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Visualizing Criminal Careers with the Life History Plot

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Introduction

The use of visual tools and techniques provide criminologists with a variety of mechanisms to collect, present, and interrogate data on crime, social control, and public policy.

The Life History Plot (LHP) is one such tool designed to collect and present data in a format suitable for new types of interrogation, explanation, narrative-creation, and client response to life histories in the context of the criminal justice system. They can highlight the relationship between various events and situations across the life span on an individual level. They contribute meaningfully to what we know regarding individual criminal careers and the turning points within them. The possibility also exists for additional analysis by superimposing multiple plots and generating hypotheses based on apparent similarities and differences across cases. Finally, in addition to these research objectives, the plots have the capacity to be useful in therapeutic contexts for both practitioners and participants.

As part of this collection, contributors have been asked to consider the definition of visual criminology that animates this volume. Based on criminology's interdisciplinary nature Wheeldon and Harris (2015: 144) offer a definition that is intentionally broad. They define visual criminology as:

> …the use of any image (including, but not limited, to paintings, photographs, drawings, maps, diagrams, graphs, charts and other visual/graphic approaches) to: collect information from participants; describe, present and analyse data; and/or examine or interrogate the meaning(s) of those data.

We adopt Wheeldon and Harris' (2015) broad definition of visual criminology and focus specifically on how the LHPs' visual approach achieves a variety of aims including collecting information from participants, presenting the data to specific key audiences, and examining the meaning of those data by visual comparison.

In this chapter we summarize some developments in visual criminology and describe the LHP. As part of a case study, we describe the evolution of our thinking about criminal careers and explain how and why visualization became such a meaningful step in our research process. Finally, we reflect on the definition of visual criminology and on what happens when a criminologist, a visual learner, a science communicator, a graphic designer, and an artist work together. We provide an overview of the evolution of the LHP, present a brief history of previous attempts to visualize life histories (including calendars, etc.), and describe the rationale for plotting officially recorded criminal history and self-reported data. This includes personal, relationship, and employment histories of a sample of men involved in the criminal justice system. Finally, we reflect on the ways this tool has been used by researchers and practitioners in the several years since its creation, and consider what opportunities lay ahead for its future.

Data in Visual Criminology

Information graphics and data visualization have become increasingly prominent in many communication and information environments including education, journalism, social media, and academic publishing. While visual communication serves a vast number of roles in culture, there has been comparatively little progress in the actual development of data visualization among criminologists (Francis & Pritchard, 1998). Some previous work sought to highlight and advance a variety of visual examples and approaches in criminology (Wheeldon & Harris, 2015). In a recent example, some research journals now require visual abstracts for each paper published. However, any sort of data visualization represents a departure in some ways within traditional criminology, where there is a heavy reliance on cross sectional sampling methods and spreadsheet-based statistics. Indeed, advancing visual approaches must contend with the overwhelming complexity of many criminological datasets and the substantial time and cost that is involved in the creation of any kind of graphic.

Visual criminology in this context enables us to not just present information, but to interrogate data and the systems in which those data were generated. As an example, creating visualizations of crime data performs the immediate function of extracting, synthesizing, summarizing, and communicating but also gives us a lens through which to view the criminal justice system itself. We can use visual approaches to gain a new appreciation of what data have been collected, what has been made publicly available, and what assumptions have been made in organizing and storing those data. The act of making a visualization provides a different perspective of the subject matter which then further shapes the visualization. Indeed, during and after interviewing over 70 men (Harris, 2017), the first author relied heavily on data visualization as a first step in getting to know the data and beginning the analysis. This idea is hardly new. As Maltz (2010) promised, this was an essential step in looking for patterns and relationships in the data.

Just like the range of sophisticated statistical techniques that are available, there is no one standard means of visualizing data and the options are proliferating. Such examples might include anything from basic pie or bar charts, to trellis plots, or network graphs. It is preferable, however, to try different techniques on specific data to determine which approach makes the most sense for that particular type of information. As Maltz (2010: 28) argues, "plotting data in different ways permits the analyst to obtain information from the dataset that would normally not be possible using standard (nonvisual) social science methods." He has also argued that complex patterns might end up being concealed simply as a consequence of the very analytical tools and processes that criminologists typically use (Maltz & Mullany, 2000).

Twenty years ago, Wild (in Maltz, 1998: 398) predicted that "the primary language for promoting the human understanding of data will be sophisticated computer graphics rather than mathematics." Although data visualization has thrived in many areas of social inquiry, criminology has been comparatively slow to adopt these techniques. Some such attempts include eventcharts, lexis pencil diagrams, and timelines (Golman in Maltz & Mullany, 2000). In recent years, other advances in visualizing social science research have taken precedence. These include geographical information systems (GIS) analysis (Batsche & Reader, 2012), crime mapping, spatial analysis (Youstin, Nobles, Ward, & Cook, 2011), and genograms (Weiss, Coll, Gerbauer, Smiley, & Carillo, 2010).

GIS is a computer system that captures and organizes information within the context of geography and has since been applied to the study of various ''human behaviors that can be measured by or influenced by distance'' (Batsche & Reader, 2012: 26). Crime mapping or geocoding assesses the spatial association between pairs of events or incidents. This technique was recently employed in a study of the ''near repeat'' phenomenon, testing whether certain areas that have experienced a particular crime are at a greater risk of experiencing repeat victimization (Youstin, et al., 2011). These examples, however, are of techniques with wide applicability to commonly produced datasets and situations. More specialized or even custom data visualizations, which are not present as standard tools in SPSS or common packages in R for example, will be more appropriate in many circumstances.

The genogram is a third example of the use of data visualization in social sciences. Most often used in counselor and therapist training, the genogram is a graphic representation of the nature of relationships across generations in a person's family, typically used by clinicians as a data gathering tool for assessment but also in the context of therapeutic intervention (Lim, 2008; Weiss et al., 2010). This may include medical history and may include visualized hereditary patterns and psychological factors that inform relationships. A related example of specific relevance for criminologists is the Life History Calendar (Laub & Sampson, 2003). Life History Calendars allow for the time (year), length, and frequency of major life events to be plotted by age. These life events usually include arrests, convictions, residences, housemates, family, marriage, children, employment, military, and custody. Data are drawn from a variety of sources: archival data including court reports, criminal records, police reports, school and employment records, correspondence sent and received during treatment, psychological reports, clinical assessments, and interviewer notes.

The definition of visual criminology accepted above states some uses of images are to "describe, present and analyze data; and/or examine or interrogate the meaning(s) of those data." With respect to this definition, a useful distinction to draw is between infographics and data visualizations. For Cairo (2016: 31), infographics primarily intend to communicate one or more specific messages whereas data visualizations are displays of data designed to enable analysis, exploration, and discovery. These categorically different uses of visuals are somewhat hidden in the definition of visual criminology as they are conflated in the phrasing used. However, both categories fit squarely within the definition. Of immediate interest is the Life History Plot (LHP), and its value for criminologists and others involved in meaning making within and around the criminal justice system.

Of course, meaning is created in multiple ways. For the purposes of visual criminology, two are significant. The more obvious is at the stage of perception of the visuals (what information is conveyed or meaning created in the mind of the audience), or what we typically think of as communication. But another key locus of meaning is in the act of designing the visuals themselves. The design stage affords additional perspectives on data, systems, contexts, and audiences and is an act of meaning-making itself. That renewed understanding through design further influences the revision of visual design artefacts through the typical iterative process used by designers.

As highlighted by the definition of visual criminology we adopt, the interdisciplinary and broad nature of criminology is highly context dependent. Design of effective visuals needs to take into account the specific context for which they are intended and are actually used. Thus, the possible range of visual and graphic approaches serve many purposes and provide different kinds of value. Packed into the definition are a large number of concepts that reflect underlying philosophical positions about visual communication. Of all the criminological questions, the examination of life histories seems eminently appropriate for data visualization.

Visualizing Lives

Developmental and life course criminology acknowledges that even "if people experience similar events, they may have entirely different reactions to them" (Maltz & Mullany, 2000: 255). For example, the death of a parent might devastate one person, but free another from a lifetime of abuse. Whether one subscribes to Gottfredson and Hirschi's (1990) argument that a person's propensity for criminality is stable across their life; to Sampson and Laub's (1993) perspective that early childhood experiences can be negated by subsequent, later experiences, or; to Moffitt's (1993) combination approach that some individuals can change their behaviors, but not as easily as others (Maltz & Mullany, 2000), it is necessary to examine events across the life course on an individual level.

Developmental perspectives within developmental and life course criminology favor individual-level explanations. When the unit of analysis is a person, it becomes possible to focus on how events are sequenced over time, how those events interact with each other, and how the individual is affected by those variables. Maltz and Mullany (2000) establish three further advantages of plotting the timing of events that are experienced by an individual. First, events are differentially meaningful across time. For example, the impact of sexual abuse will be different for a child of five, compared to a child of sixteen, or for an adult. Second, it is necessary to consider life events in a historical context, where unemployment or divorce might be experienced differently during a time of war, or an economic recession, for example. Third, cohort effects are similarly important. Military service during the conflicts in Vietnam or Korea, when a draft was in place will be distinct from military service during a time of peace (Maltz & Mullany, 2000).

These data sources do not easily lend themselves to longitudinal analysis and certainly not to answering qualitative questions. Our work, therefore, is a response to Maltz's (1998) appeal for the field to consider the benefits of representing criminological elements in graphical ways. Criminology has not yet taken full advantage of the many and varied ways in which patterns of criminal behavior could be understood (Maltz, 1996). But given the technological capabilities of advanced software now available, many of the obstacles of time and cost can be reduced. Perhaps more importantly, specialist graphic and communication designers are becomingly increasingly involved in research communication whether through professional journal services, independent graphics services, in-house designers, or collaborative ventures.

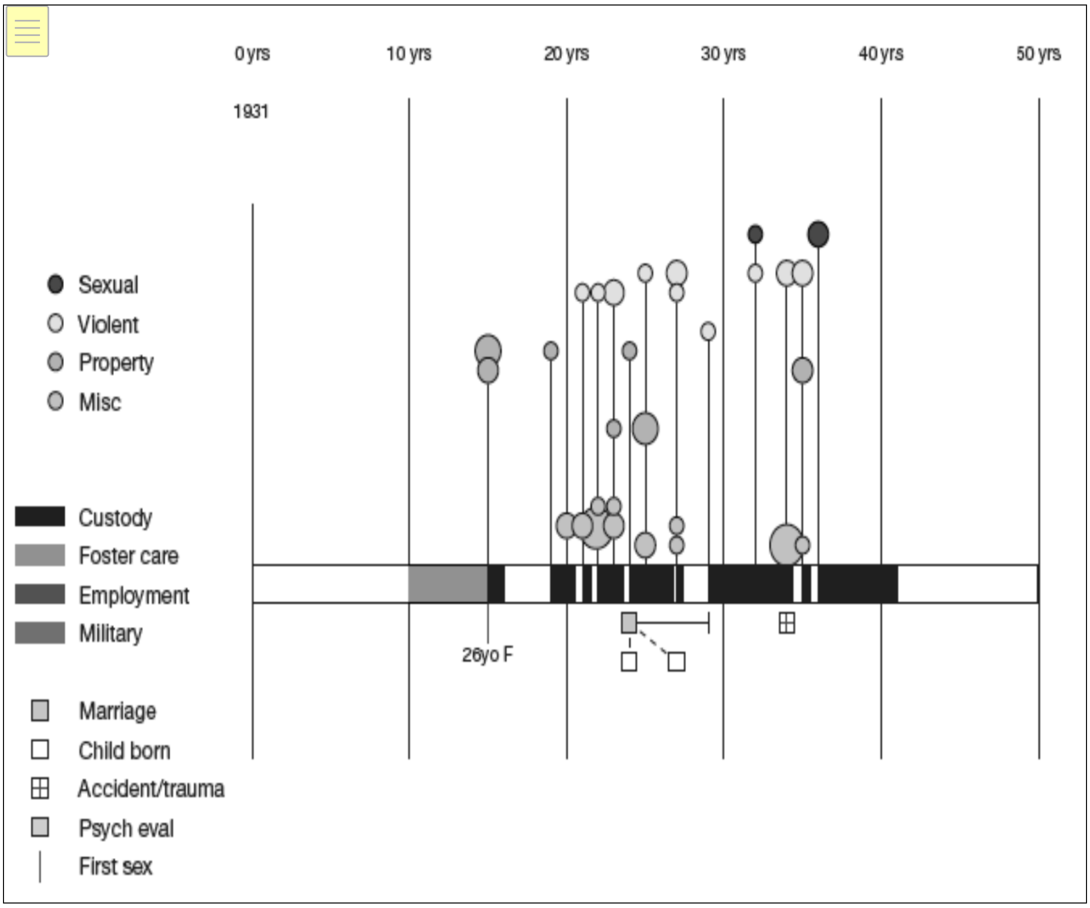
The Life History Plot

The Life History Plot (Harris, 2013) visually depicts various important events in one's life. It allows researchers and practitioners to combine different characteristics of individuals' offending, including number of criminal charges, age of official criminal onset, and criminal career length. In addition, it includes life-course relevant details such as military involvement, marriage, parenthood, and foster care. Each important event can be observed in context and compared to other events that may have preceded, followed, or co-occurred with it. The LHPs are a type of visual object that doesn't fit neatly into any of the example concrete types. They sit closer to the quantitative types of visual rather than the more artistic representation or interpretations. In terms of the types mentioned, they contain elements of graph, chart, and diagram. As with any such non-conventional visual object, this allows them to perform different functions but also presents additional interpretational challenges. One of the reasons for the non-conventional form is that they are attempting to perform a few different kinds of semiotic work and serve multiple functions from within the broad range of visual criminology. Some of these uses emerged during the design process as it revealed new understandings of the data under consideration.

The main use cases (the categories of uses with associated contexts) for the LHPs are 1) for researchers to achieve a different understanding of a person's history, 2) for clinicians to quickly gain an overview of a client's offending history, and 3) for clinicians to use the plots as a tool when working with clients as a focus for discussion. All three categories of use cases for the LHPs indicate that a data visualization approach rather than an infographic, in Cairo's (2016) terms discussed above, is the more appropriate framing. Considering the plots as tools of discovery rather than tools of messaging influences their design. It is, however, fair to say that the LHPs can be used to convey a message, but only with additional context provided.

An example of a life history plot and brief description is provided below (Harris, 2013: 100-103). Case A was born in 1931 and was referred for civil commitment while serving a custodial sentence for two incidents of sexual assault that occurred when he was 36 years old. The LHP shows that he lived in foster care for five years, from ages 10 to 15. His first officially recorded offense at age 15 included several property crimes for which he served a year in juvenile detention. His first sexual experience occurred the same year, with a 26-year-old woman. He reoffended at 19 with another property offense and again received a custodial sentence. He spent much of the next twenty years in custody, and was immediately re-incarcerated upon release. His criminal career was marked by a versatile array of property, miscellaneous, and violent offenses, including acts of violence and property damage committed while in custody. Figure 1 provides an example LHP of this case.

Figure 1 - Life History Plot Example (Harris, 2013: 102)

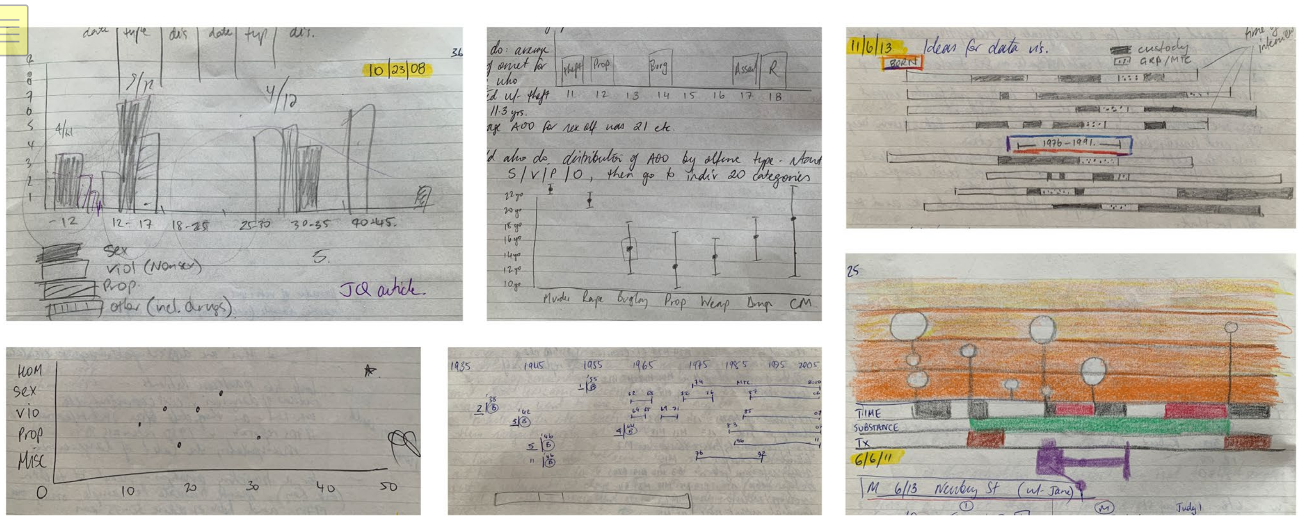


LHP: Means and Methods

The first step in the construction of LHPs was to complete a life history calendar (Laub & Sampson, 2003) for each participant. Laws and Ward (2011) explain that these calendars can be partially completed from official records, but ultimately require the offender's self-report, and if possible, the ability to crosscheck details from more than one source.

Employing an iterative process, which is standard in most design frameworks including those previously discussed, prototype sketches were prepared to represent different selections of elements from offenders' histories. These prototypes began as hand sketches on paper but as the visual ideas were developed and the utility of the sketches assessed, they progressed to more refined forms (Figure 2). The three major phases of visual design for this project captured different needs for the LHP. The first phase used pencil and paper sketches to rapidly assess what kinds of stories could be told visually. By going through dozens of quick sketches, different kinds of visual stories could be trialed, the data were checked for whether there was sufficient information present to allow those kinds of representations to be presented consistently, and the concreteness of the visualization task using real data pointed toward other potential data collection and processing needs.

Figure 2 – Initial hand sketches developing the components of the Life History Plots.



The initial list of variables considered as potentially relevant for the LHPs included births and deaths of parents, siblings, and children; substance abuse history; educational disruptions; parental separation; and number of residences. As the LHPs began to be built, however, it became clear that there was a limit to how many items could be displayed meaningfully on a single plot and in some cases (regarding substance abuse, specifically) the files did not provide sufficient or reliable detail. Thus, the final list of variables included: official criminal record (year and type of individual charge (miscellaneous, property, violent, sexual)), and timing and length of foster care, employment, military involvement, incarceration, and marriages (or marital-type relationships). These variables were ultimately selected for their consistency with other studies and because they tended to be reported consistently across cases. In addition to these components, the graph also plots number of offspring (and their year of birth); reported year of first sexual experience (including age and gender of partner if known); serious accidents/head trauma, or suicide attempts, and stays at in-patient psychiatric facilities. Although these variables were appropriate for our participants, we acknowledge that it is likely that different variables might emerge as especially relevant for other more contemporary samples, or for different offence types. Such variables could be substituted in future incarnations of the plots, especially once they are further automated. A description of this and other options are provided in further detail in the discussion.

The process of determining the variables to include in the LHPs illustrates an important point in the design of these kinds of visualizations: effective design requires both subject matter expertise (on the criminology side in this case) and visual design expertise (on the graphic and communication design side). Neither is sufficient by itself, nor can the two parts be linearly sequenced. Tufte (2001: 87) points out a danger of letting visuals take too much control, noting that, "Substantive and quantitative expertise must also participate in the design of data graphics, at least if statistical integrity and graphical sophistication are to be achieved." A set of data cannot just be handed off to a designer to make it aesthetically interesting. But he also notes that "the task of the designer is to give visual access to the subtle and the difficult—that is, the revelation of the complex" (Tufte, 2001: 191). This is an expertise not commonly taught in academic research programs outside design and graphic arts and is a place where trained or experienced designers can add value to the visual communication process. A simplistic expression might be that the subject matter expert knows what to communicate and the designer knows how to communicate it. Clearly though, these acts are closely coupled, and a collaborative approach can be effective.

A recurrent suggestion in informal scientific publishing dialogues, including on social media platforms, is that journals should provide additional professional graphics services to make research visuals more effective. Among the common strongly expressed negative opinions from researchers toward that suggestion is that graphic designers' outputs would miscommunicate the intent to such a degree that it would be in conflict with the actual results of the research. This attitude often carries an assumption of a one-way handoff of data or draft graphics, a misunderstanding of the process and skillsets of communication designers, and a (sometimes warranted) general lack of trust between academic researchers and the academic publishing industry. However, positive reactions to designers' involvement appear to arise from positive experiences involving a more collaborative, back-and-forth process. There is common recognition that research outputs often gain more attention when presented with visual sophistication even though many researchers might bemoan this fact.

In the case of the LHPs, the interaction between authors involved a more collaborative process of working together through iterations of the plots as each came to learn more of the other's perspective and expertise and then making decisions about the plots together. Importantly, the interplay of perspectives at an early stage of the process helped the LHPs develop their value as each collaborator was able to question the plots from different perspectives and challenge assumptions made by the other.

The second phase of the visual design process directly addressed the needs of end users of the LHPs. This phase explored what kind of visual language and aesthetic was most appropriate to communicate the stories encoded in the data in a way that was approachable and understandable. The communication requirements included the need for clinicians to rapidly understand what was being conveyed by the plots without additional extended consultation with all the details of the case files and a sufficiently simple presentation that the plots could be used as a prompt for discussion between the clinicians and participants. These plots went through a number of iterations prepared using professional illustration software such as Adobe Illustrator to refine an aesthetic that met communication needs. It was also important to use this phase to develop plots with the appropriate technical properties to allow for clear reproduction in color or greyscale, and in print or online.

After initial publication of the plots (Harris, 2012) and obtaining further feedback from the broader research and clinical communities, the third phase of the design process was to increase usability and scalability for those communities. The process of hand-generating plots with high-end illustration software isn't feasible for the majority of people involved in the preparation and use of these plots, of course, and a more accessible approach was required. The approach developed allows researchers and clinicians to simply enter the relevant data collected from case files into a Microsoft Excel spreadsheet template with an automated tool to generate the plots. For the LHPs, all relevant details were extracted from previously coded, secondary data maintained using SPSS. Custom computer software prepared by the authors took that spreadsheet file as input and prepared the LHP as visual images, which it then automatically and instantly output as a set of digital files in appropriate file formats, color palettes, and resolutions. The custom software was written in the Processing computer language designed originally at MIT Media Lab as a "software sketchbook" and a tool for teaching programming fundamentals. However, it quickly evolved into a development tool for professional artists, visualization specialists, and a broad variety of coders [Processing Foundation, n.d.]. The Processing language works as a code library and wrapper around the Java language and can use many existing Java code libraries without modification. Both Processing and Java remain in widespread use and are actively being developed. This allows for great extensibility and significant longevity of the software solutions, at least on the timescales of coding languages.

Case Study: LHP and Visualizing Criminal Careers

The LHP is a graphic timeline-based chart that provides an individualized examination of a criminal career. Each plot shows the date (year) and type of various life events (such as marriage, family, and employment histories) while preserving their chronological sequencing. It also contains the sequence of offenses committed throughout their criminal career, along with information about the dispositions from those offenses. At a single glance, it is possible to view onset, persistence, frequency, escalation, crime switching, specialization/versatility, de-escalation, desistance, and recidivism. LHPs allow the researcher, the clinician, or indeed the participant themselves, to view the criminologically and psychologically relevant components of an individual's life in a single chart. It also provides a way of understanding the interaction (if any) between those components and makes it possible to look for patterns or cycles of behavior. This might assist in the answering of questions such as: does the individual usually offend when he is unemployed? Did his divorce lead to drug use? And so on. The most important contribution of this work is that we are quite literally seeing the individual criminal career in a way that we could not see it before, using extant analytical methods.

At first blush, the overall complexity of some lives compared with others can be seen at a glance: whether an offender escalated from property offending in adolescence to sexual violence in adulthood, or offends indiscriminately across all crime categories over time, or led a relatively uneventful life with an unremarkable upbringing, stable employment and relationship until a sudden change in circumstances (e.g. divorce, death, diagnosis, or retrenchment) suddenly brought about a change in behavior.

We describe the use of the LHP as a tool for data collection and analysis prior to, during, and after an interview between the first author and an incarcerated offender.

At the time of his interview, Glenn (Harris, 2012) had been incarcerated for 15 years and was serving a life sentence for a violent sexual assault that ultimately resulted in a conviction for attempted murder. He will likely never be released. He was 47 years old when we met. It was a freezing day in New England, and we met in the poorly heated visiting room of a "treatment center" that was, for all intents and purposes, a maximum-security correctional facility. I had spent the previous day reviewing his case and constructing a Life History Plot (LHP; Harris, 2012) based on his officially recorded criminal history. This drew from the records maintained by the Department of Corrections (DOC), Federal Bureau of

Investigation (FBI) and Criminal Offender Record Information (CORI). I also included his many disciplinary infractions (D-Reports) while in custody.

The tool depicted his difficult childhood including long stretches in foster care, multiple hospitalizations for serious head injuries, and many inpatient psychiatric observations and evaluations. The LHP showed that his offending started early, and that Glenn was known to police by the time he turned nine. His adolescence was marked by frequent and versatile offending that featured a range of antisocial behaviours including everything from petty theft and drug use to property damage and violence. He did several separate stints in juvenile detention and was often only on the street long enough to reoffend and return to custody. He escaped from jail twice. His transfer to prison proved difficult. The first few years of his current sentence were fraught with multiple D-Reports that included charges as minor as not standing in line, to disrespecting a correctional officer, property damage, assaulting other inmates and officers, and setting fire to his cell on several occasions.

My life history interview with Glenn took about 90 minutes. We discussed his upbringing, his family life, and what he missed most about the outside world, while being locked up. He shared how he felt when his mother died and what it was like to not be able to attend her funeral. He shared some of the details of his more recent convictions and described what he had learned through his many years of psychoeducation and offender treatment programs. He was softly spoken and looked much older than his 47 years. His forearms were covered with ink - both professional and improvised, old and recent. As he talked, I checked boxes and filled in dates on the A3 grid I had printed. I was doing my best to catalogue the parts of his life that weren't in his file: the unreported abuse, the unnoticed neglect, the self-reported thefts, the undetected burglaries, the unconvicted assaults. There was so much more to his story than what existed in that bulging manila folder.

I presented him with the LHP I had created the previous day. He was puzzled at first, not really knowing what he was looking at. I explained the central timeline and how it represented how his time was spent (in the military, in a job, in foster care, or in custody) and how the height of the balls indicated seriousness of conviction and how the size of the circles represented the number of counts of said offence in each year. He was at once relieved and sad: "It suddenly all makes sense;" "this is my life;" "what a waste." I suggested that the image might help to reveal some interesting connections and that led us into a different line of more time-specific questioning: "it looks like your first arrest came at around the time you moved out of foster care. Can you remember what was going on at that time?" "What was happening here, in your early 20s. There are a few years here where you don't appear to have gotten caught for anything." "So, you got married in 1987 but you were back inside later that year, what was that like?" In an instant, he could see his life before him. He was making connections and correcting errors from his file. He admitted to the actual number of separate occasions that were "disguised" as a single count. He downplayed the seriousness of one conviction, and elevated the seriousness of another one, with a story of how he got off light. It was a revelation for both of us.

A few years before I met Glenn, I had been motivated to graphically represent the temporal ordering of various elements of a criminal career. I had spent my graduate study examining onset (Harris, 2004; 2013) and later, specialization and versatility (Harris 2008; Harris, et al., 2009a; 2009b). A colleague and I subsequently explored the nature and extent of burglaries in the official criminal histories of rapists who offended in their victim's homes (Harris, Pedneault, & Knight, 2012; Pedneault, 2011), and this led to a string of manuscripts about escalation and versatility (Pedneault, Harris, & Knight, 2012; Pedneault, Beauregard, Harris, & Knight, 2014). Now I was interested in the other end of their career, in the process and mechanisms of desistance, especially for those who had been convicted of sexual crimes (Harris, 2017).

As a visual learner, I wanted to *see* a person's rap sheet and I was frustrated with the limitations of official statistics. I wanted to include it all because everything mattered. Given that this particular man had racked up so many D-reports in custody, I decided to plot those as well, as if they were regular charges - to be sure, most of his infractions were not simply administrative, but included overt acts of assault, arson, or other property damage. I noticed that while the first several years of his sentence were marked by repeated and varied infractions, there was a sharp decline in violence and property crime, followed by some sporadic and minor administrative rule violations, and then nothing. It was as if the record keepers had simply ceased to keep a record of his D-reports.

Glenn and I realized together, while looking at the LHP, that he had not received a single D-report for anything for the past seven consecutive years. I asked him why he thought that was. We thought back to that year and calculated how old he was at the time. We situated that point in time in relation to when he lost his mother, and when he got transferred to a different facility. We reminisced on some common memory markers - who the president was at the time, who played in the World Series that year. He sat for a moment, thinking. After a short pause he explained that it was around that time that a cousin who he knew only peripherally as a kid, had looked him up and made contact. After a few letters back and forth, the cousin visited.

After a lifetime in and out of custody with not a single visitor, a family member who he remembered from childhood had made the long drive out to his now remote and rural location and met with him in person. For the last seven years, his cousin had visited weekly. For seven years, this man had felt a connection with a human being in the outside world. He had someone to talk to, to connect with, to impress…Making that connection in that moment was meaningful for us both. I was mounting evidence for an emerging theory of desistance and he was putting the pieces of his life together. We were both acknowledging the importance of connection.

Reflections

Just as this work draws on a variety of disciplines, we can reflect on how each of them has contributed to this work from the perspectives of those disciplines and the interplay between them. Here we reflect on the visual design methodology, the utility of the LHPs, and the effectiveness of their visual approach.

Reflecting on the visual design methodology

It is often quipped that there are at least as many design methodologies as there are designers and even summarizing the range of possibilities is unwieldy and beyond the scope of this chapter. Some of these frameworks have been popularized for use by individuals and groups who are not ostensibly "designers." We refer to a selection of relevant methodologies now to give an impression of some of the commonalities useful for visual criminology applications. These primarily connect with methodologies in the realm of human-centered design and design thinking.

Human-centered design (HCD), a framework developed over decades by international design firm IDEO, "offers problem solvers of any stripe a chance to design with communities, to deeply understand the people they're looking to serve, to dream up scores of ideas, and to create innovative new solutions rooted in people's actual needs." (IDEO, p.9) The process of HCD is a non-linear set of actions often considered in three overlapping types: inspiration, ideation, and implementation. Inspiration involves deep observation and learning about a client community and its needs. Ideation involves making sense of that learning, identifying opportunities for design, generating ideas, and testing and refining solutions. Implementation involves getting the ideas to a useful and usable form in the world in a way that maximizes impact. Perhaps more important than any specific process for HCD is a set of "mindsets" that embody the philosophy of the approach. They are labelled Empathy, Optimism, Iteration, Creative Confidence, Making, Embracing Ambiguity, and Learning from Failure and are described in detail in the IDEO Field Guide to Human-Centered Design (IDEO, pp 17-25).

A related framework, developed by an overlapping group of designers, is presented by the Hasso Plattner Institute of Design at Stanford University, often known as the “d.school”. That framework considers 5 “modes”, again an outline of a non-linear process, called Empathize, Define, Ideate, Prototype, and Test (d.school, 2010). Both of these frameworks might be considered particular cases of Design Thinking, a now general term that encompasses a range of definitions and uses, particularly in the design and business management sectors. One form of design thinking defined by its original proponents considers five phases: (re)Define the Problem, Needfinding and Benchmarking, Bodystorm (Ideate), Prototype, and Test. Derived from a combination of influences from design, social sciences, engineering, and business, design thinking “is about the creation of, as well as adaptive use of a body-of-behaviors and values. This goal stands in sharp contrast to, while complimentary to, the predominant disciplinary model based on the creation and validation of a body-of-knowledge” (Meinel & Leifer, 2011: xiv).

One defining feature of this cluster of design methodology variants is that it inherently and explicitly takes into account the experiences and needs of client communities. In that context, a social semiotic framework is relevant as it is a functionalist position that sign-making (such as visual communication) is developed to perform specific actions or do semiotic work (Aiello, 2020). This kind of framework is important to consider when constructing or using visuals in criminology as it considers them “in specific historical, cultural and institutional contexts, and how people talk about them in these contexts – plan them, teach them, justify them, critique them, etc." (Van Leeuwen, 2005: 3). A social semiotic viewpoint encourages us to consider in greater detail the context in which we will use an artefact of visual criminology when we come to producing it.

Thus, understanding often comes from a combination of words and visuals, rather than either by themselves (Cairo, 2016) and so it is a design choice to construct the LHPs such that they enable a variety of uses that go beyond a standalone presentation of information and might require supporting text, speech, or discussion. The plots can achieve certain aspects of one-way communication and messaging when used appropriately but they are not designed as standalone infographics for that scenario.

With this social semiotic stance in mind, these relevant design methodologies encourage visual criminology approaches that tackle root issues in a community beyond the construction of the designed visual artefact. That approach would indicate embedding the visuals in a social or clinical context that aims to resolve significant issues for an existing population, such as one considered by the criminological community. Each of these methodologies carry with them sets of suggested methods for implementation, and many other methods exist in other design frameworks. A common feature of design process is that, "while the stages are simple enough, the adaptive expertise required to choose the right inflection points and appropriate next stage is a high order intellectual activity that requires practice and is learnable" (Meinel & Leifer 2011: xiv). So although there is no specific design process that can be defined in a useful algorithmic sense, there is a large group of design tools that have been developed over the decades to address the challenges relevant to criminology given its inherently social nature and the presence of its many of what Rittel and Webber (1973: 160) call “wicked problems” by which they mean ill-defined or tricky rather than malicious.

Just as the study of general design methodologies is a vast field, the exploration of visual design approaches is wide and deep. A particularly useful synthesis of experience in this area is contained in Cairo’s (2016) framework of great visualizations. Cairo (2016) argues that a data visualization is successful if it has the qualities of being truthful, functional, beautiful, insightful, and enlightening. Although he admits these terms are “dangerously polysemic,” his unpacking of the terms brings to light many features of data visualizations that are highly appropriate to visual criminology. We evaluate the LHPs against these criteria later but note now that truthfulness is a particularly challenging quality to assess on both ontological and epistemological grounds.

At a more immediate and practical level, there are numerous guides to producing data visualizations. However, given the breadth of data visualization as a field, these guides tend to focus on quite specific types of data visualization, general properties of visual communication such as design aesthetics, or speak to fairly abstract topics with considerable interpretation needed to make them useful. For any specific data visualization task, reference to a wide variety of sources is typically useful so that nuggets of information can be extracted from each and combined. The skill in using these guides then comes from being able to synthesize appropriate lessons from each to apply to the situation at hand.

Many of the widely celebrated texts require extensive dissection to find useful principles. For example, much of Tufte's (2001) "The Visual Display of Quantitative Information" is not easily generalizable if the subject of a visualization is not based on statistical data. Even in the cases of smaller datasets, some of Tufte's (2001) exemplars are only successful when judged by particular criteria. For instance, his oft-cited example of Charles Minard's (in Tufte 2001) visualization of the fate of Napoleon's army in Russia in the 1812-3 campaign, which he says, "may well be the best statistical graphic ever drawn," (p. 40) is extremely difficult to interpret by itself without significant study and an appropriate context for a reader. This is not to argue that the graphic is essentially flawed, but that the very idea of a "best" visualization is highly context dependent. Minard's (in Tufte 2001) visual, which would be considered an infographic in Cairo's (2016) formulation, is relatively opaque without some preliminary orientation to the subject matter and the reading of the lengthy textual explanation. Once understood, the infographic is indeed rich and compelling, but it only achieves that through study and therefore relies on a context for the viewer including them having the time and capacity for intricate examination of fine details and a general familiarity with images of graphical sophistication.

If that same graphic were viewed for example through the lens of Frankel and DePace (2012), it struggles to achieve clarity in one of their three fundamental questions: "What is the first thing you want the viewer to see?" (p. 13) Their framework of using five basic tools from graphic design, namely Compose, Abstract, Color, Layer, and Refine would likely lead to a quite different rendering of the same underlying data in all five of these areas.

There are countless other ways in which to examine the design of data visualizations, but the lesson seems to be to draw inspiration from a wide variety of sources and use them within a more general design process to achieve a desirable outcome.

Reflection on the uses of the LHPs

The LHPs have value in a number of use cases and we reflect on them here. Many advantages of the LHPs are clear. These include identifying behavioral patterns and finding interactions between different life events; keeping large caseloads organized for clinicians; and, enhancing therapy and treatment by presenting the plots to the participant themselves. Each will be discussed in turn.

The first intended use case for the LHPs is for researchers to achieve a different understanding of individual histories. This happens in at least a few different ways. At one level, the construction of the plots provides a framework for analyzing and synthesizing what are often complex, extensive, and detailed case files. The act of making the plots helps identify gaps in records and data and suggests specific further information that might be valuable in understanding a criminal career. Once a plot is made, the contours of a criminal history can be rapidly assessed. Has she offended persistently or sporadically? Is his record more specialized or general? Have the offences increased in seriousness or decreased in frequency over time?

The plots then provide sufficient information to assist in identifying connections between events, specifically assessing “whether the nature of stressful events is more important than their intensity, their number, or their timing” (Maltz & Mullany, 2000, p. 276). For example, it is possible to see whether an individual only behaves violently when he’s in a relationship, or whether her offending declines when she’s employed.

The second main use case is for clinicians to quickly gain an overview of a client’s offending history. This was not initially intended but the potential emerged during the design process. Plotting all of the pertinent information from an individual’s file onto a single and readily accessible chart is an instantaneous way of getting a brief overview of the ‘shape’ of a person’s life. This allows therapists or probation officers, for example, who are often faced with overwhelming caseloads, to keep track. This could be useful in the following circumstances: Before an initial meeting with a client, to prompt one’s memory in preparation for an appointment with a client who is only required to visit rarely; or to quickly review in preparation for a group session (especially if substituting for a colleague). It is possible to assess instantly whether the client has a persistent, specialist criminal record, is recently married with three children, or a criminally versatile drug addict who has never held a steady job.

The third main use case is for clinicians to employ the plots as a tool when working with the subjects themselves. As Maltz and Mullany (2000) point out, it is useful from a fact-finding perspective to get the dates of events and other data correct, but it also has the ability to be a valuable therapeutic tool. To be able to ask, “what was going on at this time in your life?” or to demonstrate that someone only offended when they were single, for example, could provide crucial insight into someone’s offending behaviors. “After the initial interview, the chart could be shown to interviewees to give them an idea of how their own lives have been shaped, and might elicit more information from them about other salient events and processes in their lives" (Maltz & Mullany, 2000, p. 276). This was certainly the case with Glenn above.

As the contributions of environmental and situational explanations of offending continue to gain traction and offer alternatives to the psychological explanations of personal, personality, or cognitive deficits it is increasingly valuable to illustrate the relationship between the impact of circumstances and life events and turning points on someone's behavior.

Reflecting on the visual effectiveness of the LHPs

Evaluating the effectiveness of data visualizations in a comprehensive, rigorous manner is challenging, just as it is for essentially all communication efforts. We can, and do, use informal or semi-formal qualitative feedback from users as part of an iterative design process. Another useful approach to testing likely effectiveness of designed objects is to evaluate them against criteria synthesized from best practice and past experience. We can consider the LHPs in terms of such criteria here. Although there are a variety of frameworks in which we can perform this evaluation, we consider Cairo's (2016) five-pronged approach mentioned earlier.

The first of Cairo's (2016) qualities to strive for is truthfulness. Truth as a concept is philosophically difficult at the best of times but we consider a few aspects of it here. Just as it is easy to lie with statistics, so is it easy to lie with data visualizations. However, confident in our intent to produce work based on “thorough and honest research”, consistent with Cairo (p. 45), this is less of a concern than other aspects of truth-finding. There are particular challenges of obtaining truth in a data visualization due to the fact that our “graphicacy” (Balchin & Coleman 1966) is often not as developed as our literacy or numeracy. Data visualizations are also particularly susceptible to errors in reasoning or fallacies such as apophenia (the tendency to perceive non-existent connections and meaning), confirmation bias (in which we interpret a visual through the lens of a pre-existing framing), illusory correlation, or questionable-cause fallacies. These potential errors need to be considered in design of the visualization schema, the construction of a specific visual instance (such as a single LHP), and by users of the visual objects.

Cairo (2016) proposes that “any visualization is a model” (p. 69), that models lie on a continuum of truth (pp. 86-87), and that the goal of a visualization should be to come up with the model given constraints that best corresponds to any idea of “absolute truth” (p. 95). He states that, “the way we think about theories and opinions being more or less true is identical to the way we can think of truer or untruer visualizations” (Cairo, 2016, p. 89). Without getting bogged down in too many details of this analysis, we primarily propose here that an awareness of these issues as part of the design process is a first step to trying to achieve a truthful visualization. It is worth noting a few specific aspects that are challenging for the LHPs in this process. The first is common to general criminological inquiry in that data are incomplete and the choice of what data are collected and how is biased by institutional, political, social, and cultural factors. This limitation becomes particularly clear from a social semiotic stance, as mentioned previously, because attempts to create the visual highlight the ways in which the data encoded in a complex case file are structured (or lacking in structure) according to various biases. The second challenge arises from an interplay between an imperative of data visualization to answer the question “what is the first thing you want the viewer to see?” (Frankel & DePace, 2012, p. 13) and an attempt to not pre-construct an unwarranted particular narrative or form of narrative. Although this is a general concern, it is of more significance for the LHPs because developmental and life-course criminology essentially requires the construction of narratives and the LHPs have a role in that construction. This second challenge presents a real epistemological difficulty but one that we have attempted to mitigate through careful consideration of the elements chosen to include in the plots and by doing so in a way consistent with the significance of those elements according to the research literature.

The second of Cairo’s (2016) qualities is functionality. Designing the LHPs led to interesting realizations about functionality. As we worked through iterations and showed them to others for feedback, we appreciated other potential uses of the plots. In their original conception, they were tools for researchers to come to a different view of a life history. However, clinicians who saw the plots identified an additional use case: the LHPs as prompts for discussion with clients. By producing the plots in a way that would be accessible to the clients, they could be literally placed on the table with elements pointed to and discussed, with questioning prompted by the relationship between different elements. An example line of questioning could explore the possible connections, *in the client's view*, of a drop in criminal activity (visually obvious from the changing pattern of lollipop elements) and significant life events such as employment or marriage (clearly indicated on the explicit timeline component of the plot). The iteration of the design took into account this kind of use, consistent with Cairo's (2016) determination that "the purpose of your graphics should somehow guide your decision of how to shape the information" (p. 51).

Cairo's third desirable quality is beauty. Like truth, beauty is a challenging term, and this is not the place for a deep investigation of aesthetics as philosophy. An important distinction to make here is that there is a difference between styling or decorating and design for purpose, a distinction often elided by non-designers, to designers' endless frustration. The relevant aspect of beauty here as expressed by Cairo and consistent with typical definitions is that beauty involves a feeling including "the way we perceive the appearance of an object and its deep connection to its purpose" (p. 55). Beauty is an individual judgement but there are also aspects of beauty that are generally agreed upon by a particular population, with that group view often as much a cultural construct as a psychological one. Cairo (2016) states that "what matters isn't if the objects of our creation are beautiful or not per se, but if they are experienced as beautiful by as many people as possible" (p. 55). For the purposes of the LHPs, this needs to be interpreted as referring to as many of the intended users of the plots as possible. Our current standards of visual aesthetics in a research community tend toward simple and clear visual elements with a minimum of decoration or non-functional adornment. The property of simplicity also enhances functionality when it comes to using the LHPs with client groups who might not have the same graphicacy as researchers used to the world of graphs and charts.

The meaning of insight, Cairo's (2016) fourth quality, is again difficult to pin down. However, he argues that spontaneous insight (an "a-ha" moment) and knowledge-building insight are related and relevant framings (p. 59). The LHPs aim to produce the first of these through the presentation of patterns of criminal behavior at first glance: the visual effect of a low-level life-course persistent record appears entirely different to a brief but large burst of serious offences. This difference might not be appreciable with a glance at rap sheets of these two cases, which might appear to cover similar volumes of crime in the sense of the number of specific charges. In other words, this visual device allows a different perspective than is possible via a text document. Knowledge-building insight is also possible with the LHPs as a user can discover the relationships between the different kinds of information in the plots with a view to forming narratives and hypotheses.

Cairo's (2016) fifth quality, enlightening, is different from insightful as it refers to not just how the visualization will increase a person's knowledge or understanding but how the visualization will change people's minds for the better. It refers more to the topic of visualization rather than the form of it. Cairo (2016) writes, "Choosing topics ethically and wisely—casting light over relevant issues—matters a lot" (p. 60). Naturally, we believe that finding ways to better understand and interrogate life histories and the conditions in which they develop is an important topic worth time and effort.

Beyond analysis in this framework, we could delve into the nitty-gritty details of the specific visual design choices (color, size, font, weight, hierarchy, structure, etc.) made in the LHPs but that is beyond the scope of this chapter. It is also a set of choices that were made at a particular point in time, with a dominant aesthetics, publishing requirements, and a certain set of digital tools and technologies available. All of these have since changed in that decade and are worth revisiting. In our opinion, the plots now appear dated and could do with considerable refinement and reworking. However, the core qualities of the LHPs appear to be on reasonably solid ground according to feedback we have received and our analysis relative to design frameworks.

Limitations

This work is not without limitations. The potential generalizability of this work, restrictions on what is included in the plot, limitations of using archival files, and the obstacles regarding color printing are each discussed below. First, with respect to generalizability, we make no claim about the extent to which Glenn's story (the case study presented above) is any way representative of the larger sample from which he was drawn. However, because our focus is squarely on understanding individuals, it is already clear that meaningful stories can be told from exploring the data in this way. As Maltz (1996) so rightly argued, until we study at least a few cases in considerable depth, we really have no baseline from which to discuss the characteristics of *any* case.

Not every aspect of a person's life can be plotted on a graphic such as this one. The variables that are depicted in the present plots were chosen because they were readily available in the data at hand and could be compared reliably across cases. It is likely that more contemporary datasets would include more detail on other variables that might be of interest such as education, time in treatment, co-parenting without being married, and so on.

LHPs are certainly limited in part by the nature and format of the records that were used. Although these limitations are relevant, consistent results have been achieved across archival and official sources of data for the present sample. Further, even though it is acknowledged that official statistics likely under-represent the true nature and extent of actual offenses committed, a second reason to include only officially recorded charges is the standardization they provide across cases. Discrepancies in criminal justice system processing notwithstanding, the exclusion of self-reported data (even though it was available for some participants) ensured all of the plots were comparable to each other.

Finally, although color is certainly preferable when "trying to show more than one or two relationships in the data" (Maltz, 1998, p. 405) a comparable level of detail can be achieved in black and white. The original LHPs were constructed in both color and greyscale alternatives to take into account availability of color reproduction. They were useful for clinicians and therapists working in circumstances where the cost of color printing was prohibitive. In addition, it is worth noting that as interactive technologies advance and more information is consumed on mobile digital devices, the production of high-resolution color plots will no longer be as disadvantageous. The use of color can often be an advantage but needs to be used judiciously and carefully to enhance the usefulness of graphics.

Future directions

In the time since the LHPs were first designed and used, the range of visualization tools and their sophistication has increased markedly. A refreshing or redesign of the LHPs could make use of many new options although some of the core requirements of the originals remain. For example, the allure of interactive, screen-based visualizations is undeniable and can be of great value to researchers if well designed. Such an interactive version could feature options to select or hide various domains (such as to show only sexual offenses, hide disciplinary reports during custody, or show only formal marriages and hide common-law relationships, and so on). This could also allow for the magnification of sections of the plot, "to inspect a sequence of closely-packed events" (Maltz & Mullany, 2000, p. 277). However, if clinicians are unable to carry electronic devices into secure areas, that kind of visualization reduces the value of the effort. One potential pathway for visualizing life histories then would be a splitting of tools to cater for different use cases, or at least be built such that different forms of output can be generated that accommodate the different needs of users.

Separate to the design of the visualization schema, the process of constructing and coding an individual life history in a form suitable for rendering as an LHP is quite lengthy. This is unavoidable to some extent due to the varied nature of source materials drawn on for establishing a life history. However, an admittedly ambitious and speculative future possibility might avoid the intermediate coding phase and employ a natural language processing approach (in which important information is extracted directly from narrative case reports including semantic analysis and discourse analysis, increasingly enabled by new machine learning techniques in the 2010s). Going further, as machine learning approaches develop, future techniques might be able to extract potentially unnoticed patterns from the raw case reports, for which the most appropriate communication strategy is likely a visualization. Such techniques would need to be developed cautiously to avoid many of the known issues with injudicious use of these emerging technologies.

Design methodologies evolve, particularly with the growing experience designers have working in a broader range of situations with a more diverse set of clients. Revisiting the LHPs would likely involve a deep consideration of alternative design methodologies to build the plots or even potentially some quite different solution as the methodology might identify. One example of a methodology that the authors consider worth further exploration is that of norm-creative innovation (Nilsson & Jahnke 2018). This framework involves a first *norm-critical* step "critically analyze[s] relevant social norms, including socially constructed mental models, outlooks, and values; perceptions of difference; and perceptions of which roles and characteristics we value and devalue" (p. 376). The following *norm-creative* design thinking step involves "developing design solutions that counteract such norms through reflection on what might be." Although not creating any particularly new form of design, this example provides a methodology that recombines many of the approaches and tactics of other design methodologies with a value set at its core.

Conclusion

LHPs are a tool designed for a specific purpose: to collect and present data in a format suitable for new types of interrogation, explanation, narrative-creation, and client response to life histories in the context of the criminal justice system. They can highlight the relationship between various events and situations across the life span on an individual level. They contribute meaningfully to what we know regarding individual criminal careers and the turning points within them. The possibility also exists for additional analysis by superimposing multiple plots and generating hypotheses based on apparent similarities and differences across cases. Finally, in addition to these research objectives, the plots have the capacity to be useful in therapeutic contexts for both practitioners and participants.

There are many advantages of the LHP. First, it contributes to the little that is known about offending patterns in sexual offenders from the perspective of criminal career research. Second, it provides a vehicle by which the offending tendencies of a group of chronic sexual offenders are able to be explored in depth. Third, it achieves these two objectives visually, and generates an individual level graphic representation of the criminal career. Finally, the clinical utility of these plots from a therapeutic standpoint has been particularly exciting to witness (Harris 2012).

Importantly, as part of a consciously designed iterative process, these life history plots have a life history of their own, continuing to evolve in response to the context in which they operate and in the service of the greater aims of the criminology community for which they are designed.

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