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Looking through their eyes: participant-driven videography to inform visitor use management

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Participant-driven videography (PDV) consists of research participants using a camera to record videos about a subject or experience, giving participants control and minimizing researcher assumptions. This multi-case study demonstrates the application of PDV to parks and protected area (PPA) research, and concludes with recommendations for its future application in such research. In interviews conducted remotely with national park stakeholders, participants were asked to conduct a 'virtual tour' using video and audio while identifying attributes of importance. Analysis includes a priori coding of videos and transcripts to highlight variables of importance based on visual and auditory clues. SWOT analysis exploring the strengths, weaknesses, opportunities, and threats of applying PDV to PPA research indicates its utility for gaining qualitative insights into PPA management above and beyond more common qualitative approaches.

Keywords: *parks and protected areas, participant-driven videography, recreational impact, visitor use management, nature-based tourism*

1 INTRODUCTION

As cameras have become more accessible over the last 20 years, their application in social science research has increased significantly (Little et al. 2020). Videography is one of these widespread applications. Here we refer to videography research as 'interpretive analysis of gathered video data in the context of an ethnographic collection

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process' (Knoblauch et al. 2014: 19). Videography allows for footage of real-life activities and experiences to be documented and used as data (Mackenzie/Kerr 2012). Video footage helps participants recall and detail memories of specific events or activities, and captures the meaning of spatial and temporal movement in ways inaccessible to photo and text formats (e.g., Brown/Spinney 2010; Mackenzie/Kerr 2012; Brown 2015a; Budowle et al. 2022). These qualities make videography a practical complement to qualitative interviewing for visitor use management in nature-based tourism settings.

Here, we use participant-driven videography (PDV) as an adapted ethnographic method. PDV is a subset of videography methods that allows the participant to control the camera, choose what to record, and tell their own narrative (Brown et al. 2008; Smith/Dunkley 2018). Real-time dialogue recorded through videos can provide additional meaning and context beyond photographs, such as sound and motion in the surrounding landscape and interaction with other individuals (McClain/Zimmerman 2016; McClain 2018). Moreover, post-videography discussion with researchers and participants allows for the recorded video data to act as a prompt that inspires further elaboration (Brown et al. 2008).

PDV as a method in tourism and visitor use research is under-utilized. Zajchowski et al. (2020) identified only nine studies that used videography and video footage in similar research, and these studies all used videography differently. The authors posit that video data visualizes the visitor experience and perspective with increased granularity and clarity. Regardless of the utility of PDV, to date there is no clear systematic method guiding the application. Accordingly, the two case studies presented here from US National Park Service (NPS) units demonstrate the application of PDV to visitor use research in nature-based tourism settings, using a strengths, weaknesses, opportunities, and threats (SWOT) analysis (Helms/Nixon 2010).

1.1 Study purpose and objectives

This study modifies existing PDV methods to a remote design in two NPS units: Chesapeake and Ohio Canal National Historical Park, spanning Washington, DC and Maryland; and Rock Creek Park in Washington, DC. PDV was applied in 2020 by conducting remote walking tours through the online Zoom application to investigate variables important to the recreation experience from the perspective of park stakeholders. Stakeholder involvement in developing management objectives helps to ensure support for management decision-making. Additionally, it is one of four factors – issue uncertainty, impact risk, stakeholder involvement, and level of controversy – used to create the sliding scale of analysis for the Interagency Visitor Use Management Council (IVUMC), which guides visitor use planning and management across US land management agencies. Therefore, the objectives of this multi-case study are to: (1) apply PDV remotely to explore how the method provides understanding of participants' perspectives and experiences; and (2) provide recommendations for the application of PDV in visitor use research.

Although PDV is not always a remote method, it may be particularly useful in certain contexts, such as decision-making across a broad geographic and social range. This includes trail networks or other nature-based tourism sites that cross agency jurisdictions, states, or management sectors – for example, many urban park settings, such as the two cases presented here. For these reasons, the overarching goal of this research is to outline the process, results, and findings of adapting and applying

PDV remotely. We provide the discipline with clear guidance regarding how and why to apply PDV across a range of visitor use management decisions.

2 LITERATURE REVIEW

2.1 Nature-based tourism and visitor use management research

Nature-based tourism, or travel and stay for the purpose of visiting a natural environment(s), is among the fastest-growing types of tourism around the world (Komasi et al. 2022). Nature-based tourism is known as a bridge to connect many sectors of the economy, and parks and protected areas (PPAs) often serve as hosts to these experiences. As such, the management of tourists to natural parks and protected areas in the US follows the guidelines established for managing visitors to those sites while maintaining the natural features that draw them there.

Visitor use management in natural settings requires an understanding of the social, natural, and managerial variables that are important to maintaining a positive user experience. These three variables are known to impact, and be impacted by, visitors, and are important components of managing tourists in parks and protected areas (Manning 2011; Miller et al. 2019). According to Miller et al. (2019), social variables include people and their respective activities and behaviors; natural variables include wildlife, aquatic, and terrestrial features; and managerial variables include park regulations, facilities, and services offered. Management-by-objectives frameworks, such as the IVUMC's most recent *Visitor Use Management Framework* (2016), involve a formulation of objectives and associated quality indicators that can be managed and measured as proxies for progress toward management objectives (Manning 2007, 2011). To identify indicators and associated levels of acceptable impact, managers, stakeholders, and users are often asked to evaluate levels of potential impacts on the social, natural, or managerial landscape by visitors themselves (IVUMC 2016). For instance, participants may be asked to evaluate the impacts related to the increasing number of visitors to a site (social), increasing erosion in a riparian area (natural), or the availability of services and facilities along a hiking route (managerial). Those variables (indicators) aid in visitor use management because they inform how people make decisions about what activities to participate in, locations to visit, and when and how to engage in them (IVUMC 2016).

2.2 Participatory research and participant-driven videography (PDV)

Participatory research is a qualitative approach by design, based on a constructivist paradigm, in that people's perspectives are created or influenced every day by the various elements encountered (Howe 1988). Participatory research consists of direct participant involvement in the data-collection process through fostering collaboration with researchers (for example, Bitsura-Meszaros et al. 2019). Participatory approaches are usually qualitative in design (Howe 1988), and are used in nature-based tourism and visitor use research to map landscape topics such as ecosystem services and cultural landscape values (Garcia-Martin et al. 2017; Tebbutt et al. 2020; Lim et al. 2021).

Participatory research can also include the use of film (photos and videos) to explore participant perspectives, with the advantage of additional detail (Balomenou/Garrod 2019; Gou/Shibata 2017). Two specific approaches are participant-generated images

(PGIs) and participant-driven videography (PDV). PGI studies recognize participants as experts in their own experience and use photography as a tool to communicate those experiences (Fefer et al. 2020). While PGI techniques are useful in capturing static images and providing context to traditional interviews, PDV enables participants to document activities and experiences in real time, including through audio-visual interactions (Mackenzie/Kerr 2012; Zajchowski et al. 2020).

Given the context-specific nature of PPA experiences and research, videography is well-suited to address management challenges but is yet to be fully realized. Zajchowski et al. (2020) conducted a systematic review of PDV in the PPA literature, and identified only nine relevant articles (Brown 2015a, 2015b; Brown et al. 2008; Brown/Spinney 2010; McClain/Zimmerman 2016; McClain 2018; Petheram et al. 2011; Smith/Dunkley 2018; Smith et al. 2019). Within these selected studies, videography was identified as a key tool in capturing verbal and non-verbal interactions with the environment and between others. Videography can be used to capture and analyze the meaning of experiences and activities in a way that static images cannot (Brown et al. 2008). Moreover, videography can be combined with transect walks to gain rich information about contexts experienced while walking (for example, Battista/Manaugh 2017). Walking methods can be considered a participatory design due to their ability to gain deep, spatial insights from the participants. Videography captures movement and surrounding content, thus bolstering the data-collection process by providing visual and audio data.

Benefits of PDV include: (1) providing visual examples that prompt memory; (2) capturing videos of highly mobile subjects, such as cyclists; (3) allowing for meanings to be discovered through video, such as how people engage with the surrounding landscape; and (4) reducing power imbalances between participants and researchers (Hammersley 2006; Brown et al. 2008; Brown/Spinney 2010; Brown 2015a, 2015b). Various technologies – including headcams, mobile apps, and body-worn chest harnesses – record participants' videos (Brown et al. 2008; Brown/Spinney 2010; McClain/Zimmerman 2016; McClain 2018; Smith et al. 2019). After video capture, analysis of PDV can involve thematic analysis, line-by-line coding of transcribed data (with audio and visuals captured and included in the transcript), and the use of qualitative analysis software such as NVivo 12 (Brown et al. 2008; Brown 2015b; McClain/Zimmerman 2016; McClain 2018). This paper applies PDV to both inform visitor use management in nature-based settings and systematically evaluate PDV as guidance for future use.

3 METHODS

3.1 Theoretical foundations

The application of video data in this study is further explored as a quasi-video ethnographic technique. Ethnographies use multiple data sources (for example, conversations and observations) to explore complex social contexts and situations, and have been used in previous studies to explore social science hypotheses in outdoor and nature-based tourism settings (Laurier 2004; Brown et al. 2008; Brown/Spinney 2009; Brown 2015a, 2015b; Smith et al. 2019; Nassauer/Legewie 2021). The National Park Service (2021) conducted ethnographies in park units to understand group-specific cultures, histories, and preferences within these units. The present study adapted existing PDV methods informed by ethnographic techniques to a

remote design to gather rich data about what constitutes a quality visitor experience in a practical timeframe that meets managerial needs.

The present work is organized as a multi-case study informed by mobile and video ethnographic methods, as well as an analytic approach driven by visitor experience variables, to explore the utility of PDV as a research and management tool in the PPA discipline. A multi-case study allows us to explore real-life experiences in an in-depth manner since experiences are context-dependent (Yin 2014). Descriptive questions can be asked to gain insight into a research topic that is bound by time or location, as case studies seek to examine the meaning of a particular case, such as a park unit (Creswell et al. 2007; Babbie 2017; Lim et al. 2021). Using a multi-case study allows for comparison of multiple holistic designs that are replicated (for example, PDV), which provides profound details regarding a specific issue or topic – such as the variables that constitute a quality visitor experience (Yin 2009).

3.2 Site descriptions

We applied PDV at two NPS sites: Rock Creek Park (ROCR) and Chesapeake and Ohio Canal National Historical Park (CHOH). ROCR was established in 1890 as the third site under the management of the NPS. Located in the US capital, its primary section encompasses 1,754 acres, with an additional 99 sites including various tributary parks, traffic circle parks, fort circle parks, memorials, farms, and statues. Average visitation for 2012–2021 was 2,223,470 annual visitors (NPS 2022a), many of whom commute into the nation's capital along Beach Drive. Construction of the Chesapeake and Ohio Canal began in 1828 and was completed in 1850. After nearly a century of obsolescence and disrepair, CHOH was designated as a linear park, and now stretches for 184.5 miles from Washington DC to Cumberland, Maryland, running parallel to the Potomac River. The towpath was converted into a walking and cycling trail, providing access to the park that, in part, drives the economies of adjacent historic 'Canal Towns'. Average annual visitation for 2012–2021 was 4,864,018 (NPS 2022b), putting it often in the top segment of national park units for visitor numbers. Given the spatial extent of both sites (that is, satellite site management and a linear trail), PDV with stakeholder participants allows researchers and park staff to learn from on-the-ground partnerships across a wide geographic range.

3.3 Participant selection

Park staff identified representatives from stakeholder groups that hold formal and informal partnerships with one or both park units. The NPS specifically wanted stakeholder voices to be amplified during this process since their organizations support aspects of the parks' operation and future direction. Similar to other researchers (for example, Archibald et al. 2019; Tebbutt et al. 2020; Lim et al. 2021), snowball sampling was used to identify additional user groups as needed. While snowball sampling can result in sampling bias, it has been proven effective in reaching small interest groups where the researcher might otherwise lack knowledge of or connections to reach participants (Creswell 2013). In this case, only two participants were recruited from snowball sampling, and both were members of organizations involved with the NPS. The names of 30 individuals were provided by the NPS, 16 of whom agreed to participate, making our response rate 53.3 percent.

In March 2020, the first invitations were sent via email, with an introductory statement describing the research objectives and the role of the participant. Those who agreed to participate received a follow-up phone call to describe the expectations further and to schedule an interview. Participants were asked to select a location that was representative of them or their representative organization, as some organizations focused on specific locations within the park unit. Participants from these organizations received questions that were formulated with the guidance of park staff regarding social, natural, and managerial variables that impact the visitor experience. For privacy and data-protection purposes, details of participants and participating organizations remain confidential.

3.4 Data collection

This study was originally scheduled to be administered on-site; however, in March 2020, the US declared a national emergency due to the COVID-19 pandemic. As a result, it was adapted to be conducted remotely using videoconferencing. Various studies across disciplines have utilized videoconferencing for qualitative data collection (Sedgwick/Spiers 2009; Deakin/Wakefield 2014; Archibald et al. 2019; Mirick/Wladkowski 2019). This adaptation also follows past PDV research that justifies using new technologies in improving visual methods research (Brown et al. 2008). Zoom was selected as the application. Archibald et al. (2019) demonstrated its superior performance compared to other videoconferencing technologies such as Skype or Facetime.

During the scheduled Zoom meeting, the participants used the external camera on their phone to showcase the landscape and provide a visual context of the surrounding area. The lead author then instructed them to walk within their selected site and first give a general insight into the area, before moving to interview questions and a guided walk by the participant. Similar to other qualitative approaches (cf. Creswell 2013), throughout the process she employed memos and journaling to note reflections about the general data-collection process, the success and challenges associated with applying the method, and any initial results and patterns.

Three of the participants did not use the described process due to unsteady internet connections or discomfort using the technology. These participants were therefore asked to go to the site in their own time and record video(s) of the landscape while narrating responses to the same interview questions as other participants. Opportunities were provided for follow-up questions as needed. The respondents received the same set of questions and instructions, driving the conversation just as in the live remote interviews. This data is therefore included and analyzed in combination with the live interviews.

3.5 Data analysis

The transcribed audio and video footage from the recorded interviews were coded using NVivo 12. Coding consists of analyzing text or visual data by grouping them into smaller categories of similar information and then labeling those smaller groups in a code (Creswell 2013). Specifically, a priori coding – a deductive analytic strategy that allows for identifying codes that are based on research questions and guiding theories – was used first (Miles et al. 2014). We then used open coding, an inductive analysis process that consists of seeking out common or dissenting themes, concepts, or patterns (Mirick/Wladkowski 2019; Budowle et al. 2022).

Video footage was analyzed by applying selected a priori and open codes to capture still frames from the video using screenshotting on Google Drive, thus maintaining the multi-dimensionality captured in the video. Work by Nassauer and Legewie (2021) served as a foundation for our video analysis through their presentation of analytical dimensions and procedures. Dimensions include facial expressions and body posture, interactions, and context. The authors note that these dimensions provide a lens for understanding the recorded video footage through 'theoretical reflection and employed clear, detailed coding schemes' (Nassauer/Legewie 2021: 138), which we do in this study through our a priori and open codes. Because the participants in our method flip the camera to showcase the landscape, we do not focus on facial expressions and body posture in our analysis, but rather on interactions and context. The analytic dimension of *interactions* focuses on movement, actions, gestures, and verbal communication to understand situation dynamics (Nassauer/Legewie 2021). For this study, our analysis focused on participant interactions with their surrounding environment (to inform planning) and with the research tool (to inform methodological application). *Context* can be physical (such as the space someone is in) or social, regarding factors such as people present, their relationship(s) with other people or the study subject, and their relevant background information. As a result, our analysis of context largely focused on surroundings in the natural and cultural landscape participants described.

3.6 SWOT analysis

After completion of the two-step coding process, a SWOT analysis was undertaken as another tool for categorizing the effectiveness of the method applied to visitor use management. SWOT analysis is a qualitative and descriptive method that assesses strengths, weaknesses, opportunities, and threats, and has been identified as a useful analysis framework (Helms/Nixon 2010). Strengths and weaknesses are considered internal factors, and opportunities and threats are external factors to the overall study subject (Gürel/Tat 2017). Tourism literature has applied SWOT analysis previously; for example, when assessing ecotourism management, management of protected areas, and identifying management strategies for sustainable tourism development (Petheram et al. 2011; Hossain/Khanal 2020). Helms and Nixon's systematic review found that SWOT has been used in healthcare, and by government, for-profit, and non-profit organizations. They also noted that the tool can be applied in any situation that requires a complex decision-making process due to its reduction and analysis of the amount of information provided.

To identify the strengths, weaknesses, opportunities, and threats of using PDV to inform management, we applied the a priori codes *Strength*, *Weakness*, *Opportunity*, and *Threat* to the interviews and the researcher's written memos. Following that, we applied open coding to uncover additional themes and patterns. After the initial coding process was complete, we conducted axial coding, which involves regrouping information to look for relationships and patterns among the codes themselves (Babbie 2017). As a result, we were able to organize our experience and formulate recommendations on how to best apply PDV in future studies.

3.7 Data validation

To ensure the trustworthiness of our results, we implemented data triangulation and member checking. Data triangulation is a method whereby researchers use multiple

sources and data to authenticate the results (Creswell 2013). Our triangulation approach included video and audio from the interviews, researcher memos, and exploration of multiple cases. Member checking, also called participant or respondent validation, is when the researcher shares the results with the participants to confirm their interpretation and to establish credibility of the findings (Creswell 2013). To apply member checking, we sorted our codes with supplementary quotes into larger themes per participant and into individual documents. These documents were then sent to the respective participants to verify the researcher's interpretation of their words.

4 RESULTS

Our total sample includes 6 participants in Group A (ROCR) and 10 in Group B (CHOH), representing the 16 out of 30 stakeholders identified by park contacts. We consider this a useful segment of stakeholders to inform management objectives and understand the success of PDV to answer research questions due to their knowledge of the study sites. Average interview length was 38 minutes, ranging from 20 to 79 minutes, and just over 10 hours of video and audio footage were collected to inform the research questions. Overall, the PDV results reveal differences in the primary focus among respondents when comparing their experiences in the two park units. The following section briefly showcases ROCR- and CHOH-specific results but will focus more specifically on the SWOT analysis and application of PDV.

4.1 Rock Creek Park results

Results from the PDV analysis at ROCR suggest that current managerial factors are the most important to the participants. Concepts such as signage, access to Beach Drive for recreation, and perceived under-utilization were identified. Current natural variables are the second most noted codes from participants, with discussion of prominent wildlife, invasive species, and threats from stormwater. Current social variables point to factors such as visitor activities and how COVID-19 changed the experience. Participants were successfully able to communicate their feelings and experiences through their video documentation and verbal explanations. The results have been reduced here to one example (with more details available on request).

4.1.1 Example of managerial variable at ROCR

A participant-identified factor influencing the visitor experience is the maintenance yard, which is a popular spot for birding. However Capitol Building stones and old maintenance tools intrude on the experience, and an informal path inhibits accessibility (Figure 1), as shared by Participant 2, who elaborates in detail:

> When they re-did the Capitol Building, they stored a bunch of the stones from the Capitol back here … The architect of the Capitol doesn't have any place to put them, so they just sit … It's kind of interesting in itself, but realistically, this has become a storage unit, and the Park Service has been trying to get rid of these things [Capitol stones] for years … But if you come up here in the morning … there will be 20 or 30 birdwatchers here looking in the

Figure 1 Surplus Capitol Building stones and informal trail leading to maintenance yard in Rock Creek Park

> tops of these trees because this is prime bird habitat for migrating birds. It's a pretty exceptional birding area. But then you come back here. This is the sort of stuff [old maintenance tools]. And these things have been here for years … when the Park Service developed a general management plan for this area, many of the comments from the birding community were that instead of walking down the path that I just walked down, why don't you improve that, you know, make it so it's accessible.

4.2 Chesapeake and Ohio Canal National Historical Park results

Results at CHOH indicate that stakeholders are focused on current social variables such as programming at the park, using the towpath for recreation, and recognizing the variety of users. Following social variables, current managerial variables are the second most frequent sub-code, with components such as visitor amenities, managerial bureaucracy, and the complex relationship between a local Native American tribe and the NPS being discussed. Current natural variables discuss concepts such as the perceived dangers of the Billy Goat Trail and the Potomac River. Like ROCR, the results here have been reduced to one example for brevity.

4.2.1 Example of managerial variable at CHOH

Regarding the towpath that runs through the park, Participant 16 expressed that the park is 'trying to resurface what we call the 80 worst miles, which is the least safe miles of the towpath … This is the new surface where it's all crowned and there's no puddles, tree roots, or rocks. There're no ruts' (Figure 2). Signage can be found along the towpath, but Participant 14 describes that there are 'some interpretive media … along the towpath here that tells a little bit about the lock house. It's not had much attention recently, and that's another situation with some of the older wayside markers … you can barely read through the dirt' (Figure 2).

Figure 2 Resurfaced towpath (left) and unmaintained wayside sign (right) in Chesapeake and Ohio Canal National Historical Park

4.3 SWOT analysis results

A SWOT analysis was conducted through coding of transcriptions and memos to assess the efficacy of using PDV in PPA research. Results indicate that PDV faces more internal strengths than weaknesses, but more external threats than opportunities (Table 1). Specifically, the internal strengths of the method itself, such as strong visuals and fewer power imbalances, occur more frequently than the internal weaknesses, such as freezing video and confusing information from participants. The external opportunities, such as conducting follow-up calls and having more than one participant per interview, were less frequent than external threats like a lack of experience with the videoconference platform or poor camera skills.

4.3.1 Strengths

The most frequent code in the strength category is 'capture visuals', with 68 counts. This code pertains to any time a participant was purposely showing something on the screen, usually indicated by phrases used by all participants, such as 'Do you see that?', and the pointing out of specific sites (Figure 3). For example, Participant 9 said, 'You can actually see the canal.'

The second most frequent code is 'walking around the area as a transect walk', as indicated by Participant 2 saying 'I'm going to walk across here' and Participant 7 saying 'I'll walk over here.' Such phrases show the researcher movement on the part of the participant. In addition to visuals, sounds such as the participants' words and noises from the environment around them are recorded. For example, Participant 2 says 'Can you hear the birds up there now?', followed by chirping sounds, and Participant 6 asks the researcher to 'Just listen to the sound for 30 seconds', followed by the noise of a rushing waterfall. The code 'interacting with the landscape' pertains to participants pointing out active features of the landscape that they encounter.

In all the PDV interviews, the method enabled the researchers to gain deep insights from participants about site-specific details, as well as offering the chance to examine

Table 1 SWOT analysis results

Code	Sub-Code	Frequency
Strengths		
	Capture visuals	68
	Walking around the area as a transect walk	25
	Gain deep insight from participants	16
	Create a relationship with the participants	16
	Work with multiple stakeholders	16
	Examine human and non-human relationships	16
	Gave participants control	16
	Record verbal and non-verbal interactions	14
	Record how people engage in the landscape	14
	Capture multi-dimensionality of life	14
	Capture sounds	13
	A positive experience for the participant	6
	Researchers can ask questions about what they see	5
Weaknesses		
	Freezing video	18
	Poor audio quality	16
	Data analysis takes time	16
	Interviews are site-specific	16
	Cutting audio	12
	Weak internet connection	8
	Limited technical capabilities	6
Opportunities		
	Alternative remote option	3
	Two participants in one video	3
	Follow-up phone call	2
	Two researchers in one interview	2
	Use the internet as a supplement	1
	Include previously excluded groups	1
Threats		
	Noise interference	11
	Poor camera skills	6
	Distracted by external factors	4
	Information presentation can be bulky	3
	Lack of experience with videoconferencing	2
	Poor lighting	1
	Phone battery can run out	1
	Frustrating for participant	1
	Not suitable for some participants	1

human and non-human relationships. For example, Participant 16 saw an off-leash, unaccompanied dog and said, 'Hey buddy, going for a stroll?' PDV also enabled participants to largely lead the conversation. Once they were instructed by the researcher to begin, participants held the power over the interview since they were on-site showcasing chosen areas of importance. A final strength of PDV is that it affords an overall positive for some of the participants. For example, Participant 9 states 'This was fun', and Participant 3 says 'I've actually never done Zoom on my phone before. I usually just am at home on my computer. So, this is a fun experiment.'

Figure 3 Research participant pointing out features in Chesapeake and Ohio Canal National Historical Park

4.3.2 Weaknesses

Weaknesses include issues related to reliance on internet connections, such as freezing video, cutting audio, and interruptions to communication. Both researchers and participants can experience these problems, but freezing audio usually occurred at the researcher's end. For example, in Participant 3's interview the researcher said 'Your video is frozen, but let's give it a minute' (Figure 4), and in Participant 5's interview, 'I can hear you, but the video is still frozen.'

Relatedly, poor audio quality follows as the second most frequent code. For example, with Participant 5, the researcher said 'Your voice is cutting out a little bit.' Similarly, another sound issue includes the inability to hear one another. These issues are all tied to poor internet connection, as indicated in Participant 4's interview, when the researcher said 'The internet is cutting out', and by Participant 9, who said 'No internet connectivity, it's to be expected with doing remote Zoom calls.' The internet connection was also poor during Participant 5's interview, thus impacting a large portion of the interview and causing frustration for the participant. Lastly, the remote nature of this method may be limited in capturing the full breadth of the on-site of experience. However the ability to connect on-site video and audio in large or long, linear park systems that require a mosaic of management structures across individual managers outweighs this limitation.

The technological limits of both the video application itself and using cellular devices pose challenges in utilizing PDV. Some participants experienced low volume on their devices: Participant 4 said 'Let me get the volume set up … I can't … I'm right next to the creek'; and Participant 5 'The voices are a little dim. I'm up at full volume, but I can hear you.' Visual challenges include the camera not being able to zoom in closer to what participants want to showcase, as demonstrated by Participant 7, who said 'That doesn't zoom in, does it?', and poor lighting, as shared by Participant 3: 'That's probably really hard for you to see, just given the glare off of it.' Technical difficulties can also occur. For example, Participant 5 'got a phone call which might have messed up the Zoom'. Various user errors expose a weakness of this method. For example, Participant 6 'ran out of battery'; and lack of experience

Figure 4 Frozen image from a participant's video feed

may also present a challenge, such as for Participant 1, who had 'never done this on [their] phone before'.

Some of these issues – including connection issues, limitations to features in the application, and user error – may or may not persist. These particular limitations may grow fainter as technology improves and users have adjusted.

4.3.3 Opportunities

Opportunities for extending the use of PDV occur before, during, and after implementing the method. Before conducting a remote PDV interview, some participants may disclose that their site does not have an internet connection. To address this, an alternative remote PDV method may be the best option. Three participants in this study had this issue, but it was overcome as described in our methods.

Follow-up phone calls were used to gain additional understanding and further develop rapport. The researcher also utilized the internet as a supplement to aid in the PDV process. For example, Participant 11 was unable to get to a specific location, so they said, 'I think if you Google "Great Falls of the Potomac", you would see pictures of it'; and Participant 5 said, 'If you look at your map' as the researcher had a map pulled up to orient themselves. Additional opportunities include having more than one participant and the researcher joining in with the virtual interview. Participants 6, 11, and 14 had other people with them, sparking additional conversation and insights; and interviews with Participants 14 and 15 included an additional researcher. Researchers can also ask questions about what they see on the video for clarification and to spark additional conversation. For example, in Participant 16's interview the researcher asked, 'Quick question. I see this really interesting structure on your right. What is that?'

4.3.4 Threats

The use of PDV faces some threats, the greatest of which is noise interference. Examples of this include remarks from Participant 1 – 'We're constructing new bathrooms

right now … it's kind of noisy'; Participant 11 – 'There's a helicopter going over. I'll wait until it disappears'; and Participant 14 – 'There's some truck backing up here', followed by truck beeping noises. The participants may also become distracted by external factors, such as when Participant 6 started talking to someone else during the call. Other threats to using this method include the participants showing a lack of familiarity with the technology, including actions such as blocking the camera, as some participants did at times.

On a larger scale, the threats to applying this method from a data-collection and analysis perspective include having a limited number of participants. During the recruitment process, the researcher must ensure that the participants have a strong working knowledge of the study subject, and time and willingness to participate thoughtfully. As with most qualitative inquiry, the time it takes to analyze these interviews may be hampered by lack of human resources, so it may not be appropriate when large sample sizes are desired.

4.3.5 SWOT analysis recommendations

We provide strategies or recommendations for applying remote PDV in future research management and research by organizing the SWOT analysis into Strength–Opportunity (S–O), Weakness–Opportunity (W–O), Strength–Threat (S–T), and Weakness–Threat (W–T) strategies (Tables 2 and 3). These are modeled after Hossain and Khanal (2020), who identified internal and external factors of SWOT analysis in forest management. S–O strategies apply opportunities that add to the strengths; W–O strategies use opportunities to address the weaknesses of PDV; S–T strategies use strengths to reduce threats; and W–T strategies prevent threats and weaknesses from occurring.

In addition to the insights listed, higher-level observations about remote PDV should be considered and discussed. First, data can be made available to others to validate interpretations or inform additional questions. This data was not collected to fulfill a specific hypothesis, but rather to explore the visitor experience of two park units

Table 2 S–O and W–O strategies for PDV

S–O Strategies	**W–O Strategies**
Ask broad questions in specific sites to gain rich qualitative insights	Follow up as needed to gain additional relevant information
Encourage the participant to bring a friend to foster additional discussion and provide meaningful context	Pin the videoconference camera on the participant so all visuals are captured
Let the participant lead the conversation	Instruct the participant to speak clearly into the microphone
Record the video for later data analysis	Consider using automatic coding to be more time-efficient
Ask clarifying questions about sounds you hear to spark additional conversation and gain clarity	Utilize the internet (for example, Google, park websites) to gain further clarification on the site during the interview
Send protocol and research questions to participants ahead of time so they can prepare their answers	Work with participants to find suitable alternative platforms if necessary

Table 3 S–T and W–T strategies for PDV

S–T Strategies	W–T Strategies
Inquire about surprise variables seen in video or if the participant becomes distracted by another factor	Provide written instructions on how to download and operate the videoconference platform for participants who may be hesitant
Consider snowball sampling to reach participants who may not have been contacted previously	Alert participants when their hands are blocking the camera, the video is frozen, they can't be heard, and so on
Let participants choose the videoconference platform they are most comfortable with	Obtain the participants' cell phone numbers to contact them if sudden issues arise
Have a positive attitude and be willing to problem-solve in original ways that were not previously considered	Instruct participants to charge their phones ahead of the interview

using PDV to gain a deeper contextual understanding of stakeholder relationships with the units (Budowle et al. 2022). PDV is a useful tool for exploratory purposes, such as in this study. Moreover, this is one of the first studies in visitor use research that wholly relies on remote technology as the means of connecting researcher and participant via video. We therefore anticipate further studies to come forth, especially as the application of participatory research continues to grow.

5 DISCUSSION

As participatory studies evolve and transition through adopting new technologies, we explored how participant-driven videography (PDV) may be a useful tool for visitor use in nature-based settings research and management. We employed PDV to explore the social, natural, and managerial variables important to the user experience at Chesapeake and Ohio Canal National Historical Park (CHOH) and Rock Creek Park (ROCR). As has been demonstrated in previous studies (Sedgwick/Spiers 2009; Deakin/Wakefield 2014; Archibald et al. 2019; Mirick/Wladkowski 2019), the benefits of using videoconferencing outweighed the potential risks or challenges encountered in this study. Although a structured participant and researcher evaluation was not conducted, the informal feedback the researcher received about remote PDV from participants was positive overall. Remote PDV allowed the lead author to connect with participants who otherwise would not have contributed due to scheduling and distance. These positive feelings were described in terms of convenience, accessibility, and the ability to connect both through technology and the actual feeling of connection with the researcher despite geographic distances. These findings are consistent with other remote qualitative interviewing studies that utilize videoconferencing (Sedgwick/Spiers 2009; Archibald et al. 2019; Mirick/Wladkowski 2019).

Additionally, the technological challenges experienced, including freezing audio/video and poor internet connection, are consistent with what has been previously reported in the literature (for example, Saavedra 2022). These challenges presented opportunities for further connection between researcher and participants through troubleshooting and problem-solving, and actually increased rapport in other studies (Deakin/Wakefield 2014; Mirick/Wladkowski 2019).

5.1 Managerial implications

A number of variables interact to impact a visitor's experience within nature-based settings (Manning 2007). At ROCR and CHOH, we explored a multitude of social, natural, and managerial variables in an urban visitation context to understand what constitutes a quality experience based on the perspective of stakeholders with more knowledge than a typical visitor. For example, we found that ROCR is valued as an 'urban oasis' that offers a wide range of recreational opportunities, such as gardening, biking, and walking, to name a few. Recommendations to ROCR managers based on the results include: creating more opportunities to educate and engage visitors; increasing accessibility by reducing barriers such as poor signage, lack of public transportation to the park, and park fees; and, finally, removing maintenance building materials and debris.

Multiple stakeholders shared that CHOH features a variety of experiences and users, ranging from locals using the park to walk their dogs, to international cyclists and thru-hikers using the canal towpath. Recommendations to CHOH managers include: adding and/or maintaining amenities such as waysides and a smooth trail surface for safe cycling; providing more opportunities to educate and engage visitors; and updating the visitor centers along the canal (Great Falls Tavern Visitor Center and Cumberland Visitor Center).

5.2 Limitations and future research

The application of remote PDV in this multi-case study was not without limitations. Before the COVID-19 pandemic, 30 original stakeholder participants provided by the NPS agreed to conduct interviews in-person and on-site; but, because of the remote method and limitations imposed by the pandemic, we faced challenges in recruitment. Despite these limitations, we successfully reached 16 participants. This also led to uneven groups between parks; but, because there is no cross-group comparison, this is not a pressing issue. Additionally, participants and researchers did not complete evaluations post-interview. This may mean that participants' feelings regarding their interview experience were not captured unless they made explicit verbal or written statements. The remote aspect of PDV may also hinder the researcher's observation of the surrounding space that the participant is walking through, as compared to a traditional 'go-along' or 'walk-along' interview. However, since the participant leads the interview, moving the camera to show what they are narrating, this may not impact the interview extensively.

Based on our experience, the research team finds utility in further exploring PDV for visitor use research and management. It could be used alongside GPS data loggers in spatial–temporal studies to add footage of qualitative data along a trail between various users. Trail use has been analyzed using GPS analysis previously (Peterson et al. 2020). PDV could aid in studies like this by giving cameras to visitors and asking them to share their experiences on camera, adding a visual qualitative element in assessing travel patterns and the potential to create Storymaps (Budowle et al. 2022), for instance. It could also be applied to studies where stakeholders cover a large spatial expanse, such as national and scenic trail networks (Sedgwick/Spiers 2009; Garcia-Martin et al. 2017). In our study, stakeholders at CHOH ranged across 184.5 miles, so PDV was useful in capturing their various perspectives as they span state borders and may have minimal internal communication otherwise. Finally, PDV can be used in studies that assess crowding thresholds that traditionally use photo

panels (Fefer at al. 2020). Because photos are one-dimensional, using PDV to dynamically display issues such as crowding shows participants a real-world context that is multi-dimensional, and therefore more representative of life (Zajchowski et al. 2020). Because of the ability to conduct PDV remotely, multiple stakeholders across extensive trail networks can be accessed to help us understand the visitor experience or any other qualitative variable that influences visitors or management. Future studies should consider creating an evaluation form to be completed by participants and researchers post-interview to provide a formal opportunity to share positive and negative feedback and contribute to further analysis of remote PDV applications.

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