Common mistakes observed on TV include poor hand hygiene, such as a lack of hand washing before starting food preparation, after handling raw food and after coughing, scratching or blowing one's nose; insufficient cleaning of utensils and surfaces between operations; as well as personal hygiene aspects such as wearing rings during food preparation. In total the poor hygiene video displayed nine different types of hygiene lapses frequently observed in TV cooking shows, some of which were committed more than once (see Table I). Conversely, in the exemplary video these mistakes were avoided and replaced by hygiene behavior that complies with WHO's (2006) recommendations for safe food handling. External experts in the field of food hygiene reviewed the hygiene videos.

The choice for the recipe (iceberg salad with chicken, pineapple, and homemade curry mayonnaise) was based on the combination of foods that are frequently affected by microbial contamination (e.g., raw chicken and eggs) and foods that are eaten without prior heating (e.g., salad). Due to the risk of cross-contaminating ready-to-eat foods with harmful bacteria, intermediate cleaning of hands and kitchen tools is essential when handling these foods. The duration of the cooking videos was five and a half minutes on average. Due to the inclusion of short sequences of correct hygiene practices (e.g., cleaning of hands), the correct hygiene video had a duration of approximately six minutes.

3. RESULTS

Data were analyzed with SPSS (version 21.0, IBM Corp., Armonk, NY, USA, 2012), with an alpha

(a) (b) (c)

Fig 1. Illustration of how three video versions with different hygiene levels were realized, using seasoning as an example. (Panel a) Correct hygiene video: Seasoning with spoon. (Panel b) Poor hygiene video: Seasoning with fingers (after touching raw chicken). (Panel c) Control video: Close-up of food being sprinkled with seasoning.

level of 0.05. The data of two participants—both from the control group—were excluded from the analyses. One participant exceeded the control groups' mean error rate per minute by more than 2.5 *SD*. Due to a technical failure, the cooking duration of one participant was unknown so that the dependent variable could not be calculated for this person. All analyses were carried out on the data of the remaining 63 participants. Table II provides an overview of participant characteristics by video group.

3.1. Main Analyses

To evaluate the effect of the cooking videos on the hygiene practices of the participants when cooking the recipe, a one-way analysis of variance (ANOVA) was performed with video as the between-subjects factor (poor hygiene, correct hygiene, no hygiene control video) and number of hygiene lapses per minute cooking time as the dependent variable. A significant overall effect of video was found ($F(2, 62) = 3.32$, $p = 0.043$, $\eta_p^2 = 0.10$), with pairwise Bonferroni-adjusted comparisons revealing a significant difference between the two experimental (i.e., correct and poor) hygiene groups. Participants who had watched the video showing correct kitchen hygiene practices committed significantly fewer hygiene lapses per minute ($M = 0.59$, $SD = 0.31$) than participants who had watched the video showing poor kitchen hygiene practices ($M = 0.88$, $SD = 0.44$), $t(41) = 2.58$, $p = 0.037$, $\eta_p^2 = 0.10$. The mean number of hygiene lapses per minute in the control condition fell in between those of the two experimental groups ($M = 0.74$, $SD = 0.34$), but pairwise comparisons with neither the correct hygiene nor the poor hygiene group were statistically significant (both p's > 0.05) using a conservative analytical approach with Bonferroni-adjusted comparisons. To take possible differences between outcome measures into account, analyses with an alternative dependent variable, total number of hygiene lapses per recipe, were conducted. These analyses yielded analogous results.

To control for individual differences, a one-way analysis of covariance (ANCOVA) was performed with video as the between-subjects factor (poor hygiene, correct hygiene, no hygiene control video), number of hygiene lapses per minute cooking time as the dependent variable, and participant characteristics (gender, age, professional experience with food [safety], cooking proficiency, cooking frequency, adherence to kitchen hygiene rules, hygiene standard in own kitchen, and frequency of watching cooking shows; see Table II) as covariates. Two notable findings were obtained. Most importantly, the significant effect of video on the number of hygiene lapses per minute remained significant ($p = 0.039$) when controlling for the influences of participant characteristics. Furthermore, on top of the effect of video on the number of hygiene lapses per minute, two participant characteristics (age and self-reported adherence to kitchen hygiene rules) had significant associations with the dependent variable. Younger age ($\beta = 0.278$, $p = 0.031$) and higher self-reported adherence to

Table II. Participant Characteristics by Video Group

	Poor Hygiene Video ($n = 22$)	Correct Hygiene Video ($n = 21$)	No Hygiene Control Video ($n = 20$)
Gender			
Male	$n = 9$ (41%)	$n = 7$ (33%)	$n = 11$ (55%)
Female	$n = 13$ (59%)	$n = 14$ (66%)	$n = 9$ (45%)
Age (in years)	$M = 45.9$ ($SD = 15.3$)	$M = 44.3$ ($SD = 13.8$)	$M = 44.0$ ($SD = 15.3$)
Professional experience with food (safety)			
Yes	$n = 2$ (9%)	$n = 3$ (14%)	$n = 3$ (15%)
No	$n = 20$ (91%)	$n = 18$ (86%)	$n = 17$ (85%)
Self-reported cooking proficiency			
Good or excellent	$n = 11$ (50%)	$n = 11$ (52%)	$n = 8$ (40%)
Average	$n = 8$ (36%)	$n = 6$ (29%)	$n = 8$ (40%)
Poor or very poor	$n = 3$ (14%)	$n = 4$ (19%)	$n = 4$ (20%)
Self-reported cooking frequency			
Six to seven days a week	$n = 7$ (32%)	$n = 6$ (29%)	$n = 1$ (5%)
Four to five days a week	$n = 6$ (27%)	$n = 10$ (48%)	$n = 7$ (35%)
Two to three days a week	$n = 7$ (32%)	$n = 3$ (14%)	$n = 9$ (45%)
One day a week or less	$n = 2$ (9%)	$n = 2$ (9%)	$n = 3$ (15%)
Self-reported adherence to kitchen hygiene rules			
Below average	$n = 0$ (0%)	$n = 1$ (5%)	$n = 1$ (5%)
Average	$n = 10$ (46%)	$n = 5$ (24%)	$n = 5$ (25%)
Above average	$n = 12$ (54%)	$n = 15$ (71%)	$n = 14$ (70%)
Self-reported hygiene standard in own kitchen			
Below average	$n = 0$ (0%)	$n = 0$ (0%)	$n = 0$ (0%)
Average	$n = 7$ (32%)	$n = 7$ (33%)	$n = 6$ (30%)
Above average	$n = 15$ (68%)	$n = 14$ (67%)	$n = 14$ (70%)
Frequency of watching cooking shows			
At least once a week	$n = 6$ (27%)	$n = 8$ (38%)	$n = 7$ (35%)
Less than once a week	$n = 16$ (73%)	$n = 13$ (62%)	$n = 13$ (65%)

hygiene rules ($\beta = -0.437$, $p = 0.008$) were associated with fewer hygiene lapses per minute.

3.2. Types of Hygiene Lapses

To examine whether participants differed in terms of the types of hygiene lapses they committed depending on the video they had watched, additional analyses focused on those hygiene lapses that were demonstrated by the chef in the poor hygiene video (e.g., wiping dirty hands on a tea towel, failing to clean utensils and surfaces between operations; cf. Table I). Results revealed that participants who had watched the poor hygiene video tended to commit particularly those hygiene lapses demonstrated by the chef in the video more frequently ($M = 0.69$, $SD = 0.31$) compared to participants who had watched the correct hygiene video ($M = 0.41$, $SD = 0.27$; $t(41) = 3.42$, $p = 0.008$, $\eta_p^2 = 0.22$). Further analyses taking the severity of the committed hygiene lapses into account showed that hygiene lapses of medium severity occurred more frequently ($M = 0.35$, $SD = 0.24$) than hygiene lapses of low ($M = 0.08$, $SD = 0.07$) or high severity ($M = 0.30$, $SD = 0.18$). For hygiene lapses of medium severity, pairwise Bonferroni-adjusted comparisons revealed a significant difference between the two experimental groups, again with fewer hygiene lapses per

minute in the correct ($M = 0.25$, $SD = 0.18$) compared to the poor video group ($M = 0.44$, $SD = 0.23$; $t(41) = 3.02$, $p = .025$, $\eta_p^2 = 0.11$). No significant differences between video groups were observed for hygiene lapses of low or high severity (both p's > 0.05).

3.3. Power, Sample Size, and Effect Size

A statistical power analysis (Cohen, 1988) could not be performed pre-experimentally (*a priori*) for sample size estimation, as the main dependent variable (number of hygiene lapses per minute cooking time) was a new measure with an unknown effect size. The sample size was instead based on published studies with a similar methodology (Potts & Swisher, 1998; Racicot & Wogalter, 1995).

Post hoc power analyses with G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) were conducted using a two-tailed test and an alpha of 0.05 to test the difference between two independent group means. A medium to large effect size (Cohen's $d = 0.76$) based on Cohen's (1988) criteria and a power of 0.68 were found for the difference between the two experimental groups (correct vs. poor hygiene video). This seems to be an acceptable level of power in view of the effortful recruitment procedure and implementation of the study. Given the unidirectional nature of the main hypothesis, a one-tailed test may be suitable; in this case, a power of 0.79 would be obtained.

As illustrated in Fig. 2, the mean in the control condition fell in between those of the two experimental groups (i.e., participants in the control condition committed more hygiene lapses than participants who had watched the correct hygiene video and fewer hygiene lapses than those who had watched the poor hygiene video), which is consistent with the general predictions of this study. However, as reported above, the pairwise differences with the control group did not reach statistical significance. In view of the smaller effect sizes and lower power for the pairwise comparisons with the control group ($d = 0.46$ and power $= 0.30$ for the difference between the control group and the correct hygiene group; $d = 0.36$ and power $= 0.19$ for the difference between the control group and the poor hygiene group), the occurrence of a Type II error cannot be ruled out (i.e., a significant difference may have been overlooked due to a lack of power). However, to obtain a power of 0.80 about 100 participants in each condition would have been required.

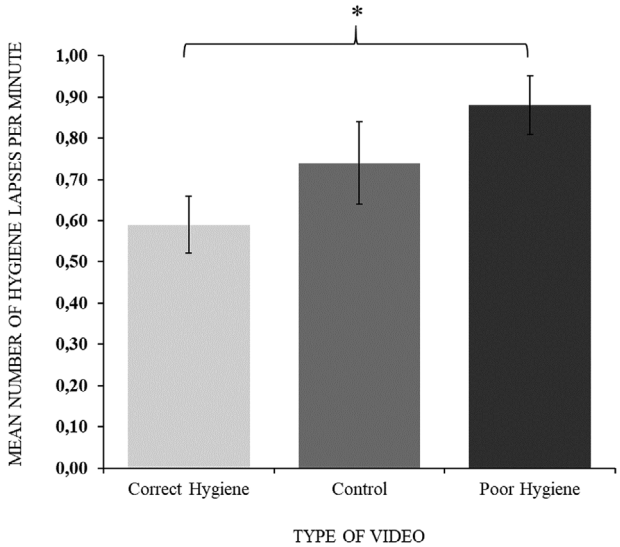

Fig 2. Mean number of hygiene lapses per minute depending on the type of video participants had watched (correct hygiene, control, or poor hygiene). Error bars represent standard errors (*SE*) of the mean. $*p < 0.05$.

4. DISCUSSION

In this study, participants who had watched a cooking video with correct hygiene practices subsequently committed significantly fewer hygiene lapses than those who had watched a video with poor hygiene practices. Whereas previous studies have shown that common kitchen rules to prevent foodborne illness are often not followed in both TV cooking shows (Maughan et al., 2017) and private homes (Byrd-Bredbenner et al., 2013), the present findings extend this research by showing that hygiene practices observed in cooking shows indeed affect viewers' hygiene behavior when cooking the demonstrated recipes. Crucially, participants in this study tended to repeat the types of hygiene lapses demonstrated by the chef with the poor hygiene practices. These findings are in line with the basic assumptions of observational learning (Bandura, 1986). Individuals tend to learn behavior by modeling the behavior of others, particularly others who are perceived as high status or expert models (Brewer & Wann, 1998; Buchanan, 2019).

As unhygienic hygiene practices in cooking shows have been observed in various countries (Borda et al., 2014; Geppert et al., 2019; Maughan et al., 2017), from a risk prevention perspective much can be gained by integrating correct hygiene behavior in these shows more frequently. This could

be done in one of two ways, either by explicitly addressing hygiene aspects in cooking shows, or by incidentally demonstrating correct hygiene to reinforce corresponding norms among viewers and promote behavioral change at a less conscious level (Bandura, 2001). Strategies to improve hygiene behavior often focus on the former, more educational approach (King et al., 2016).

In the context of TV cooking shows, however, explicitly addressing hygiene aspects may drive away those viewers who watch these shows mostly for entertainment rather than educational reasons. In addition, educational approaches may primarily affect knowledge levels rather than actual behavior (Clifford, Anderson, Auld, & Champ, 2009). Complementing educational approaches with a generally higher incidence and greater visibility of correct hygiene practices in cooking shows may be the more promising strategy to facilitate safer food-handling practices among viewers. Crucially, the present findings suggest that short, uncommented sequences suffice to affect viewers' kitchen hygiene in a favorable way. Whether explicitly addressing hygiene has similar beneficial effects or, for example, evokes reactance among viewers is a question for future research.

A limitation of this study is the artificial testing environment that limits generalization to hygiene behavior in the home setting. Considering that participants were aware that their behavior was monitored in the laboratory kitchen, hygiene lapses may be more frequent when cooking privately at home. In addition, there was only a brief delay between the presentation of the videos and the replication of the dish by the participants, which may have inflated the effects. Finally, although the power and sample size in this study were adequate for the main comparison of interest (correct vs. poor hygiene video), it cannot be ruled out that significant differences with the control group were overlooked due to a lack of power. Given the effortful recruitment procedure and implementation of the study, obtaining a power level of 0.80 for the comparably small differences with the control group was not feasible with limited research resources. Follow-up research may address this limitation by testing a larger sample of participants with proxy measures instead of actual behavior as dependent variables (e.g., cooking in a computerized or virtual reality environment that provides opportunities to commit hygiene lapses; see Moran, 2017). This way, the requirements for adequate statistical power and a considerate use of research resources may be reconciled. Although measuring actual behavior tends to yield more valid results (Byrd-Bredbenner et al., 2013), proxy measures may be a useful complement in resource-intensive study designs.

4.1. Implications

Hygiene sequences in TV cooking shows may often be edited out due to time constraints (Mathiasen et al., 2004; Maughan et al., 2017). Consequently, the absence of visibly performed hygiene practices can be interpreted as a failure to sufficiently prioritize food safety in TV shows rather than a shortcoming of individual TV chefs. The present findings suggest that visibly performing correct hygiene practices in cooking shows is a promising, easy to implement risk communication strategy to improve hygiene practices among viewers. TV cooking shows are well placed to convey knowledge of essential hygiene practices during food preparation to a broad audience, which may improve safe food-handling practices in private homes.

ACKNOWLEDGMENTS

The authors would like to thank Maria Behr, Annika Behrends, Natalie Berger, Dan Borzekowski, Volker Ebert, Petra Hiller, Elisabeth Kosiolek, Juana Kühn, Ann-Kathrin Lindemann, Lea Mörgenthaler, Sarah Schulze Struchtrup, and Heidi Wichmann-Schauer for their valuable comments and contributions.

Open access funding enabled and organized by Projekt DEAL.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure A1. Experimental set-up in the laboratory kitchen equipped with four cameras (marked in red).

Figure B1. Screenshot of video recordings from the four camera positions.

Table A1. Scoring Sheet Listing Common Violations of Basic Hygiene Rules