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How useful is Thematic Analysis as an elicitation technique for analysing video of human gait in forensic podiatry.

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Forensic gait analysis

- Forensic gait analysis was first used in the United Kingdom in 2000 when Haydn Kelly, a British podiatrist, provided expert testimony at the Central Criminal Court in London. He provided evidence regarding the defendant's gait which ultimately led to conviction DiMaggio and Vernon (2011).

- Since then, past publications Bouchrika *et al.*(2011) plus author experience have indicated that this approach has been used successfully within court cases across the UK, Canada, Denmark and Sweden Lynnerup and Vedel (2005).

Gait analysis

- Gait analysis has been identified as a potentially valuable tool, when more traditional means of identification such as DNA and fingerprints are not available Bashir *et al.*(2010).

- The analysis of gait is non-invasive and does not require the perpetrator to be present in order for comparisons to be made.

- Gait can be influenced by external and internal features such as, clothing, carrying objects, rucksacks and an individual's mood Birch *et al.* (2013)

Gait analysis

- In order for an analysis of gait to take place CCTV recorded evidence plus a further recording made either overtly or covertly is required. The characteristics from those recordings can be used to either confirm or exclude potential identification Bouchrika *et al.*(2011).

- However, it has been suggested that ideally the suspect should be recorded covertly in order to prevent any attempt being made to alter their gait pattern Larsen *et al.*(2010).

Gait analysis

- The role of a forensic gait analyst is to compare the two sets of recordings looking for both compatible and incompatible features of gait Birch et al. (2013) and Birch, Ray et al.(2013).

- A significant amount of research has been undertaken in relation to the development of forensic gait analysis. However there appears to be limited research into the clinical experience of the professional examining the evidence.

- In a recent court case in the UK, the defendant was found not guilty in part when the witness giving evidence relating to the gait analysis was unable to justify their findings upon cross examination Pump Court Chambers (2012).

Skills required for a forensic gait analyst

- Due to forensic gait analysis still being in its relative infancy as a forensic science, there appears to be limited research into what skill level is required in undertaking gait analysis for the purpose of contributing towards criminal proceedings.

- Within the International Association for Identification it has been stated that expertise into forensic podiatry can be obtained through a variety of routes ranging from a master's degree programme through to relevant continuing professional development Vernon *et al.* (2009).

Skills required for a forensic gait analyst

- There is no doubt from the review of literature that gait analysis has an important and successful role to play within forensic biometrics, however the level of experience and skill base that the analyst needs appears to be under-researched.

- How could you distinguish between novice Forensic gait analysts and Expert gait analysts?

Investigating a possible metric

- How useful is Thematic Analysis as an elicitation technique for analysing video of human gait in forensic podiatry.

Thematic analysis-What is it?

- Boyatzis(1998) states that thematic analysis is a method that is frequently used in analysis of qualitative data. He notes that its focus is to identify patterns in a dataset, from these patterns categories are produced and subsequently themes emerge from the data Boyatzis(1998).

- In practice, thematic analysis is essentially a means of taking a rich abundance of data, finding patterns (themes) within that data categorising these themes and ultimately using these to suggest a theoretical model Boyatzis (1998).

What is a theme?

- Boyatiz (1998) feels that what creates a theme may vary between qualitative researchers but it captures something essential about the data in relation to the research question.

- A theme would be something seen by the researcher as having direct relevance or importance to the researcher or those who have participated in the project.

- He states that there is no one answer to the question of what proportion of one's data set needs to display evidence of the theme for it to be considered a theme Boyatiz (1998).

A model for thematic analysis

- One approach to Thematic Analysis has been presented by Braun and Clarke (2006) and involves a six-phase process:

- **Familiarisation with the data**: This phase involves reading and re-reading the data, to become immersed and intimately familiar with its content.

- **Coding**: Involves generating succinct labels (codes!) that identify important features of the data that might be relevant to answering the research question. It involves coding the entire dataset, and after that, collating all the codes and all relevant data extracts, together for later stages of analysis.

- **Searching for themes**: Involves examining the codes and collated data to identify significant broader patterns of meaning (potential themes). It then involves collating data relevant to each candidate theme, so that you can work with the data and review the viability of each candidate theme.

- **Reviewing themes**: Involves checking the candidate themes against the dataset, to determine that they tell a convincing story of the data, and one that answers the research question. In this phase, themes are typically refined, which sometimes involves them being split, combined, or discarded.

- **Defining and naming themes**: Involves developing a detailed analysis of each theme, working out the scope and focus of each theme, determining the 'story' of each. It also involves deciding on an informative name for each theme.

- **Writing up**: Involves weaving together the analytic narrative and data extracts, and contextualising the analysis in relation to existing literature.

The study

- Ethical approval was obtained for this study by the University of Northampton School of Health Ethics Committee.

- Two groups comprising 30 podiatry students in each group participated in the study. Both groups were registered on an undergraduate podiatry degree in the UK.

The study

- The first group consisted of first year podiatry students who had not been previously introduced to human gait on the course (the "novice" condition).

- The second group consisted of third year podiatry students who had had three years of instruction on this topic (the "expert" condition).

Expertise-Care here!!

- There is no one definition of expertise but from his work on chess De Groot (1965) suggests that experts can do things that the rest of us aren't able to do.

- Experts are not necessarily more intelligent than non-experts but retain huge numbers of facts about their expertise.

Health warning!

- The final year students (third years) in this study are not experts in the strict sense of the definition but they have undertaken a longer period of formal instruction about human gait whereas the novices didn't and as such demonstrated the relative expertise required in this project.

- I am not presenting the results from this study as findings of expert v novices but I am using expert v novice students to evaluate the technique of thematic analysis (study needs repeating with expert and novice forensic gait analysts)

- Nevertheless it does produce some interesting findings.

The study

- A volunteer who was unknown to the participants of the study agreed to be filmed by one of the authors to provide a video clip of their gait.

- Filming was completed on a home video camcorder (Samsung HMX-F90).

- The clip was filmed in the frontal plane. The video clip was shown to both "experts" and "novices" groups on separate occasions.

The Study

- A video clip was shown to both "experts" and "novices" groups on separate occasions .

- Within each group the participants viewed the video all at the same time but it was not on a continual loop.

- They were not allowed to view the video clip more than once.

- The participants were allowed unlimited time for response but were not allowed to discuss the findings with anyone else in the group during the session.

- The "novice" and "expert" podiatry students were interviewed separately on different occasions. A blank sheet of paper was provided for them to record observations of gait.

Producing categories

- In order to generate categories for the observations of gait, a thematic analysis was undertaken by one of the authors using the six stage process previously described by Braun and Clarke (1996).

- This involved one of the authors gaining familiarity with the data through reading the expert and novice transcripts. This generated codes or labels of head, shoulders, arms, hips, knees, and feet. Broader patterns were then attached to the codes such as position or movement of the body and further themes added such as straight or bow legged.
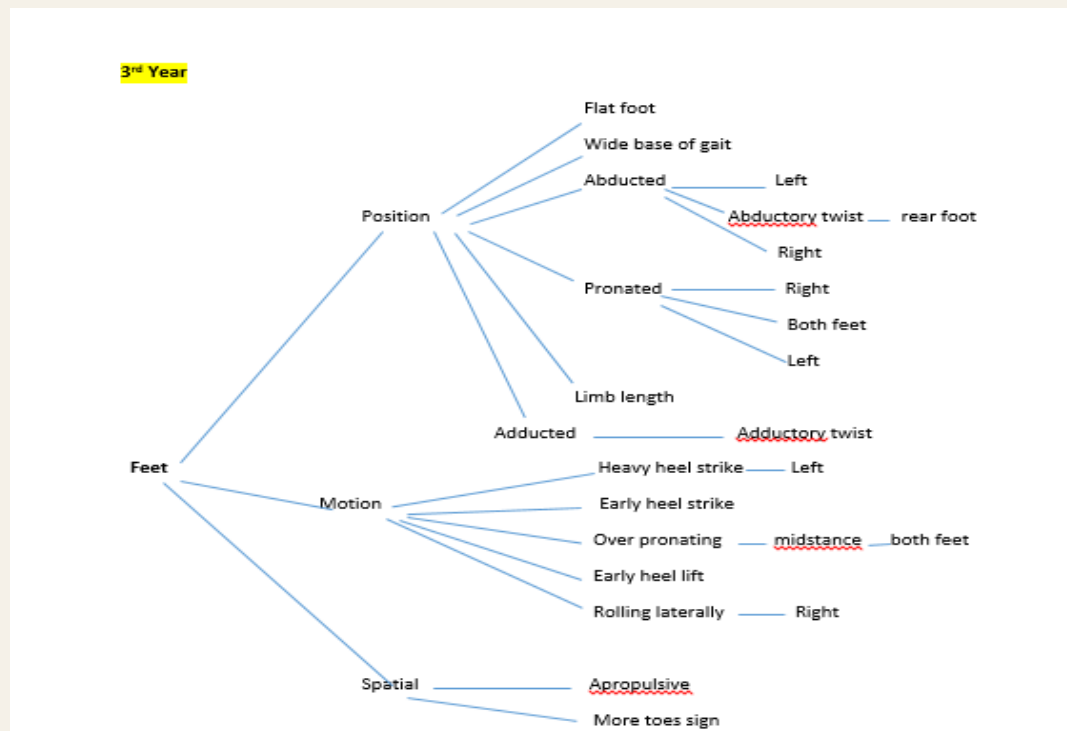
The themes

- These themes were reviewed in conjunction with another one of the authors to determine if they explain the data and answer the research question.

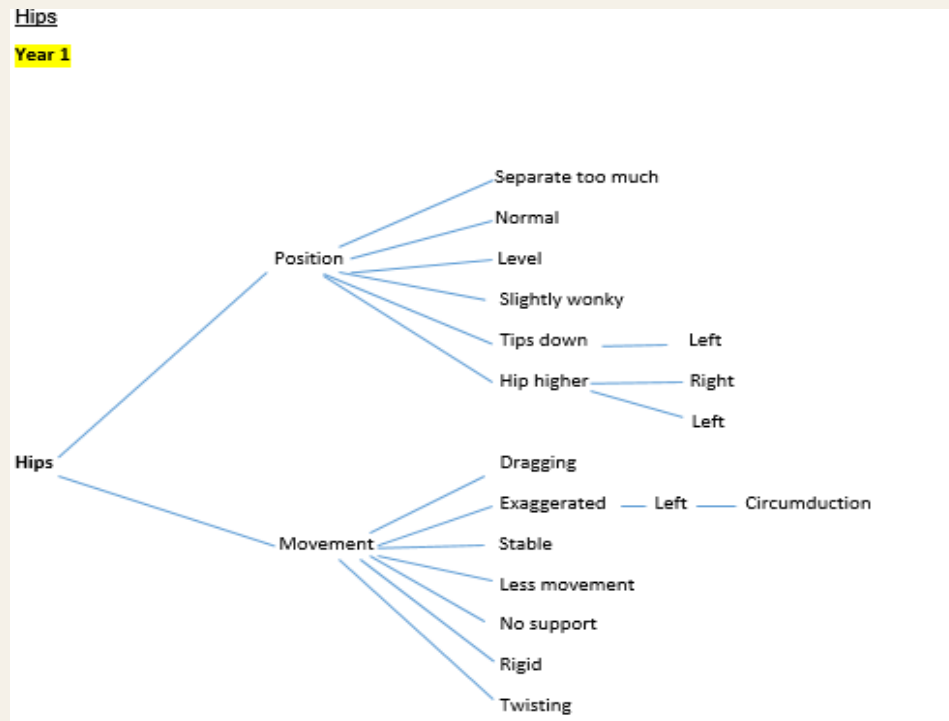- The findings are presented as flow diagrams.

Findings (Feet) "Novice" 1ˢᵗ years

Feet

1ˢᵗ Years

- Feet
  - Motion
    - Looks uncomfortable
    - Normal and firm step
    - Big heel strike
    - Inside heel makes first contact
    - Exaggerated step
      - Right
      - Left
    - Big step
  - Position
    - Separate too much
    - Walking more on heels
    - Splayed feet
    - Point outwards
    - Turned out slightly — Left
    - Wide movement
    - Flat footed
      - Pronation
      - Everted
    - Lateral rotation
  - Spatial
    - Careful walking
    - Lifts foot higher than opposite — Right

Findings (Feet) "Expert" third years

Findings (Hips) "Novice" 1ˢᵗ years

Findings (Hips) "Expert" third years
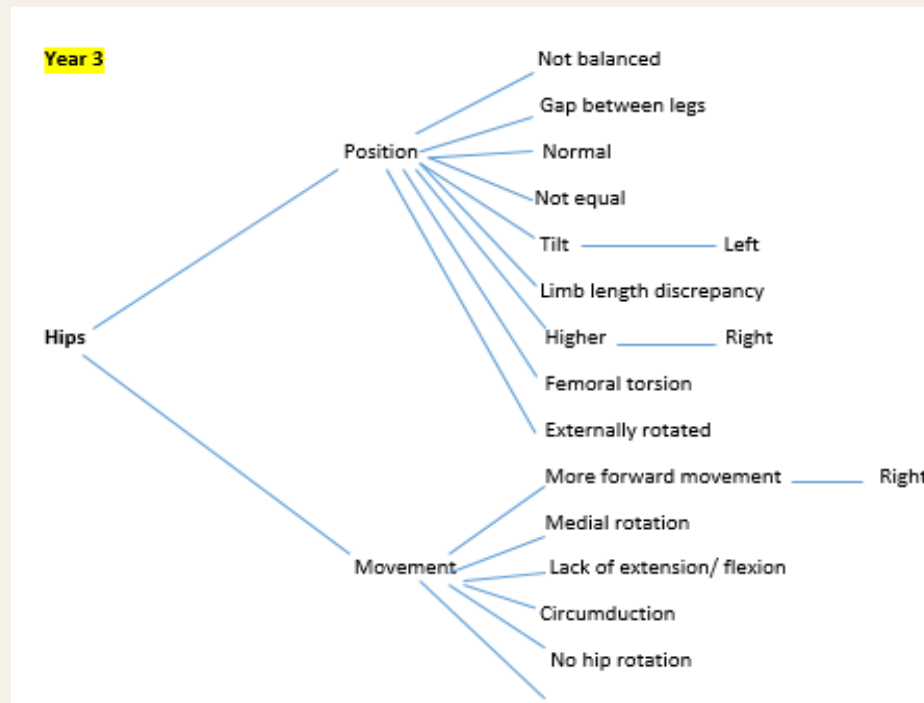
Main findings

- The significant findings from the study are that the technique of Thematic Analysis provides a rich amount of information about human gait and demonstrates differences in expertise between "novice" and "relative experts".

- One finding depicted that novices tend to use layman's language which is descriptive in nature. For example when describing the position of the feet novices stated that feet "point outwards", whereas experts described feet as "abducted".

- Another finding was that both experts and novices have the ability to observe the same traits of gait but experts provide much more in-depth information.

Discussion

- These findings appears to concur with findings of Birch (2013) in that those with greater experience are able to provide more detailed information.

Discussion

- There was also a difference in both the amount of information and the terminology used when describing upper limb movements as opposed to lower limb movements.

- Within the upper limb, there was no use of terminology for either novices or experts in descriptions of the head, shoulders or arms, although one novice specified that the arms are flexing forwards by 15 degrees.

- It has been acknowledged that for a complete analysis of gait to be made the whole body should be observed it was also identified within Birch *et al* (2013) that when analysts considered both upper and lower limb movements, there was a greater percentage of identification made.

Discussion

- Stevenage (1999) identified a 50% success rate for non-experienced volunteers to pick out the suspect walker from an identification parade, being viewed from sagittal plane.

- Our study did not allow for identifiable traits to be commented on therefore it is difficult to directly correlate the results of this study to that of Stevenage (1999).

Discussion

- This brings into question whether all cases of forensic gait analysis require experienced analysts, that have undertaken additional training, as proposed by Vernon *et al* (2009) in order to be able to observe traits that the inexperienced eye would be unable to view.

- However, low observation rates could also be compared with the earlier studies completed by Cutting and Kozlowski (1977) and Stevenage (1999) where their rates of recognition for inexperienced observers ranged between 19.4% and 30% for Cutting and Kozlowski (1977) and 50% correct for Stevenage (1999).

- In the terms of this study, it can be seen that the lower down the human body, the more observations are made indicating that there is an increased confidence about making observations of the lower limb as opposed to the upper body. Perhaps this is not surprising as podiatrists tend to have specific expertise in relation to the lower limb and its function.

Conclusion and future research

- Thematic analysis allows the expertise of podiatric students to be evaluated in performing gait analysis from a video clip by looking at their use of language and depth of knowledge.

- The exploration of human gait using this technique provided a rich abundance of information and demonstrated that a basic experience or knowledge is required to provide a simple description of human gait.

- However with more sophisticated experience and knowledge on the part of "experts" came a greater depth and breadth of observations of human gait.

- **Recommendations for further research**

- Whilst it has been a useful study and elicited differences between "novice" and "expert" groups, it was accomplished using podiatry students. It would be useful to repeat this study with expert podiatrists or forensic gait analysts.

Thank you
for listening

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Thank you

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