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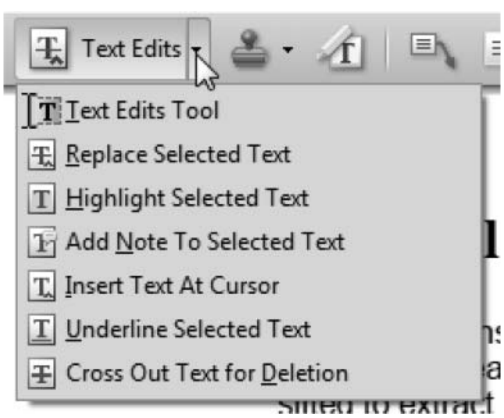


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# Temporal Activity Patterns of Theme Park Visitors

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ABSTRACT *In this article, we illustrate the importance of time in understanding theme park visitor activity patterns. The study that is described here made use of the GPS (Global Positioning System) technology to track and record the time–space trajectories of visitors at the PortAventura theme park in Spain. The findings suggest that visitors to theme parks do demonstrate distinct diurnal and intradiurnal mass behavior patterns or rhythms of activity. The investigation of temporal activity patterns holds two main advantages: the first is that compared with spatial activity patterns, it is more straightforward to aggregate, present, and compare temporal patterns; the second is that the external validity of temporal activity patterns is generally higher than that of spatial activity patterns. That is to say that temporal activity patterns are more likely to repeat themselves in other environments. Practical, theoretical, and methodological insights that can be relevant to both researchers and site managers are discussed.*

KEY WORDS: Temporal activity patterns, tourist behavior, theme park, rhythms, PortAventura, GPS

## Introduction

Researching human activity is a complex challenge which involves an exploration of numerous different types of activities that are taken by different individuals in different time–space locations. One of the earliest theoretical frameworks that were suggested to analyze individuals' activity in time and space is Hägerstrand's time-geography (Hägerstrand 1970). According to time-geography, three types of constraints impose certain daily routines and sequences of activities on the individual. These constraints, which include capability constraints, coupling constraints, and authority constraints, are manifested in our daily time–space trajectories (for elaboration about time-geography, see Hägerstrand 1970, 1973; Golledge & Stimson 1997: 268–276; Gren 2001). In tourism research, time-geography was adopted by several

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researchers to explain, describe, and categorize tourists' behavior within a destination (see, e.g., Dietvorst 1995; Shoval & Isaacson 2007a; Zillinger 2007).

Time-geography was developed as a theoretical framework that can be used to describe and analyze daily routines. During a vacation, however, tourists change their familiar daily routines. Therefore, it is indefinite whether tourists can actually develop routine patterns of behavior throughout their vacation. In this article, we would like to claim that tourists do demonstrate distinct activity patterns. These patterns should probably not be referred to as routines, since they are not repeated by the same tourists over and over again, but rather by different tourists who attend the same place. Hence, a more appropriate name for these typical activity patterns would be mass activity patterns or, as Zillinger (2007) termed them, 'rhythms.' Furthermore, these patterns do not appear only when we examine the entire period of vacation, as was demonstrated in previous works (see, e.g., Lau & McKercher 2006; Zillinger 2007), but also when we scrutinize tourists' activity in specific attractions and sites during their holiday.

As mentioned above, it is not a trivial task to deduce routines or patterns of activity out of individual time–space trajectories. In order to do so, it is necessary to aggregate available time–space activity datasets using several different data manipulation and conversion methods. In the current study, we employed simple time and space manipulation techniques on visitor time–space location datasets that were collected at the PortAventura theme park (Spain) using GPS (Global Positioning System) devices. The manipulations that we employed had already been used in numerous behavioral studies. However, these manipulations were usually done intuitively, without any explicit consideration of the impact they have on the results of the research. In this article, we emphasize the investigation of temporal activity patterns, which, in contrast to spatial patterns, can be easily aggregated. Moreover, after claiming that temporal patterns have a better external validity than spatial patterns, since they are not place-specific, we show how GPS information, which intuitively coincides with the spatial domain, can also be used to investigate temporal patterns of activity.

In the next section, we will review time–space data collection methods and studies that made use of time–space information to investigate tourist activity patterns. The following paragraphs will introduce the theme park phenomena in general and the activity research in theme parks more specifically. We will then discuss the methodology and results, and conclude with a discussion about the theoretical, methodological, and practical implications of the research.

### *Time–Space Data Collection and Analysis*

*Time–space data collection.* The main method for collecting temporal data regarding human activity is the 'time budget' method (Pearce 1988; Golledge & Stimson 1997). In this method, the temporal aspects of subject activities are documented either by the subjects themselves using self-reported activity diaries or by interviewers.

Information is supplied regarding the subject's sequence, timing, and duration of activities (see, e.g., the classical works of Sorokin & Berger 1939 and Szalai 1972). The 'time–space budgets' provide an additional spatial dimension to this inquiry, allowing the conduction of spatial analysis (Anderson 1971). In practice, the distinction between time budgets and time–space budgets is fuzzy, since most time budget studies include some documentation of location. Exemplary works that made use of time–space budgets technique to investigate various aspects of tourism behavior, such as the spatial activities of tourists at destinations or in wider regions and the structure of tourist spaces, include Murphy and Rosenblood (1974), Cooper (1981), Lew (1987), Pearce (1988), Debbage (1991), Fennell (1996), Thornton *et al*. (1997a), and McKercher and Lau (2008).

Other data collection methods of tempo-spatial data that were used less frequently are reviewed by Thornton *et al*. (1997a). These methods include: 'behavioral mapping,' in which tourists activities are recorded in different sites and are aggregated; 'behavioral observation,' where the research subjects are directly observed either by a trained observer or with the use of remote observation means (such as cameras or aircrafts); and 'nonobservational means,' which involve questionnaires.

The development of advanced tracking technologies in recent years has brought up new possibilities for collecting high-resolution and accurate time–space data. The current digital tracking technologies that are available for the research of pedestrians movement are reviewed by Shoval and Isaacson (2006, 2007b, 2010). These technologies include land-based tracking, global navigation satellite systems (most notably the American Global Positioning System), and hybrid systems that make use of both the land-based and global navigation satellite systems. Advanced tracking technologies, or more specifically the GPS technology, were adopted to record human recreational and leisure activity in several different studies (see, e.g., Arrowsmith & Chhetri 2003; Modsching *et al*. 2006; Shoval 2007; Shoval & Isaacson 2007a, 2007b, 2010; Harder *et al*. 2008; Pettersson & Zillinger 2011).

*Time–space data analyses.* In order to be able to aggregate spatial movement patterns of individuals and compare spatial activity patterns between different environments, researchers have used several techniques to manipulate and convert discrete individuals' location data into general spatial quantities or qualities. In visitor activity studies, one out of the following three spatial data manipulation techniques are generally used: (1) *Relative distance*: Several studies measured the travel distance of tourists relative to departure points such as the tourist's accommodation (see, e.g., Thornton *et al*. 1997a, 1997b; Zillinger 2007). Since the distance is relative to a general location, such as the tourist's hotel, the technique is not place-specific and can be implemented and compared with other environments. (2) *Categorization of space*: Space is a continuous entity. However, we can divide it into distinct and comparable spatial units. Fennell (1996), who examined tourist movement patterns in the Shetland Islands, divided the study area into core and periphery. This categorization allowed him to compare between tourists who were located in several different locations along the islands. (3) *Functional space*: This method 'converts' the spatial location of an individual into the functional usage of that location. For example, if a tourist spent a night at a hotel located in a specific location, we can convert its spatial location and define it according to its functional usage, in this case—accommodation (see, e.g., Lew 1987; Pearce 1988). It is also possible that a different tourist (and maybe even the same tourist) came to the same hotel to dine in its restaurant. In this case, the same location will be defined as a catering service or simply as a restaurant. With this method, the spatial qualities of space are dismissed entirely, which allows a straightforward comparison between different environments. In the current study, we employed the latter technique and converted our discrete GPS locations into functional spaces.

We will now turn to discuss how temporal issues are addressed in research on tourist activity. The use of discrete time notations (i.e., 8 June 2011) is infrequent. The time dimension is usually brought in using one of the following methods: (1) *Duration of stay*: The most common, and probably most intuitive, temporal quantification that is used in activity research is the calculation of the duration of the tourist stay at the location. This is usually done using standard clock or calendar time such as minutes, hours, and days. When we measure the duration of an activity taken by an individual or a group, we usually ignore the discrete time in which the activity took place. This allows comparing activities that occurred in different periods. Many researchers have used duration of stay in order to describe, aggregate, and analyze tourist activity (see, e.g., Kemperman *et al*. 2004). (2) *Percentage of time*: Since generally vacation time is limited, one of the most important decisions faced by visitors at destinations is how to allocate their time between an available set of attractions and services. Mathematically, it is most convenient to calculate and present time allocation using percentages. Fennell (1996), Thornton *et al.* (1997a) and (1997b) all used percentages in order to describe time allocation by tourists in various types of activities or locations. Another advantage of the use of percentages instead of absolute numbers is that it allows comparing between individuals even when their activities or vacation differ in their durations.

When a temporal pattern of activity is described, the implication is that some kind of repeated sequence of activity can be identified. This sequence is dependent on the time scale. In the characteristic context of short tourist permanencies in visited places, reference is usually done to the following temporal scales: (1) *Diurnal activity patterns*: Most studies investigate vacationers who arrive on different dates to their destination. However, it is believed that regardless of the date of arrival, tourists demonstrate distinct behavior patterns depending on the day of their vacation (Pearce 1995). Researchers who used a diurnal perspective of tourist activity patterns include, among others, Zillinger (2007) and Lau and McKercher (2006). (2) *Intradiurnal activity patterns*: Activity patterns do not change only between days but also throughout the day. Apart from several daily temporal anchors, such as meal times, there is also a difference between the types of activities that are performed in each part of the day. Morning time is traditionally dedicated to outdoor activities, such as beach-going, sightseeing, and excursions, whereas evening time is typically dedicated to entertainment activity, such as bar crawling, clubbing, and indoor entertainment. Thornton *et al*. (1997a) referred to the change in activity patterns throughout the day as intradiurnal patterns. The existence of intradiurnal patterns was also suggested by Pearce (1988) and examined by McKercher *et al*. (2012).

In our research, we use both absolute duration of stay and percentage of time, and both diurnal and intradiurnal perspectives in order to investigate activity patterns of visitors to the PortAventura theme park. Before turning to describe the methodology, the research study area, and the results of the study, we review the theme park environment in general, and more specifically, the works that focused on visitor activity at theme parks.

### *Theme Parks*

Theme parks are mass tourism destinations attended by millions of visitors worldwide every year. According to the *Global Entertainment and Media Outlook* (*2008–2012)* by PricewaterhouseCoopers (PwC 2008), it is estimated that theme park spending worldwide in 2010 was about $27.7 billion, growing at a 5% compound annual rate during the 2008–2012 period. The United States is the largest destination market for theme park visitors (48.9%), while Asia-Pacific gets at 27.1%, and Europe, Middle East, and Africa at 20.9%. According to the TEA/AECOM Global Attraction Attendance Report (TEA2010), 185.6 million visitors attended only the 25 top worldwide theme parks in 2009.

A theme park may be defined as a recreational product that combines tangible goods and intangible services. Following Kotler (1994), the ‘theme park product’ involves three product layers. *The core product* is what the customer is primarily buying: the excitement and/or atmosphere it arouses in its visitors. *The tangible product* is made up of the elements that the designers and planners’ creative capacity transfers to the contents of the park (safety, range of rides, attractions and shows, brand name, quality of services, sharing the park with other people). Finally, the *augmented product* comprises ancillary services such as catering and retailing, car parking, services for visitors with special needs, procedures for handling complaints, opening times, and the weather (Swarbrooke 2002; Anton Clavé 2007). As in this study we examine the behavior of visitors in the park, we focus on the use of rides, attractions, and shows as components of the tangible product category, as well as on the catering and retailing services, among those that belong to the augmented product category.

The highly controlled, artificial environment created in theme parks provides a convenient platform on which to conduct a behavioral research. As Dietvorst states:

> Theme parks can serve as very useful sites to experiment with time-space analysis techniques. They offer a wide variety of attractions in a relatively small area receiving several tens of thousands of visitors on peak days. From a methodological point of view a theme-park is an ideal research area because the in- and out-flow of visitors is regulated (1995: 174).

*Activity research in theme parks.* Though the theme park environment has been extensively studied, only a handful of works explore human activity in them, drawing conclusions about the service quality and efficiency of operations in that light. Kawamura *et al*. (2004) simulated the activity of visitors in a 'theoretical theme park', in order to improve park's efficiency and hence visitor satisfaction. A similar simulation made by the same group of researchers (Kataoka *et al.* 2005a, 2005b) examined the effectiveness of a multiagent system that allowed visitors to register their next move in order to reduce park queuing. The computer simulation that was done by the researchers confirmed the effectiveness of such a system. Kemperman *et al*. (2002, 2003) analyzed conjoint choice experiment data using an order logit model in order to predict the duration of theme park visitor activities. The participants in this study were presented with hypothetical choice situations regarding theme park activities and were then asked to decide about the order of activities and the time they would allocate to each activity based on the activity characteristics (location, waiting time, duration, and type of activity). One of the main advantages of this study is that the probability of attending each activity (including the activity in hypothetical nonexisting attractions) throughout the day, as well as preferred duration of stay in each type of activity, could be indicated explicitly. On the other hand, one of its biggest disadvantages is that the experiment is merely a choice task, which does not fully simulate the real environment and situations in the park.

While the previous studies were based on computer simulations or hypothetical choices of visitors, the next group of studies that are reviewed here, investigated real, observed activity of theme parks visitors, using data gathered from activity diaries. Dietvorst (1995) reported a study that was conducted in the Efteling Park (The Netherlands). His article mostly deals with the relationship between the park structure (i.e., location of main attraction and stores) and visitor movement, park revenue, and the carrying capacity of the park. According to Dietvorst, visitors move more during mornings and during the peak season when the place is crowded. Rajaram and Ahmadi's (2003) followed a very similar line of investigation, which reckons that visitor flow management can increase parks' profits from retail sales. In the first part of their study, they analyzed the activity diaries distributed at Universal Studios, Hollywood. Then, they developed a flow management model that simulates changes in capacity and schedules of attraction in order to control visitor flow, and as a result to increase shops profits. An earlier study by Ahmadi (1997) used a similar research design to explore the performance of ride operation at Six Flags Magic

Mountain in California and to find out how park managers can more efficiently manage ride operation by adjusting their capacities (i.e., by controlling the number of operating units in the rides) and by controlling visitor flow (i.e., by directing visitors to designated routes). After presenting findings regarding visitor patterns of activities, which were induced from both the empirical survey that he conducted in the park and from the park's database on ride capacities and actual usage of rides, he used a four-model application that evaluated the rides' utilization in the park.

Kemperman *et al*. (2004) examined visitor activity sequences through the sequence alignment method (SAM) to measure the extent to which activity sequences differ from each other. The researchers distinguished seven different activity patterns (sequences) of visitors and found a relation between the pattern of activity and familiarity of the visitors with the park.

Three main aspects are common to the studies presented above: the first is that all of them have a strong commercial orientation and were supported and, in some cases, even sponsored by the parks' management (with the sole exception of the simulation study by Kawamura *et al*. (2004)); the second is that all these studies analyzed or at least discussed potential actions or manipulations that are likely to improve the park's performance and/or its profits; and last, all the studies considered temporal qualities, such as duration of activity, waiting time, time of arrival and time of the day, as significant factors that strongly influence visitor decision-making.

Yet such studies did not produce any general, common conclusion. One of the reasons for this lies in the different and incommensurable results that this type of study yields. It is easier to compare the temporal dimensions of activity (i.e., duration, time of the day) rather than the spatial aspects, which differ from one park to another. Here is where Hägerstrand's time-geography gives us an understanding of how time patterns can also shed light on spatial activity as the two dimensions are closely related.

In the current article, we based our analyses on general activity categories that are common to most theme parks. In addition, we took advantage of the temporal information that was recorded by GPS devices in order to generate relatively simple and comparable outputs that may be used in a comparative research in the future. This approach is suitable not only to research at theme parks but also to any other activity research of humans.

## Methodology

This study is based on data collected at the PortAventura theme park, approximately 100 km south of Barcelona, in Catalonia. PortAventura is one of the key attractions in the central Costa Daurada (Golden Cost), which also includes one of Catalonia's largest coastal resort areas, Salou. In recent years, it has exceeded 3 million visits yearly. This makes it the sixth most-visited theme park in Europe (TEA 2010). The park has been designed as a round-the-world travel experience divided into five


B/w in print, colour online

**Figure 1.** Park map: sites 1–15 are restaurants, 16–31 shops, 32–40 show venues, 41–53 rides, and 54–55 games.

different thematic areas, each representing a different geographical region—Mexico, Polynesia, China, Far West, and the Mediterranean (see the park map in Figure 1). The park also owns four hotels (500 rooms each), a water park, three golf courses, a convention center, and a beach club (Anton Clavé 2010).

Participants were drafted using a systematic sampling method. Each fifth visitor who entered the park was asked several questions by the park staff as part of the regular market research operations. Whenever a visitor and his/her group matched the research sample profile (a family with at least one child under 11), they were asked to take part in the study, and upon acceptance, were approached by the research team. Each of the 288 family groups that took part in the study were asked to fill in a questionnaire with their socio-demographic details and then handed a GPS logger

(I-blue 747 or BT 335) to carry with them throughout the visit. The GPS devices recorded the time–space location of the group in intervals of 10 seconds. A total of 276 viable GPS sequences that could be used in the analysis were received at the end of the field work (12 GPS sequences were eliminated due to technical problems with the devices). The fieldwork itself was conducted during two nonconsecutive weeks. The first week of fieldwork took place in the low season, during April 2008. The second took place in the high season, during July 2008.

The parks' attractions have been classified into five main types: rides, shows, restaurants, shops, and games. The total time that was spent by each visitor in each site was calculated using the Geographical Information System (GIS) software, which also aggregated time allocations at the five site types. In such aggregation, we refer to the functionality of the sites (functional space) visitors attended rather than to the location of the sites. This information was used to obtain three relevant, straightforward outputs that describe the temporal activity of visitors in the theme park. The first is the time budget pattern that indicates how visitors allocate their time between different activities. The second output refers to how visitors allocate their time between activities along the day (intradiurnal analysis). The third output addresses the influence of the day of the visit on visitors' time allocation (diurnal analysis). Another, simpler, temporal information that is examined in this article and which might be of great importance to park managers is the visit's duration.

The use of GPS devices involves a number of methodological limitations that should be addressed. PortAventura is a summer theme park, with most of its facilities being open or partly open to the sky. Therefore, satellite reception and GPS readings were of relatively high quality. However, temporary loss of GPS satellite signal in the few closed sites did produce less accurate readings. In order to deal with this problem, a careful examination of visitor track data was put into effect. GPS sequences of bad quality (over 15 minutes of unexplained gaps in spatial data) were eliminated. Single inaccurate GPS readings were eliminated manually, as well. These readings took place when visitors entered closed buildings and therefore were easily detected and treated (for more elaboration about this methodology, see Russo *et al*. 2010).

We should also keep in mind that smaller sites, such as food stands and minor attractions, were not mapped in the current study and hence the activity that took place in these sites was not included in the analyses. Moreover, some locations in the park, such as trails, do not have one specific use (people can walk, talk, or sit along the trails); thus, it is impossible to infer the type of activity by relying solely on GPS information.

In spite of these technical drawbacks, the application of GPS technology in this specific study still holds significant advantages. First, GPS devices do not interrupt the routine (visitors do not need to stop and document their activity). They are more reliable and accurate than activity diaries, since they are not dependent on visitors' memory and/or willingness to participate. It also seems that they achieve higher

**Table 1.** Average visits lengths and standard deviations for different nationality groups, and the statistical tests ANOVA and Tukey–Kramer HSD ($\alpha = 0.05$)

| | Nationality | Sample size | Average length of visit (min) | St. Dev | ANOVA |
|---|---|---|---|---|---|
| Low season | Average | 132 | 466 | 87.20 | $F$-ratio: 12.1343 |
| | Spanish | 47 | 492 | 87.30 | |
| | French | 65 | 476 | 68.85 | $p$-value: $<$l0.0001* |
| | British | 17 | 371 | 76.49 | |
| High season | Average | 144 | 569 | 176.67 | $F$-ratio: 3.6154 |
| | Spanish | 96 | 586 | 177.60 | |
| | French | 27 | 581 | 151.43 | $p$-value: 0.0149* |
| | British | 21 | 465 | 166.06 | |

*Tukey–Kramer HSD: Low season – Spanish & French > British. High Season – Spanish > British.

compliance rates than the diary. Finally, they are easier to analyze since they supply us with an already digitized format of data.

## Results

*Length of visit.* Table 1 presents the length of visit of visitors from the main visitor groups by nationality: Spanish, British, and French. The information about the length of visit is probably the most basic temporal information that can be gauged from time–space data, both because it is technically simple to collect such information and because it does not require exploring the activities that took place along the visit (i.e., the location, duration, and order of activities). In the analysis below, a distinction was made between low- and high-season results, accounting for the fact that the two periods differ in their opening hours; in the first sampling period, which took place during the low season, the park was open until 20:00, and in the second sampling period, during the high season, the park was open until midnight.

Table 1 shows that in the first sampling period (low season), Spanish visitors had the longest visits in the park compared with other nationalities, with visits that lasted just less than 500 minutes (more than 8 hours) on average. Not far behind them are the French, with visits that were only a few minutes shorter. The British had the shortest visits in the park, with visits that are more than 100 minutes shorter than both the French and the Spanish visitors. In the second sampling period (high season), longer visits were recorded, a result of the longer opening hours that took place at that time of the year. Nevertheless, the relation between the groups remained similar, with the Spanish having the longest visits and the British having the shortest. The higher standard deviations in the second sampling period indicate that not all the visitors in the groups extended their stay in the park but rather that this is a result of a subgroup of ‘late leavers.’

One-way analysis of variance (ANOVA) tests on this series indicate that the differences between groups are not random. The Tukey–Kramer statistical test revealed that the duration of visits by British visitors was significantly shorter than those of Spanish and French visitors in the low season. In the high season, British visits were only shorter than the Spanish visits. The fact that British visitors tend to buy more multiday tickets compared with Spanish visitors (∼60% compared with ∼20%, respectively), might explain some of the difference between the two groups (i.e., British come to the park for few hours every day during their vacation while Spanish come for one long visit). However, French visitors, who also tend to buy multiday tickets (∼70%), visit the park for a longer time, similarly to the Spanish. It seems that in this case, nationality (cultural differences) better predicts visitor length of visit.

### *Time Allocation Between Activities*

In the next table, we present the time budgets of visitors in PortAventura as percentages. The transformation of the results from clock time (minutes) to percentages allowed the aggregation of visitors' data from both sampling periods, keeping in mind the different opening hours and longer visits that were recorded in the second sampling period. It is important to note that over 60% of the activity in the park did not occur in any one of the main sites that were mapped and examined (see main sites in Figure 1). These activities took place along the park's trails, at food stands, in the park hotels, and at other small attractions that were not mapped. This means that visitors spend only less than 40% of their time in the main sites of the park, most of it (about 30% of the total time) was allocated to the main attractions (rides and shows) that the park has to offer.

Table 2 presents visitor time allocation between the main sites of the park. Based on these results, we can see that more than 50% of the time that is allocated to these sites is dedicated to rides. It is important to keep in mind that the time allocated to rides is a function of both the duration of the rides themselves and the time that is spent in the queues before taking the ride. Attending shows is the second most time-consuming activity, with more than 24% of visitors' time dedicated to it. Visitors also dedicated

**Table 2.** Time allocation (%) of visitors between the different types of activities in the PortAventura theme park. (a) Time allocation as recorded in the main sites of the park in both high and low season ($n = 276$). (b) Time allocation in the main sites during the low season ($n = 132$). (c) Time allocation in the main sites during the high season ($n = 144$)

| | Rides | Shows | Restaurants | Shops | Games | Total |
|---|---|---|---|---|---|---|
| All visitors | 52.0% | 24.5% | 18.6% | 2.8% | 2.1% | 100% |
| Low season | 50.4% | 25.4% | 18.8% | 3.2% | 2.2% | 100% |
| High season | 53.2% | 23.9% | 18.5% | 2.4% | 2.0% | 100% |

almost 19% of their time to dine in restaurants, nearly 3% for shopping, and more than 2% of their time to games.

Despite the difference between the low- and high-season sampling periods in the opening hours of the park, and in some other variables, such as the number of visitors (greater number of visitors in the second sampling period), it is remarkable that visitor time allocation is very similar. Two-tailed *t*-tests which were conducted found that the differences between these two periods are statistically insignificant. This finding makes a good indicator for the stability of visitor time allocation in theme parks.

### *Intradiurnal Activity Patterns*

In Figure 2a, the activity of visitors from the first sampling period was averaged into one representative day. Visitor activity in the second sampling period was similarly

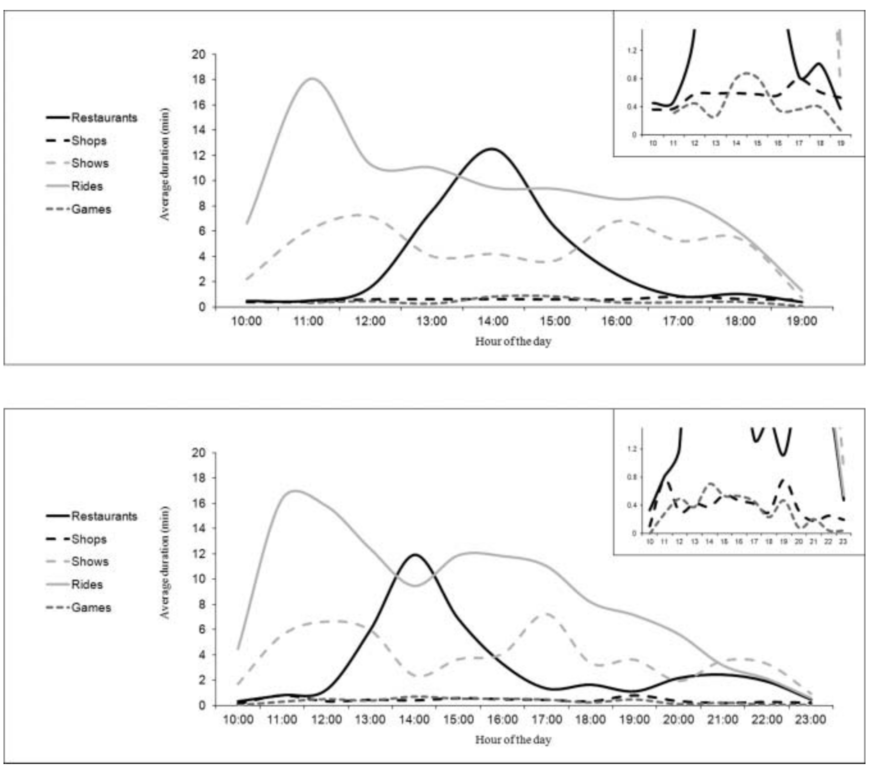


**Figure 2.** Intradiurnal activity patterns. (a) First sampling period ($n = 132$). (b) Second sampling period ($n = 144$) (the small graphs in (a) and (b) focus on the shops and games curves).

averaged in Figure 2b. Each curve in the graphs represents the time allocation change along the day in one type of activity. Once again, it seems that visitor temporal patterns of activity are very robust, regardless of the season and number of visitors who attend the park. It is important to note that in order to control visitor flow and deliver a satisfactory mix of shows and events during the day, the park regulates the opening hours of attractions and thematic areas according to the expected number of visitors. This regulation influences visitor activity in the park as well.

The most similar curves in Figure 2a and 2b are the restaurants visitation patterns, with a very clear peak at 14:00, which represents the visitors' preferred dining time. The ride curves also demonstrate very similar patterns. In both sampling periods, visitors rush to the park's rides in the first hours of their visit, then exhibit a steady decline in the time that is allocated to rides after this initial peak. In the second sampling period, however, a second peak was observed in the afternoon. Two main peaks of attendance are observed in the shows, one prior to lunch and the second after lunch. The similar pattern in the shows is more surprising than in the other activities since the activity in the shows is dependent on the shows' schedules, which changes from the low to the high season. The activity at games reaches its peak during lunchtime. It also has one minor peak before lunch and another one after lunch. The activity in shops has the most dissimilar pattern of all; it is hard to identify a clear pattern of activity when attempting to compare between the relative curves, though it seems that, in general, visitors tend to shop more toward the end of the day.

Two statistical tests were employed in order to examine the significance and strength of similarity between couples of curves of activity (i.e,. activity in restaurants in the first sampling period compared with the activity in restaurant in the second sampling period). Due to the different opening hours, only the activity in the period between 10:00 to 20:00, which was mutual to both sampling periods, was compared. The first test that was conducted was the 'two sample Kolmogorov–Smirnov test'. The null hypothesis of this test is that the two samples come from a common distribution. The alternative hypothesis of the test is that the two samples do not come from a common distribution. A large $p$-value (acceptance of the null hypothesis) will therefore mean that the samples come from the same distribution (for a more in-depth explanation of the test, see, e.g., Sheskin 2007: 577–587). As seen in the summary table (Table 3), a large $p$-value that is greater than 0.05 was found in all types of activities. This indicates that the activities had a similar distribution in both sampling periods. Rides and restaurants had the highest $p$-values; shops had a very low $p$-value which was very close to 0.05 (rejection of the null hypothesis).

The second test employed was the familiar Pearson correlation. The Pearson coefficient indicates the strength of the relationship between the distributions. A high positive coefficient that tends toward 1 is expected if the activity in both sampling periods is distributed similarly. An almost perfect correlation ($r = 0.986, p < 0.0001$) was found in the case of the restaurants. High, significant coefficients were also found in the case of the rides and games (0.808 and 0.699, respectively), the shows had a

**Table 3.** Two sample Kolmogorov–Smirnov (K–S) and Pearson correlation coefficients tests between low- and high-season intradiurnal activity patterns

| | K–S test | | Pearson | |
|---|---|---|---|---|
| | Statistic ($D$) | $p$-value | $r$ | $p$-value |
| Restaurants | 0.3 | 0.675 | 0.986 | $< 0.0001^{***}$ |
| Shops | 0.5 | 0.111 | −0.072 | 0.844 |
| Shows | 0.3 | 0.675 | 0.534 | 0.112 |
| Rides | 0.4 | 0.313 | 0.808 | $0.005^{**}$ |
| Games | 0.4 | 0.313 | 0.699 | $0.029^{*}$ |

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

high yet relatively lower coefficient ($r = 0.534$) though statistically not significant. The most exceptional distributions were the shops distributions with a very weak and surprisingly negative coefficient ($r = –0.072$), indicating that the activity in shops could not be well explained or predicted by the time of the day.

*Diurnal Activity Patterns*

In the last graph (Figure 3), the diurnal time allocation (in percentages) of multiday visitors between different types of activities is presented. The $x$-axis represents the day of the visit, and the $y$-axis the percentage of time that was allocated to each activity. According to the rides' curve, on the first day of their visit, visitors dedicate a great portion of their time to enjoy the park's rides. This initial enthusiasm declines in the 'middle days' of the visit. A small increase in ride attendance is observed on the last day of their visit. This increase might be a result of the visitors' desire to visit their favorite rides for the last time before they leave. The shows' curve presents an almost opposite pattern compared with the rides' curve. It appears that the longest

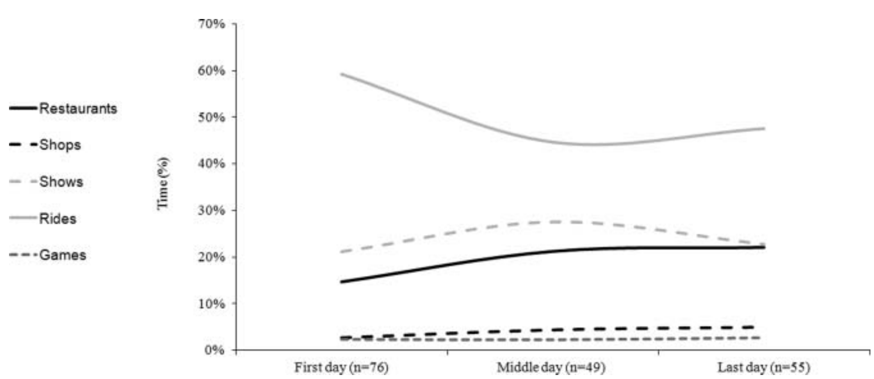


**Figure 3.** Diurnal activity patterns of multi-day visitors along their visit.

time visitors allocate to this type of activity is during the middle days of the visit. With a complete contrast to rides, on the first day of the visit, visitors dedicate relatively less time to shows. These curves indicate a possible tradeoff between these two activities.

The three remaining types of activities (shops, restaurants, and games) demonstrated a steady increase in visitation as the days went by and the entire visit began nearing its end. The interesting observation about these three activities is that all of them generate income to the park. This means that as the days go by, visitors' personal expenditures in the park increase; they are surprisingly eating more often in the park's restaurants, playing more games, and (less surprisingly) shopping more (keeping the shopping to the last days).

## Conclusions and Discussion

In this article, we illustrated the importance of temporal perspective and analysis to the understanding of tourist activity. From a methodological point of view, GPS datasets were found to be useful sources that allow the exploration of temporal patterns of activity. By implementing several simple data manipulation techniques, such as the conversion of discrete locations into functional spaces and absolute time into percentages, it was possible to generate outputs that are not bound to a specific environment. The main advantage of such results is that their external validity is higher; while people cannot follow similar spatial trajectories in different environments, simply because environments differ in their structure, they might follow similar temporal patterns regardless of the physical structure of places. Albeit the fact that the outputs that we presented here are relatively simple to generate, they were found to be robust and a useful tool for describing and detecting temporal patterns of visitors.

The results of this study indicate that temporal mass behavior patterns do exist in PortAventura. These patterns are reflected in the length of visits and in visitor time budgets, as well as in diurnal and intradiurnal patterns of activity. The fact that visitor time allocation, as well as their intradiurnal temporal patterns, was found similar in both the low and high seasons suggests that regardless of opening hours, queues, weather, and several other factors, these patterns are stable and very likely to repeat themselves in different situations in the park. These findings strengthen the notion that was presented earlier, according to which tourists follow a distinct rhythm of activity.

Beyond the methodological insights that we introduced, the results documented in this article have a more practical bearing on theme parks as a specific type of environment and on their commercial strategies. In this respect, we note that theme parks are first and foremost places of consumption (Davis 1996; Anton Clavé 2007), whose success can be measured strictly in terms of capacity to capture visitor expenditure in its various installations, such as rides, shows, and especially store revenue (for Rajaram & Ahmadi 2003, these provide over the 40% of park profits). Hence, the way in which visitors spend their time, at various temporal scales, is fundamental information to park planners and managers. The article put forth several examples:

for instance, the insights regarding the observed correlation between length of the visits and participation in profit-making activities (i.e., shops, restaurants, and games) should prompt park managers to find new ways to extend the length of their visitors' visits, especially focusing on specific groups that have been observed having shorter visiting profiles, such as the British in our study.

Knowledge on temporal activity patterns can also help park managers to efficiently respond to untapped demand through a more flexible level of service or to improve visitor experience, as was suggested by Ahmadi (1997) and Kataoka *et al*. (2005a; 2005b). In PortAventura, a high demand was detected for certain types of activities at given times (rides in the mornings, restaurants in the late morning and early afternoon, and shops in the late afternoon and evening). Since the workforce at these facilities is not highly skilled or specialized, shifting employees from one type of facility to another according to use patterns might be considered, or alternatively, it could be decided that some of the less popular rides close earlier.

On a theoretical level, we followed Hägerstrand's notion, according to which time is an essential component of human spatial behavior. In order to do that, we utilized spatial information and methodologies (i.e., GIS software, GPS devices) to scrutinize temporal patterns of visitors to a theme park. However, it should be noted that in many senses, we took a step away from the ideas of time-geography, whose original intentions were to enrich our spatial perspective by adding a fourth temporal dimension. In our work, we, at least partly, dismissed the spatial qualities of the environment in order to improve the external validity of our results. It is beyond the scope of this article to resolve the tension between the incorporation of spatial aspects in an analysis to the effect of those aspects on the external validity of a study; nevertheless, this issue should be addressed explicitly by researchers who conduct similar studies.

Finally, we should keep in mind that albeit the fact that previous works have indicated that tourist activity does follow certain rhythms, in the case of theme parks, these rhythms are highly influenced by the parks' controlled environments (i.e., opening hours, facility capacities, and show schedules). Therefore, we suggest that future, similar studies should be done in some more naturalistic environments, such as natural parks and less controlled urban and rural areas. The current study is also limited in its sample; it will be important to further explore other types of cohorts and not only families with young children, as was done in this research. In our view, the research on temporal patterns and rhythms of visitor activity has high potential to enrich our knowledge and improve our understanding regarding mass behavior patterns of tourists.

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## Notes on Contributor

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