RESEARCH ARTICLE

No Pyro, No Party: Social factors, deliberate choices, and shared fan culture determine the use of illegal fireworks in a soccer stadium [version 1; peer review: 1 approved with reservations]

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Abstract

Lighting illegal fireworks inside soccer stadiums is a worldwide and persistent problem. Despite rules and regulations as well as rigorous enforcement, the use of illegal fireworks in football stadium is increasing rather than decreasing. Little is yet known about the causes and predictors of this behavior, preventing the development of effective interventions or communication strategies. We therefore conducted a qualitative study, using semistructured interviews with both supporters of a large Dutch soccer club who participated in lighting fireworks, and with professionals who dealt with illegal fireworks in daily practice. Semi-structures interviews were based on hooliganism literature as well as the COM-B model. We concluded that hooliganism and lighting illegal are distinctly different phenomena, although they share some underlying constructs. From a behavioral perspective, using the COM-B model as a framework, reflective motivation was identified as the strongest facilitator of lighting fireworks, which appeared to be an important part of supporter life and shared culture. Quick interventions that target automatic behavior, such as nudges, will probably thus not be successful in changing this behavior. Supporters suggest compromise between supporters and professionals as preferred future direction. Reported feelings of stigmatization by and feeling unappreciated by professionals, could interfere with successful implementation of this direction. Professionals however contradict negative to have judgements of supporters. Building a bridge between supporters and professionals should be a first step towards a solution.

Keywords

Soccer, illegal fireworks, COM-B, hooliganism, fan culture

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Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

In many countries around the world, supporters lighting fireworks in soccer stadiums is considered a growing problem. This is also the case in The Netherlands where lighting fireworks is the most often observed punishable offense in soccer stadiums (Nohlen & Harreveld, 2017) and where the number of incidents related to fireworks in soccer stadiums keeps increasing (e.g., Jaarverslag Voetbal en Veiligheid 2017/2018, 2018). Yet, lighting fireworks in soccer stadiums is illegal in The Netherlands as fireworks can legally be lit only around new year (article 2.1.1 of the Dutch Fireworks Decree). In addition, lighting fireworks is against regulations of the national (Royal Dutch Football Association; KNVB), the European (Union of European Football Associations; UEFA) and the global soccer associations (Fédération Internationale de Football Association: FIFA). Lighting fireworks concerns the safety of those inside the stadium as it is often difficult to keep the European recommended safety distance from fireworks of 1 to 15 meters (Guideline 2007/23/EG). Apart from potential direct damage or injury, lighting fireworks in stadiums was shown to cause a release of large amounts of nanoparticles, among which heavy metals, affecting health and the environment (Pirker *et al.*, 2020). Containing the lighting of fireworks is thus important.

Efforts to contain the lighting of fireworks are ample and directed towards soccer clubs as well as supporters. The UEFA fines soccer clubs if a club's supporters light fireworks. In addition, the UEFA and the KNVB can require clubs to ban supporters from specific stadium boxes or the whole stadium for one or multiple matches. Individual supporters who are caught carrying or lighting fireworks inside the stadium or the stadium area receive fines from the KNVB and the Dutch government adding up to approximately 900 euros. In addition to these fines, those supporters receive a stadium ban of minimum six months. To detect fireworks offenders, soccer clubs frisk supporters at the entrances to the stadium area and surveillance is used, namely cameras, stewards, and the police. In short, fireworks in soccer stadiums affects many people, involves high costs, and demands much effort from clubs, stewards, police, and prosecution.

The high number of fireworks related incidents shows that the behavior continues and that current repressive efforts are not effective (enough) (Football and Safety Audit Team, 2017). Increasing restrictive measures even further has multiple downsides because it may not be effective, it is expensive, and it is likely to make the atmosphere in the stadium less pleasant and welcoming especially for the majority of complying supporters. For instance, when waiting times at stadiums entrances are increased because of intensified frisking. Behavior change strategies grounded in a better understanding of the behavior of lighting fireworks are currently seldomly used, but may be effective, less restrictive, and cheaper. Therefore, we took a behavioral approach interviewing soccer supporters and professionals to understand the use of fireworks in the stadium. Specifically, we focused on social, individual, and contextual factors that could explain the behavior. Behavioral explanations are crucial for identifying effective behavior change strategies (e.g., Howlett *et al.*, 2020; Michie, Van Stralen & West, 2011).

This research was initiated when the municipality of Rotterdam approached the Behavioral Insights Group Rotterdam (BIG'R) in aiming to design strategies to contain the use of fireworks in the stadium of Rotterdam's largest soccer club, Feyenoord. Like other behavioral insights teams around the world (Afif *et al.*, 2018), BIG'R enables institutionalized collaborations between behavioral scientists and public servants to pioneer the application of behavioral insights for public policy (John, 2014). Feyenoord is one of the major soccer clubs of the Netherlands with on average about 45.000 supporters visiting home matches in the Feyenoord stadium (KNVB Expertise, 2015). Feyenoord is renowned for the extensive use of fireworks by the club's supporters (Hellinga, 2019).

To the best of our knowledge, (behavioral) scientific literature on lighting fireworks in stadiums is limited, leaving the phenomenon largely unexplained. When lighting fireworks, supporters however necessarily make planned efforts to not get caught and they risk adverse consequences (stadium bans, fines). This suggests that they perceive this behavior as important or valuable. Indeed, Brechbuhl and colleagues (2017) report that lighting fireworks is seen as important and likely part of a shared culture and identity for fanatical soccer supporters. However, the authors do not analyze the behavior of illegally lighting fireworks in depth since not fireworks, but markers of escalation are the prime focus of their research. The notion that fireworks are important to substantial groups of supporters is supported by the existence of several websites (e.g., In de Hekken), songs (e.g., "No Pyro No Party"), blogs, and YouTube profiles that are created and managed by supporters which discuss the subject in a positive manner.

Fireworks offenders may (in part) be the same social group as hooligans because fireworks tend to be lit by fanatic supporters and in stadium boxes that are also popular among hooligans. Based on a survey, Scholz and Hurych (2018) states that the majority of soccer hooligans indeed also engages in lighting fireworks, suggesting at least a partial overlap between supporters who light fireworks and hooligans. In the absence of a body of literature specifically on lighting fireworks by supporters, what is known about supporters and hooliganism is used to inform and contextualize our research. Soccer hooliganism, defined as violent and destructive behavior (Budim, 2018), is often explained by group

identity and a shared culture (Zimniak, 2020) in which the *ingroup* is contrasted with the *outgroup* (Ward, 2002). Within the ingroup, strong social ties, social identity within the group, and the use of symbolism are of great importance (Dionisio *et al.*, 2008). Spaaij (2008) identifies six fundamental features of the hooligan identity: excitement and pleasurable emotional arousal, hard masculinity, territorial identifications, individual and collective management of reputation, a sense of solidarity and belonging, and representations of sovereignty and autonomy. Therefore, ingroup and identity features are candidates for explaining the use of fireworks.

Scholz and Hurych (2018) however categorized less than 5% of fanatical supporters (i.e., supporters visiting the most fanatical box of boxes in the stadium) as hooligans, and it seems that for most coordinated fireworks events more than 5% of fanatical supporters is involved. This suggests that at least part of all fireworks lit inside the stadium cannot be attributed to hooligans. How large the overlap is between supporters who light fireworks and hooligans, is currently unknown. Hooligans are known to be supported in their behaviors by a group of other supporters who have a positive attitude towards hooligans, so called *hoolifans* (Rookwood & Pearson, 2012). Supporters that light fireworks may be supported in a similar way by other supporters who encourage and reward that behavior. For instance, fanatical female soccer supporters from Czech Republic indicate to almost never light fireworks but almost exclusively regard it as a positive act and sometimes even assist (Scholz, 2020). They may not do it because fanatical fandom in soccer stadium is still associated with traditional masculinity (Kossakowski *et al.*, 2020).

In the current study, we chose a qualitative design and took an interview approach. Explorative in-depth interviews are suitable for collecting information on complex (and understudied) phenomena (Sofaer, 1999). In order to gain understanding of both the perceived barriers as well as motivations for and facilitators of the behavior, interviews were based on elements described in hooliganism literature and the COM-B model (Michie *et al.*, 2011). This general behavioral model assumes that capability (physical and psychological), opportunity (social and physical), and motivation (automatic and reflective) are basic conditions for the occurrence of all human behavior. We chose this model because we considered it broad enough to accommodate the elements from the hooliganism literature (such as social environment and motivation) and because it could guide the exploration of other personal, social, and contextual factors affecting the behavior. Additionally, we investigated possible solutions and visions for the future. We interviewed supporters who frequently lit fireworks at the time of the interview or sometime in the past. Some had recently received a stadium ban for lighting fireworks. As a frame of reference, we also interviewed professionals who dealt with fireworks in the stadium as part of their work, e.g., employees of Feyenoord and police officers. Permission to conduct this research was obtained from the ethics review committee DPECS, ESSB, of the Erasmus University Rotterdam (19-045).

Methods

Participants

Supporters: 16 fanatical supporters of Feyenoord participated in this study (i.e. all participating supporters had, or recently had had a season ticket). Data collection stopped at this point because the first author conducting all interviews felt saturation was reached because no new information came up in the last interviews. Although sample size is small, we believe we gained a complete picture of the behavior, because the studied behavior was very specific, and the target group relatively homogenous. We used purposive sampling and interviewed both supporters who were lighting fireworks at the time of the interview and supporters who had stopped doing so (both making up half of our sample). All supporters had lit fireworks during matches and/or Feyenoord-related events such as training sessions. Additionally, we interviewed supporters who had and had not been caught (half of the supporters currently lighting fireworks were caught as were a third of the supporters not lighting fireworks any longer). Participants were recruited a) through the official supporters association of Feyenoord or b) were known by the club because they carried out chores in order to shorten a recently received stadium ban related to fireworks.

All participants were men with a Dutch background. Participants were between 20 to 49 years of age, with a mean of 30 years. Several supporters showed their fandom through their appearance, for example by wearing Feyenoord clothing and tattoos. Some of the supporters who were interviewed via video calling also used Feyenoord related items for their interior design.

Professionals: 10 professionals participated in this study to offer an expert frame of reference. We again made use of purposive sampling trying to include at least one representative of all major institutions dealing with the issue. Participants worked at the municipality of Rotterdam ($n = 1$), soccer club Feyenoord ($n = 3$), the supporters association ($n = 1$), the police and justice department ($n = 4$), or a professional fireworks company that had conducted several legal fireworks shows in the Feyenoord stadium ($n = 1$). Data collection stopped after these 10 interviews because all major professional groups dealing with the issue had participated, and information provided by professionals within the same institution was highly similar. Professionals at higher management levels (e.g., KNVB or UEFA) could not be reached.

Procedure

Preparation and start-up-phase: The municipality of Rotterdam contacted BIG'R to contain the use of illegal fireworks in the Feyenoord soccer stadium. Several exploratory conversations with the municipality, the club, and the police and justice department took place. Due to the complexity and persistence of the problem and the lack of scientific literature on the subject, it was decided to carry out a qualitative study aiming to increase understanding of the behavior.

Recruitment, selection, and requirements: Professionals were recruited via the professional network of the contact person of the municipality of Rotterdam. In two instances colleagues of these professionals were interviewed after a professional had suggested to interview them because of their relevant knowledge.

Via professional contacts of Feyenoord or the Feyenoord supporter association, supporters received an information letter about this research. They could then give written consent to be approached by the research team. Supporters were approached in the name of research (rather than in the name of the municipality) in order to ensure they felt comfortable to take part in the study. Supporters were assured they would not experience any negative consequences if they participated in this research and talked openly about their behavior. They were informed that their participation was an opportunity to have a voice in the public debate as the outcomes of this research would be shared with various institutions in order to facilitate finding solutions. Participants who agreed to participate gave written consent before the interview. For their participation, supporters received a Feyenoord gift card worth 15 euros. Professionals did not receive any reimbursement for their participation.

Interview: Because the topic was sensitive, we decided to conduct one-on-one interviews. Interviews with professionals took place at their work locations and interviews with supporters took place in the Feyenoord stadium, a room offered by the Feyenoord supporter association, or via video calling due to COVID-19 measures. Supporters generally came across as motivated and eloquent. On average, interviews lasted about 50 minutes (range 25 to 90 minutes). The interviews were audio recorded and upon request participants could receive the audio recording or a transcribed version of their interview. However, none of the participants used this opportunity. After the interview, supporters were asked via email to anonymously answer a short online questionnaire evaluating the interview experience. From 12 who could be contacted via email, 10 filled in the survey (83%). In general, supporters experienced the interview as pleasant, and as an opportunity to share their opinion (see [Table 1](#)).

Materials

Interview guide: All participants were asked the same set of questions (interview guides for supporters and professionals can be found in the *Extended data*) which could be complemented with questions based on the answers of participants (i.e., semi structured interview). Questions were partly based on hooliganism literature, and partly on the COM-B model ([Michie et al., 2011](#)).

Evaluation of the interview experience: To be able to assess to what extent supporters felt they had been able to speak freely during the interview, they filled out a five-item questionnaire (see [Table 1](#)). Professionals did not fill out an evaluation because socially desirable answering or reluctance to provide answers was not expected to be an issue in this group since they did not report on their own illegal behavior.

Coding and analysis

All interviews were literally transcribed and coded by two researchers, using thematic analysis (Braun & Clarke, 2008). Codes were obtained through inductive coding in Atlas.ti 8.4 and grouped into categories. If multiple codes were applicable to the same piece of text, codes sometimes could overlap. Differences of opinion between coders were solved through discussion and consensus. Interviews of supporters were double coded, meaning that each quote received both a

Table 1. Evaluation of interview experience by supporters.

Item	Mean (range)
I was able to give a complete picture of my opinion during the interview.	4,7 (4 – 5)
During the interview, I felt free to speak openly and honestly.	4,8 (4 – 5)
I felt that I was being listened to during the interview.	4,8 (4 – 5)
I have experienced the interview as pleasant.	4,8 (4 – 5)
Relevant questions were asked during the interview.	4,5 (4 – 5)

category and a subcategory (i.e., code) label. Because professional interviews were not considered the prime focus of the current study and are used as a frame of reference, only categories were coded here.

Results

Categories

During analysis we identified five categories with each code belonging to one of them. The categories were: Ingroup/Feyenoord culture vs. Outgroup (27 codes), Context (18 codes), Motivation for lightening fireworks (13 codes), Appreciation of measures and perceived barriers (21 codes), and Solutions and future perspectives (8 codes). See supplementary Table - codes and quotes (can be found in the *Extended data*) for a complete overview of supporter codes and how often they appeared. Based on the five main categories, we present our findings. Professionals' opinions are also shortly discussed, offering a frame of reference.

Ingroup/Feyenoord culture vs. Outgroup: All supporters report that they have been supporting Feyenoord from early age onwards. Most of them came in contact via their father, some via peers. Being a Feyenoord supporter is an important part of the own identity, in which not soccer but the social ties are appreciated as most important. For example, one of the supporters stated clearly that his social life is determined by connections with other supporters:

"It really is the binding factor in my social life. All my friends have a season pass, it has always been the case that my entire life and social life is about soccer. In this phase of my life, we see each other at matches and at birthdays of our children. But back in the day, we did everything together. On Saturdays, Sundays, and by the time it was Thursday it was time to hit the pub again."

Supporters describe a sharp dividing line between ingroup and outgroup. The ingroup is experienced as fanatic, loyal, and committed. Within this group, there is an established hierarchy, social control, and consideration for each other. Ingroup members participate in creating the atmosphere via fireworks, singing and cheering, or other actions. They have at least a season ticket to certain boxes, are seen as fanatical, and share club culture and social ties. Outsiders on the other hand are less important than ingroup members, however with varying appreciation of different kinds of outsiders. Other, less fanatical supporters who also come to the stadium are seen as relatively positive.

Supporters also believe that these outgroup supporters evaluate both the fanatical group as well as the fireworks actions as positive. Generally, fanatical supporters report not really thinking about or not having an opinion about people who watch games on television. The media, the KNVB, and most of the time the club (and its board) are negatively appreciated.

Professionals describe Feyenoord as a working-class club and believe that fireworks are seen by the supporters as part of the soccer experience. Some of them mention that fireworks are part of soccer culture.

Most supporters have a strong historical awareness and a sense of shared culture. Even the youngest supporters show a sense of nostalgia. Supporters believe that the supporter experience is currently restricted by measures and regulation, making the current experience less attractive. One supporter for example stated that people are no longer as enthusiastic about visiting matches as when fireworks were still allowed:

"Back in the day we were allowed to light fireworks, there even was a special box for it. And when the team trained at the public training facility outside, there was a crowd of 20.000 to 30.000 people, it was just one big conflagration. And they've killed that. We can't do fireworks, we can't do anything, and people just stopped coming."

Relatedly, a large part of supporters state that fanatical supporters are generally stigmatized, especially by people in positions of power. This aspect was often brought up by the supporters rather than being directly linked to the prepared interview questions. Supporters experience that they are in general unjustly portrayed negatively and valued by the media, Feyenoord, and the KNVB. They report that these institutions describe them overly negative with a heavy focus on small negative incidents. Additionally, supporters feel they are being actively thwarted. Supporters suspect that the club and the KNVB do not appreciate fanatical supporters and wish to ban them from the stadium. They are believed to employ unjust measures to reach their goal (such as handing out stadium bans for very small offences).

"I really get the feeling they want to ban us; we are chased out of our stadium."

Professionals do however not speak negatively or in a stigmatizing manner about supporters. They characterize supporters who light fireworks as fanatical and highly involved in the club, both in spirit and action. They are seen as

clearly different and separate from other supporters. Sometimes professionals use appreciative phrases like “real supporters” to describe the fanatical subgroup.

Context: The context category describes the context in which fireworks were lit. This concerns the physical context (e.g., certain boxes), but also other more socially determined contextual aspects, such as unwritten rules. When it comes to social economic status and educational level, all supporters report a varied group of offenders. Generally, offenders are described as men between 16 and 40 years. Lighting fireworks generally happens coordinated and together with other supporters. Most often, coordinators of firework actions are experienced group members who typically do not light fireworks inside the stadium themselves. Lighting generally happens by younger members of the group. Supporters chose to collectively light fireworks because of the visual effects of coordinated group/mass actions, but also to reduce chances of getting caught. Supporters indicate that they take their direct environment into consideration when lighting fireworks. They scan their surroundings, try not to hurt anyone, and take the presence of children and elderly into account. Additionally, a set of consistent unwritten rules are in place, such as “no throwing of fireworks”. Social control makes sure that these rules are generally respected and followed. The following statement illustrates that the lighting of fireworks is not used to cause any annoyance or inconvenience:

“I don’t want other people to be bothered by my behavior. If someone close to me can’t stand the smoke, I would not do it, or at least I would give a warning.”

Supporters mention that social pressure or ingroup reputation could stimulate young members of the fanatical group to feel pressure to light fireworks. However, none of the supporters indicate that they themselves ever felt pressure. Own responsibility and choice are important and are frequently mentioned.

Supporters describe that fireworks should not be lit during each and every game but should be saved for special occasions. Especially evening matches (because of the stronger visual effect), matches against larger clubs or rivals, and matches of high stakes are mentioned. Fireworks are also used for other occasions with a large emotional component, such as weddings, funerals, and memorials of supporters. Fireworks thus seem to be a broad and important aspect of supporter culture, used during many different momentous situations and contexts, as is illustrated in the following comment:

“I have been at a wedding of soccer friends where fireworks were lit, that really adds something extra. Or at funerals, when someone has died. The entire Erasmus bridge [iconic bridge in Rotterdam] lit up with torches, that really gives you goosebumps.”

Supporters do not perceive fireworks as unsafe. They feel fireworks are safe because supporters take each other into account, experience, knowledge, and knowhow of offenders. Additionally, supporters report to never or hardly ever experience any fireworks related incidents or injuries.

Supporters make a clear distinction between smoke pots and torches, and bangers. The use of smoke pots and torches is broadly supported, while using bangers inside the stadium is broadly condemned. Some supporters even feel that supporters who do light bangers inside the stadium should be punished more severely than is currently happening. Supporters also mention that the current restrictions and regulations make lighting fireworks less safe. For offenders to not get caught, they wear face covering clothing and pass burning torches. Because fireworks are forbidden, no safety measures (such as buckets of sand) can be implemented in the stadium.

“You know, part of the danger is really only caused by forbidding it.”

Professionals describe the group of offenders as diverse, with a variety of backgrounds and educational levels. Professionals also see lighting fireworks mostly as a group activity and seem to be aware of the different methods supporters use to prevent identification and prosecution. They describe that sometimes supporters light fireworks individually (“lone wolves”). However, these offenders are caught easily with the major problem being coordinated group lightnings of fireworks or repeated offenders. Professionals agree that important matches are more likely to evoke firework actions. Moreover, they admit to sometimes being surprised by fireworks actions. Some professionals have the idea that supporters would want as many fireworks in the stadium as possible. While almost all professionals feel that supporters underestimate the risks that lighting fireworks inside the stadium encompasses, they do feel that supporters try to act safely and responsibly.

Some professionals do state that indeed the number of incidents is very low, but that potential incidents could turn out to have severe consequences. None of the professionals believes supporters to be indifferent, or to cause dangerous situations on purpose. The differentiation between bangers on the one hand and smoke bombs and torches on the

other that is frequently made by supporters, is barely discussed by professionals. They seem to perceive fireworks as one category of products that represents danger to visitors of the stadium.

Motivation for lightening firework: All supporters unanimously indicate that enhancement of the atmosphere is the primary reason for lighting fireworks. Supporters feel fireworks to contribute to a positive and fanatical atmosphere, also whipping up less fanatical supporters to sing and cheer along. Through this enhancement of the atmosphere, fireworks are believed to have a positive effect on the performance of Feyenoord players and potentially, but less importantly, an intimidating effect on the opponent's players, as is described by the following supporter:

"The moment these torches start burning, you immediately start hearing reactions in the stadium. They become enthusiastic; they start to make a noise. Like three years ago, we played Napoli. During the entire game, there weren't any torches, and we were on a draw, ready to be eliminated [from the competition]. So, we decided, five minutes before the match would end, to support our team one last time. So, in the 85th minute, we lit a sea of torches. Everyone reacted positively, the entire crowd. Everyone stood up, started singing and cheering, and eventually, in the last minute, we scored. The former trainer admitted, it was us that gave the final push."

Offenders also enjoy lighting fireworks in the stadium. Additionally, reputation of the fanatical supporters group and competition with other supporter groups is named as an important motivation for lighting fireworks. When it comes to fireworks, interviewed supporters believe their reputation to be the best of The Netherlands. Living up to this reputation is perceived as very important, which is attempted by organizing the most beautiful, biggest, most daring, and best coordinated fireworks actions. One supporter described it as:

"When it comes to fireworks in the stadium, Feyenoord is the best of the Netherlands. Of course, you see it everywhere, but we are the best. Head and shoulders."

Fireworks actions are shared on social media and several websites with both the own ingroup as well as with fanatical supporters of other teams. Re-watching a successful fireworks action gives a sense of pride and togetherness. Competition between different supporter groups is described as positive and almost friendly. Supporters indicate they welcome and applaud well-executed fireworks actions by other supporter groups. The following statement makes clear that no hostility but competition between supporter groups is experienced:

"It is all very positive. Rivalry has always been associated with beating the living hell out of each other, but when it comes to fireworks, that is not the case at all. It is a positive rivalry, we are trying to outdo each other in a friendly manner, on the one hand with singing, on the other hand with fireworks."

Lastly, also some rebellion was named as a reason for lighting fireworks. Some supporters feel that the fact that lighting fireworks is forbidden, makes doing so even more thrilling and challenging. Supporters also indicate that harsh execution of measures directed at containing fireworks or introducing new measures, increases motivation to light more fireworks. This way, supporters try to show that they will not be controlled by any authorities, but they are the ones in charge of shaping their own supporter culture.

Entertaining other supporters, protest, peer pressure, and intimidation of the opponent are not seen as important motivations to light fireworks. Just like supporters, professionals also indicate they believe enhancing the atmosphere and revelry are the most important motivations for lighting fireworks. Most professionals indicate that they can understand these reasons and can empathize with the supporters.

Professionals are very positive about other supporter driven actions, like large banners or flags. They know that supporters believe that lighting fireworks will enhance the performance of players. Professionals also believe that intimidating the opponent is an important motivation for supporters. Most professionals state that they do not believe fireworks to affect players' performances. Professionals also mention competition with other supporter groups and personal reputation within the ingroup as reasons for lighting fireworks. While supporters do not mention peer pressure as an important reason for lighting fireworks, professionals mention it often.

Professionals indicate that there is a strict hierarchy in which young group member have to proof themselves to established members by (among other things) lighting fireworks.

Appreciation of measures and perceived barriers: Supporters who have stopped fireworks give reaching a certain age or stage of life as most important reason for stopping. They also mention that the use of fireworks is not matching work or family life. However, in general supporters indicate that they experience few real barriers when it comes to lighting

fireworks inside the stadium. Measures are perceived as ineffective, especially because the chances of getting caught are slim. If chances of getting caught were higher, a stadium ban would by far be the greatest barrier. Not being able to attend matches while peers can, is or would be experienced as very aversive. One supporter describes a stadium ban as follows:

“You don’t even want to think about it, every game you are forced to watch on TV, you’re reminded you’re not in the stadium.”

Supporters perceive the measures as exaggerated and patronizing. The fact that fireworks are not seen as causing any harm, plays an important role and receiving two fines (one from the KNVB and one from the government) is perceived as unfair. Most resistance is felt towards collective punishment. Especially the collective stadium ban is seen as out of proportion. Such punishments, which are perceived as unfair are said to even evoke more lighting of fireworks as an act of protest, instead of preventing the use of fireworks. Other measures are also perceived as counterproductive. Supporters state that because there are measures in place, lighting fireworks becomes less safe, and that less fireworks would hurt the achievements and reputation of the club, and thus also the club’s earnings.

Professionals indicate that measures are generally not effective (enough). The stadium ban is perceived as potentially most effective since it is seen as the most adverse. However, because of low chances of getting caught, this measure is also perceived as ineffective. Professionals thus share the opinion of supporters on this matter. Some professionals indicate that some measures are not effective at all (like frisking or the occasional use of sniffer dogs) but are implemented to showcase efforts to the KNVB and other organizations.

Future perspectives and solutions: Supporters unanimously indicate that fireworks make up an essential part of the supporter culture and can never be replaced by other products. While fireworks organized by the club are appreciated, this is not seen as a replacement for supporter driven fireworks. Real fireworks should be organized by supporters and should be spontaneous, rough, and real.

“Nothing is as beautiful as an action organized by supporters, because it produces a certain spontaneity, intensity, and effectiveness.”

As possible solutions, supporters suggest a box in which fireworks are allowed. In this box, safety measures could be installed, such as extinguishing facilities. Another solution frequently mentioned is a ticket premium used to pay fines Feyenoord receives from the KNVB and UEFA. All supporters mention that they are willing to collaborate, compromise, and make agreements with the club for preparing fireworks actions together. However, both parties should be willing to compromise, as illustrated by the following quote:

“Have supporters tell their story, what they find important. Now they’re just ruling from an ivory tower. They’re afraid to get among the people. But if they would, they would know what happens inside the stadium.”

Professionals suggest an even broader range of solutions. They, for example, suggest more replacements products, like confetti and laser shows. Some professionals mention that an outspoken disapproval of fireworks from other supporters or players might result in less fireworks actions. However, those professionals who communicate with fanatical supporters more often feel otherwise. Some professionals advocate stricter measures (like prohibiting wearing hoodies inside the stadium, or conducting a house search in case of a caught offender).

Most professionals, however, state that they would prefer to see forms of legal and organized fireworks inside the stadium. Almost all professionals say that they would prefer to work together with supporters, would like to start a conversation, and are willing to aim for some form of compromise.

Discussion

The illegal lighting of fireworks by supporters inside soccer stadiums is an understudied and a therefore little understood phenomenon. To gain insights in this behavior and potential solutions, we conducted an interview study with both supporters showing this behavior and professionals who deal with this behavior.

We chose the COM-B model (Michie *et al.*, 2011) to accommodate our findings (see the *Extended data* for an overview table). Starting with capability, supporters are convinced that they have the physical as well as psychological means to use fireworks safely and they are mostly unaware of any incidents. When it comes to physical opportunities, supporters take their environment into account to avoid hurting others. However, the absence of any physical safety measures makes lighting fireworks less safe. Generally, supporters see no replacement for supporters-led fireworks, which is associated with specific stadium boxes and matches. Social opportunity aspects seem to play a major role for the use of fireworks.

Relevant ingroup members often light fireworks as well, and generally other supporters are believed to welcome the use of fireworks. The social context also influences when (during which matches, at which moment) and which fireworks are used via unwritten rules and group hierarchies. An important aspect is that supporters with their firework actions stand in competition for reputation with supporters from other clubs. Social contexts outside the stadium (namely one's family and work requirements) may discourage individual supporters from the use of fireworks. Turning to motivation, it is obvious that lightning fireworks is strongly rooted in reflective motivation. One does not simply walk into the stadium with a torch, somewhat coincidentally. Rather, supporters prepare and conduct their firework actions deliberately and in groups, often coordinating their behaviour via social media, as becomes also clear from the quote by one of the supporters indicating that shortly before the end of the match against Napoli a great number of Feyenoord supporters lit fireworks together to support the team. In addition, they are required to take deliberate measures to avoid getting caught and receiving a stadium ban that is perceived as dreadful. In fact, lightning fireworks is considered one's individual choice. Supporters do not report vast amounts of peer pressure. Sometimes using fireworks is a collective act of protest or revelry against authorities or the club and their decisions. While lightning fireworks has a strong component of automatic motivations as it possesses strong positive qualities in terms of emotions (e.g., collective cheering) and senses (e.g., appealing images), lighting fireworks seems mostly a deliberate and conscious choice. It thus follows that simple, one-off behaviour change techniques (e.g., nudging, communication campaigns) targeting individual supporters are unlikely to contain the use of fireworks and that more sustainable attempts targeting social groups (e.g., culture change) are more promising.

Indeed, the behavior should not just be considered an individual's behavior that can be understood from just a psychological or behavioral perspective but should also be contextualized within its social and cultural context. We do this by using insights from literature on hooliganism. When the six fundamental features of the shared hooligan identity as defined by Spaaij (2008) are considered, the identity features of fireworks offenders seem to be largely comparable. Excitement and pleasurable emotional arousal (1) are often reported as important motivations for lighting fireworks, as is the acquirement of a positive reputation, both individually and on a group level (2). When describing the *ingroup* (Russell & Ward, 2002), supporters often refer to strong social ties (3) and the need for being able to be their "own boss" or to do as they please in "their" stadium (4). However, although offenders are (almost) exclusively male, masculinity (5) is not reported as an important factor in explaining the illegal lighting of fireworks. Also, territorial identification (6), the felt need to defend the stadium and surrounding grounds and invade rival's territory (Ham *et al.*, 2020) is important to hooligans, but is not seen as important to supporters who light fireworks. Possibly because supporters of rival clubs who light fireworks are not perceived as hostile but as comparable and sometimes even respected groups, being part of the same culture and community. Rivalry between these groups is described as almost amicable. The aggressive component central to hooliganism (Budim, 2018), does not appear to play any role in explaining the illegal lighting of fireworks; supporters describe it as a positive behavior meant to enhance the atmosphere inside the stadium and to boost the performance of their team, making this behavior distinctly different. In short, it may be hooligans who light fireworks, but lightning fireworks does not make a supporter a hooligan. A conclusion that was confirmed by the views of professionals.

Lighting fireworks can thus not be seen as just another aspect of hooligan culture and it clearly represents substantial cultural value, being a distinct behavior that is shared, valued, and learned by a specific group of people (Birukou *et al.*, 2013). Within the *ingroup*, fireworks have substantial symbolic value, as illustrated by their use not only during important matches but also during important life events such as weddings, funerals, and memorials. This symbolic appreciation of fireworks is not unique to soccer culture, but can be found in many cultures worldwide, often signaling new beginnings or festivities (e.g., Lynn, 2006). Supporters describe the lighting of fireworks not as a hobby or pastime, but rather as shared cultural heritage, eliciting a sense of nostalgia and shared identity, that is often even passed on within families, as is often the case with fandom and soccer passion in general (e.g., Gil, 2010). Appreciating fireworks as part of the cultural heritage of a distinct and close cultural group, could explain the importance supporters assign to this behavior. Most professionals do not describe the use of fireworks by supporters from this perspective. Most mention the cultural context and value of fireworks only briefly. This could indicate an underestimation of the experienced value of fireworks by supporters.

This gap between the appreciation of the (cultural) importance of fireworks by supporters and professionals could signal a lack of mutual understanding. These differences in perception, and mutual incomprehension, and lack of perspective taking could be the breeding ground for the stigmatization supporters frequently report (Chung & Slater, 2013). Observational studies have shown that enforcement by authorities that is seen as too strict or unjust, could lead to more aggressive or unwanted behavior (e.g. Stott & Adang, 2003). This could also be the case when it comes to fireworks, since supporters often reported that they felt that professionals did not understand or appreciate them, consciously tried to thwart them, or even wanted or tried to ban them from the stadium all together. Supporters do thus not feel that they are

treated properly and justly and, in line with procedural justice theory (Nagin & Telep, 2017), are thus not motivated to comply with laws and regulations.

However, professionals do not hold as negative views of the supporters as supporters themselves believe they do. Professionals do generally not approve of illegally lighting fireworks, but often express appreciation of the positive intentions motivating it, and many of them praise the visual qualities of fireworks actions. Professionals mostly do not oppose the *spirit* of the fireworks, but point to practical barriers such as fines and safety concerns. Also, when professionals talk about the group of fanatical supporters in general, they are mostly described positively. Previous research into the willingness to engage with hooligans suggests that the stimulation of mutual perspective taking can result in more willingness to establish and maintain contact (Wang *et al.*, 2014).

Bridging the perceived opposition between supporters and professionals could be a first step in reaching a solution acceptable to both parties. Both professionals and supporters indicate that banning fireworks from the stadium entirely is not possible, nor desirable. They question thus, although only implicitly, the current legal situation that is prohibiting all fireworks. Both groups mention dialogue, compromise, and mutual agreements as preferred solutions. Also, alternative ways of lighting fireworks inside the stadium are proposed by both groups; professionals mostly suggest lighting fireworks in collaboration with professionals companies, while supporters would appreciate actively contributing to the fireworks, for example in a fireworks box. When mutual trust and understanding is established, reaching consensus does not seem impossible, however current national and international legislation and regulations could stand in the way of solutions preferred locally.

Strengths and limitations

The current study is unique because it was able to recruit a normally hard to reach group (i.e., fanatical soccer supporters) to participate in research, asking them about a sensitive topic (i.e., illegal behavior). However, supporters unanimously indicated to feel safe to discuss this topic and their views matched the images painted by professionals, suggesting supporters provided reliable information. The combination of supporter interviews and interviews with professionals dealing with the (illegal) fireworks in the stadium, offered a broad and presumably valid picture of the behavior at hand. Lastly, the current study explored an understudied, though important, topic.

Unavoidably, the current study also has certain limitations. Most supporters were recruited via the Feyenoord Supporters Association, an organization which is known to endorse the (safe) use of fireworks inside the stadium, and which could thus be inclined to get across a (too) positive image of supporters who light fireworks. Possibly, this led to recruitment of the most eloquent and nuanced supporters, leaving out those who light fireworks with aggressive intentions. However, supporters who were recruited via Feyenoord, officially opposed to the use of fireworks by supporters, did not contradict these supporters but painted a similar picture.

Additionally, it is not clear to what extent the current findings are generalizable to other clubs or countries. However, research suggests that ultra (highly fanatical supporters) culture is largely comparable and even interconnected across Europe (Kennedy, 2013), while also the use of pyrotechnics is widespread, and described as a big, and often growing, problem all across Europe (Council of Europe, 2011). Testimonials of a fanatical supporter visiting different clubs and matches across the world to experience fan culture, including the use of fireworks, also suggest shared culture and similar motivations (Hellinga, 2019). While this suggests at least some generalizability, of course, some differences cannot be ruled out, for example masculinity, which is considered a major element in the profile of the typical fanatical soccer fan (Ben-Porat, 2010), could be more important and pronounced in some cultures than in some others. Lastly, the current study focused only on the subjective experiences and opinions of supporters and professionals. While exploring the topic from a behavioral point of view is important, this focus shed little light on for example health consequences and financial damage resulting from illegal use of fireworks inside the stadium. A study investigating the English Premier League shows that at least at English League Clubs, there is no longer an adverse connection between number of arrests and soccer club revenues (Jewell, Simmons & Szymanski, 2014). Keeping in mind that hooliganism is often referred to as the *English Disease* (Green & Simmons, 2015), emphasizing the extent to which hooliganism and illegal fan behavior have been associated with English soccer, one might hence conclude that in the rest of the world financial consequences of illegal behavior inside the stadium are limited too. However, knowing that England took severe measures and invested heavily in enforcement of stadium rules, we cannot be sure if this lack of connection is applicable to clubs in other countries. However, even if soccer clubs do not suffer large financial strain due to firework offences, deployment of police officers alone costs many man-hours and a lot of money (Nohlen & Harreveld, 2017). When it comes to damage to health, studies in fireworks related incidents inside stadium are, to the best of our knowledge, yet to be performed. However, research shows that use of pyrotechnics inside the stadium resulted in large amount of nanoparticles in the air, potentially dangerous to the health of supporters, and even more so to the health of athletes (Pirker *et al.*, 2020).

Conclusion

The current study aimed at gaining insight in the behavior of illegally lighting fireworks inside the soccer stadium by supporters. Qualitative interview data on the topic, provided by supporters and professionals, were contextualized using insights from the hooligan literature, uncovering that although hooliganism and lighting fireworks inside the stadium share some underlying components, lighting fireworks is a distinct phenomenon, lacking the aggressive component that is central to hooliganism. When assessed from a behavioral perspective, motivation (reflective as well as automatic), as compared to capability and opportunity, seems to be the strongest facilitator of the behavior. This suggests that interventions directed at making mere changes in context are unlikely to have lasting effects on behavior. Supporters underline this notion by suggesting compromise and conversation as preferred future direction. Supporters feeling stigmatized by professionals could however be a barrier for this direction. However, since professionals contradict this view and talk mostly positively about fanatical supporters, building a bridge between supporters and professionals could be a promising starting point.

Acknowledgements

We thank the municipality of Rotterdam and Feyenoord Rotterdam for this research opportunity. We thank all participating supporters and professionals for their participation, enthusiasm, and frankness.

Data availability

Underlying data

The data collected for this study (voice recorded interviews) cannot be made available to the public in an open repository due to privacy reasons. Voice recordings are always defined as personal data and can be linked to specific persons. Anonymized transcripts of interviews (or relevant parts) can be shared upon specific request to the first author (merkelbach@essb.eur.nl). Please indicate in your request why the data is needed and how data will be used by sharing your research proposal with us. Data availability will be dependent on ethical approval of the ethics committee of DPECS, ESSB, of the Erasmus University Rotterdam.

Extended data

This project contains the following extended data:

Zenodo: No Pyro No Party: Social factors, deliberate choices, and shared fan culture determine the use of illegal fireworks in a soccer stadium. 10.5281/zenodo.4835766 ([Merkelbach et al., 2021](#)).

- Interview No Pyro No Party professionals.docx
- Interview No Pyro No Party supporters.docx
- Table – codes and quotes.docx
- Table – COM-B and supporters views of fireworks.docx

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

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Bernardo Buarque De Hollanda

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The article faces a current issue of engaged supporter's environments all over Europe, as well as other continents, based on a case study in the Netherlands.

The manuscript states a clear argument, goes beyond the juridic or normative debate, covers a dialog with the appropriate academic literature and provides an original approach, since it includes not only the discourses of the fans that take part in the core of the groups but rather interviews with the professionals responsible for the interdiction of the pyro artifacts inside the stadiums.

Nevertheless, it seems the authors infer the category "hooligans" to the other world realities, not considering for instance that there is a considerable supporters culture recognized as "Ultra groups", not attached to the same hooliganism principles. To ultra groups (Italy, France, Marroc), the pyrotechnics used are central demands of their world.

Last but not least, it seems important to hear from the authors to which extent the sample and the results of the inquiry with Feyenoord supporters and its local professionals could be generalized to the other realities of 'fanatic' soccer fandom in Europe and abroad.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Contemporary History; Social Sciences;

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Comments on this article

Version 1

Reader Comment 30 Jun 2022

Tom Smith, CarnDu Ltd, Kimbolton, UK

An interesting article - thank you. It confirms much of what we knew about the issues.

I would suggest you used the term (at least in the title) of "Pyrotechnics" not "Fireworks" - many of the devices used in stadia are not technically fireworks (like flares) and it is definitely true that all fireworks are pyrotechnics, but not all pyrotechnics are fireworks. (Like the dogs and animals idea...)

You may also be interested in the report we wrote for UEFA on the use of pyrotechnics in stadia - which is freely available on the UEFA website

Competing Interests: No competing interests were disclosed.

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