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## Socio-spatial and quality of life themes in aged care architecture: A qualitative methods protocol

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**Socio-Spatial and Quality of Life Themes in Aged Care  
Architecture: A Qualitative Methods Protocol**

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# Socio-Spatial and Quality of Life Themes in Aged Care Architecture: A Qualitative Methods Protocol

## ABSTRACT:

**Aim:** To evaluate the connection between residential aged care architecture, the resident's ability to find home and Quality of Life themes.

**Design:** This study uses convergent qualitative mixed methods approach across the three phases of the research project to explore the lived experience of residential aged care residents, their family members and direct care staff.

**Methods:** The chosen qualitative methodology is based on a constructionist paradigm and uses a combination of observations, photo production and prompted discussions and architectural visual data collection methods. Funding was approved in March 2018.

**Discussion:** This research will provide a novel approach to understanding ways by which residents of residential aged care facilities engage with their surrounding environments and make those surroundings into a place they 'called home'. The research will serve to articulate the core elements of residential aged care building types which lead to an enhanced quality of life and sense of place for residents.

**Impact:** There is little contemporary socio-spatial, lived experience research on the implications of new building types, such as small household aged care facilities on residents Quality of Life. This research contributes, and is significant, to the disciplines of aged care, nursing, architecture and user studies. The research will provide new knowledge about the influences of the physical environment on resident's Quality of Life and their ability to find home across different building types, while providing insight into how Quality of Life might be improved through spatial strategies.

**Key Words:** Nursing, Nursing Home, Residential Aged Care, Architecture, Health Architecture, Quality of Life, Older Adults, Physical Environment, Built Environment, Lived Experience

## INTRODUCTION

The demands of our aging population are evolving quickly, with people living longer, healthier lives with associated expectations of having a good Quality of Life (QoL). However, according to demographic indicators, future residential age care residents are likely to be older, sicker with multimorbidities and in far greater numbers than current data shows (Cullen, 2019). New models of care and associated new building models, such as the small and medium household models, are emerging across the sector with little contemporary socio-spatial research on their combined implications on QoL. Therefore the contemporary design response of residential aged care needs to rapidly respond to these changing expectations.

## Background

Since the development of the conceptual idea 'Quality of Life' in the 1950s and 1960s (Cooney, Murphy, & O'Shea, 2009) researchers have been investigating the relationship between care facilities and QoL, with QoL becoming the defining concept linking biological medicine and socio-medicine (Armstrong & Caldwell, 2004).

The World Health Organization (2020) currently defines QoL as:

*"...an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment"*

1  
2  
3 Within the context of residential aged care, research has aimed to elicit factors contributing to resident  
4 optimal QoL by establish QoL themes or rating residents' QoL (Alida HPM de Rooij1, Luijckx,  
5 Declercq, & Schols, 2011; Barney, 1974; Cooney, Dowling, Gannon, Dempsey, & Murphy, 2014;  
6 Fleming, Goodenough, Low, Chenoweth, & Brodaty, 2016; Hennessy, 2004; Parker et al., 2004; van  
7 Hoof et al., 2016; van Hoof et al., 2015; Xu, Kane, & Shamliyan, 2013). However there is little  
8 consensus around the naming of the specific factors contributing to QoL. QoL literature is in consistent  
9 agreement regarding what affects resident QoL (Cooney et al., 2014). Specifically, Tester, Hubbard,  
10 Downs, MacDonald, and Murphy (2004) identify four key areas; a sense of self, the care environment,  
11 relationships, and social support. Furthermore, Edwards, Courtney, and O'Reilly (2003) concluded  
12 QoL also related to autonomy, choice, social needs, independence, and social relationships. Coughlan  
13 and Ward (2007) also recognized that relationships are the foundation of quality of life. In addition,  
14 Murphy, O'Shea, and Cooney (2007) determined the care environment and ethos of care, personal  
15 identity, connectedness to family and community and activities and therapies were all critical to a good  
16 QoL.

17  
18 Consistently, the care environment and/or the quality of space has been a recurrent theme throughout  
19 QoL research. Most studies identified that a good QoL has a relationship with the physical care  
20 environment. However, few qualitative studies have critically considered the correlation between the  
21 role of architectural design layouts and QoL. Dyer et al. (2018) undertook a quantitative study  
22 investigating the relationship between clustered domestic residential aged care (also known as small  
23 household residential aged care) settings and QoL. Dyer et al. (2018) cross-sectional retrospective  
24 analysis of linked health services data concluded that clustered domestic models of residential aged  
25 care are associated with better QoL. Although the results indicate residents living within smaller  
26 clustered domestic models of residential aged care have a better QoL, it is still unclear what specific  
27 spatial factors (e.g. spatial relationships, orientation, size, connectivity) contribute to this outcome.

28  
29 Cooney (2012) proposed that the residents' ability to establish a 'new' home within residential care  
30 facilities can potentially have positive effects on QoL. Cooney (2012) qualitative study identified four  
31 categories critical to finding a home in long-term care settings: 'continuity', 'preserving personal  
32 identity', 'belonging' and 'being active and working'. Another study by Phillips, Walford, and Hockey  
33 (2011) similarly found that due to an increasingly unrecognisable urban environments, older persons  
34 find positivity within a residential care environment in establishing a safe and secure sense of place.  
35 Further developing the Cooney's 'finding home' hypothesis van Hoof et al. (2016) and van Hoof et al.  
36 (2015) used participatory research to investigate the residents' perceived sense of home within  
37 residential aged care facilities. The research identified four important themes: the physical view;  
38 mobility and accessibility; space, place, and personal belongings; and the social environment and  
39 activities. All three studies found the design of residential aged care plays a significant role in residents'  
40 QoL. This research will further develop Cooney (2012), van Hoof et al. (2015) and van Hoof et al.  
41 (2016) qualitative research, through the investigation of building types, design, spatial quality, and  
42 QoL.

43  
44 Given the rapidly changing nature of the residential aged care (RAC) sector alongside the consumer  
45 driven demand for homelike settings and an increased demand for well-designed places, there is an  
46 urgent need for analysis of different building types and the lived experience of the residents, family  
47 members, and direct care staff. This research will serve to articulate the core elements of residential  
48 building types which lead to an enhanced quality of life and sense of place for residents. Using  
49 architectural and ethnographic methods this research will analyse three residential aged care building  
50 types: traditional, medium and small household, to understand how spatial factors contribute to the  
51 residents' ability to feel at home and contribute to QoL outcomes. The findings will add to Evidenced-  
52 Based design knowledge, and, practically, to design decision-making for future residential aged care  
53 projects.

## 54 55 56 57 **THE STUDY**

### 58 59 **Aim**

1  
2  
3 The overarching aim of this research is to evaluate the connection between residential aged care  
4 building types, the resident's ability to find home and the spatial manifestation of Quality of Life themes  
5 to meet the following objectives:  
6

- 7 • Document, analyse and interpret the design, layout and lived experiences of Residential Aged  
8 Care models against key social-spatial, lived experience and Quality of Life themes.
- 9 • Reveal the socio-spatial factors within the three case study buildings that contribute to the  
10 residents' ability to feel at home and their Quality of Life.
- 11 • Compare the architectural, layout and lived experiences of traditional, medium and small  
12 household models of care through a socio-spatial lens.  
13  
14  
15  
16

## 17 **Design and Methodology**

18 This study uses convergent qualitative mixed methods approach across the three phases of the research  
19 project. The chosen methodology is based on a constructionist paradigm and will use a combination of  
20 methods (observation, photo production and prompted discussion and visual data collection methods).  
21 This paradigm seeks the participant views and lived experiences of the phenomenon or situation being  
22 studied (Schwandt, 1998).  
23

24 This study focuses on the lived experience of residents, family members and direct care workers within  
25 the context of the residential aged care facility (RACF) and the role of the built environment in that  
26 experience. The participation of residents and their families is critical to the success of this research.  
27 Only the resident and family members can provide information about the individual lived experience  
28 and the ability to feel at home within each building type. The direct care staff will provide critical insight  
29 into what makes them feel like they are caring for someone in their home or home environment as  
30 opposed to a medical facility. Each participant and participant group will offer a different insight into  
31 the lived experience of the particular building type.  
32  
33

34 Photo-production as a visual research method enables the researchers to experience a phenomenon from  
35 the participant's point of view and does not solely rely on spoken language (van Hoof et al., 2016).  
36 The photographs produced and shared serve as a conduit to enhance the narrative from the perspective  
37 of the participant. Within the context of this research photography will allow the complex health and  
38 social environment, to be captured and then shared with the researcher (van Hoof et al., 2016).  
39  
40

41 Spatial analysis is used to analyse the architectural drawing sets from the three RACF. The researchers  
42 will analyse the building layouts, spatial relationships, adjacencies, orientations and design qualities  
43 as represented in the architectural drawings to evaluate the frequency, size, connectivity and spatial  
44 condition of key public, social, private and organisational elements within each case study building.  
45 This method of spatial analysis has been used successfully in the analyses of varied building types,  
46 including hospice environments, housing within remote Aboriginal communities and the relationship  
47 between workplace environment and physical activity (Creagh, McGann, Tye, Jancey, & Babb, 2017;  
48 Farley, Birdsall-Jones, & Datta, 2019; McGann, Creagh, Tye, Jancey, & Blackford, 2014).  
49  
50

51 In combination with the spatial analysis and photo-production the researchers will be observing how  
52 space is used within the three RACF. The researchers will be passive participants, acting as bystanders,  
53 only watching and recording the use of space. The observations will document the everyday lived use  
54 and adaptations of the spaces. The researchers will document how space is used and how the residents  
55 have personalised the built environment. The observation will be recorded through architectural  
56 diagrams, field sketches, notes and photographs.  
57  
58  
59

## 60 **Participants, setting and recruitment**

1  
2  
3 The research project is a collaboration between the researchers and a sector-leading Australian  
4 residential aged care provider. The participant group will be recruited from three different residential  
5 aged care facilities, namely two in Victoria and one in Western Australia. Each case study is considered  
6 a different RAC model and building type; small household cluster model, medium household model  
7 and a traditional medicalised model. The participants will be residents, their family members, and direct  
8 care staff. The researchers will recruit a mixed-gender participant group endeavouring to have a gender  
9 balance.

10  
11 The participants will be selected on the bases of three different inclusion criteria. Specifically, RACF  
12 residents must be over 55 years of age; have resided in the specific RACF for at least six months; have  
13 a capacity to take photographs independently and be capable of participating in a 30 – 60 minute  
14 prompted discussion. Furthermore, it is essential that family members have an ongoing relationship  
15 with the RACF resident and be nominated as Next of Kin or primary informal caregiver. The direct  
16 care staff must have been employed at the specific RACF for at least 6 months and have been identified  
17 as an ‘exceptional’ direct care staff member by the senior staff or management.

### 18 19 **Participant sample size**

20  
21 Overall, between 5-10 residents, 5-10 family members and 5-10 direct care staff will be recruited from  
22 each RACF, with a total participant group of 45- 90 participants across the three residential aged care  
23 models and building types.

24  
25 The aim of this research is to gain an in-depth and highly contextualised understanding of the role the  
26 built environment has in a person’s ability to feel at home within a RACF. It is proposed a total of 15-  
27 30 participants across the three participant groups from each RACF will likely lead to data saturation.  
28 The desired sample size is consistent with international research that has utilised photo-production as a  
29 primary data collection method (van Hees, Horstman, Jansen, & Ruwaard, 2017; van Hoof et al., 2016).  
30 The participant photo-production data and observational data will provide critical and in-depth insight  
31 into the residents’ lived experience and what feeling at home means within different residential aged  
32 care facilities.

### 33 34 **Recruitment**

35  
36 The research team will liaise with the RACF management to coincide their first site visit with a weekly  
37 staff meeting. During this meeting, the research team will introduce themselves and the research project.  
38 On the advice of the RACF management, before the initiation of fieldwork and participant recruitment,  
39 the research team will aim to attend a monthly resident meeting, which is typically attended by residents,  
40 family members, and staff. During this meeting, the research team will introduce themselves and the  
41 research project.

42  
43 Given the researchers’ knowledge of the target population and the aim of the study, purposive sampling  
44 will be used at the recruitment protocol for residents and family members (Polit & Beck, 2017).  
45 Purposive sampling is a non-probability sampling technique which requires the researcher to  
46 ‘purposefully’ select the participants as those who have the greatest amount of information on the  
47 specific topic (Creswell & Poth, 2018). The research team will work with care staff to identify potential  
48 participants. The regular and non-agency care staff will be familiar with both residents and family  
49 members and can assist the researchers to identify which participants to approach. Once a potential  
50 participant has been identified, the researchers will seek an introduction from the care staff. If a staff  
51 member is unavailable to make the introduction, the researcher/s will introduce themselves to the  
52 potential participant. In all cases, the researcher/s will seek an introduction.

53  
54 The recruitment protocol for direct care staff will use Extreme Case Sampling method which seeks only  
55 those potential participants who are defined by specific characteristics. Direct care staff who exhibit  
56 exceptional care skills as identified by the RACF senior management will be defined as having the  
57 specific characteristics required for the research. All staff will be notified by RACF management about  
58  
59  
60

1  
2  
3 the research and that the research team will be contacted direct care staff seeking their participation.  
4 The researcher will be notified by RACF senior management as to the identity of the individual staff  
5 regarded as exceptional. Staff who have been identified by the organisation as exemplary care staff will  
6 be invited to participate via email or in-person. The discrete recruitment method will enable any of the  
7 suitable direct care staff to decline to participate without any consequences for their employment.  
8  
9

## 10 11 **Data collection and procedure**

### 12 **Photo-production method**

13  
14  
15 Participating residents will be asked to photograph objects, spaces, activities, and situations that make  
16 the space/s 'feel like home'. The direct-care staff participants will be asked to photograph objects,  
17 spaces, activities, and situations that they believe enhances the 'home' environment and allows the  
18 residents to feel 'at home'. Family members will be asked to take photographs of objects, spaces,  
19 activities, and situations that feel or appear institutional and are counter to the idea of home. All  
20 participants will be asked not to take specific photographs of people who do not want to be  
21 photographed. All images which include people will be de-identified using photo redaction and a  
22 manual illustrative technique (Farley, 2018)  
23

24  
25 The researcher/s will return after the photo documentation period to conducted individual prompted  
26 discussion with each participant. The timeframe of the photo-production and prompted discussion is  
27 designed to ensure the exercise and photographs are still current for the participants. During the  
28 prompted discussion the participants will be asked to identify their preferred 5-8 photographs and reflect  
29 on their photographs and share the meaning in a narrative format.  
30

31 The researcher will guide the prompted discussions. Should the situation or narrative become distressing  
32 for the participant the researcher will confirm if they wish to proceed or if appropriate will offer to  
33 reschedule the discussion. The prompted discussion will take place in a location that is convenient for  
34 the participant, where there is sufficient privacy and limited interruptions. All prompted discussion will  
35 be audio-recorded and transcribed verbatim.  
36

### 37 **Observations**

38  
39 The research team will be observing how the space is being used within selected areas of the RACF.  
40 Everybody occupying the selected area will be considered as part of the participant group. The  
41 participants will not be required to undertake any additional activities and the observations will have  
42 minimal disruption to daily lives and activities.  
43

44 The researchers will undertake observations at two different time points throughout the research project.  
45 The first set of observations will be recorded before the photo-production and prompted-discussions. It  
46 is intended the first set of observational data will provide a perceived understanding of the spatial use  
47 within the RACF. The second set of observations will be recorded after the participants have concluded  
48 their photo-production and prompted-discussion. Consequently the second set of observational data will  
49 be informed by the lived experience of the participants. It is important to establish if the perceived and  
50 informed understanding of spatial use is different and consider how the different perceptions effect the  
51 design of future RACF.  
52

### 53 **Architecture spatial analysis**

54  
55 The researchers will analyses the architecture drawings set from the three different RACF. The  
56 architectural spatial analysis will elicit data regarding the building layouts, spatial relationships,  
57 adjacencies, orientations and design qualities, allowing the researchers to evaluate the frequency, size,  
58 connectivity and spatial condition of key public, social, private and organisational elements within each  
59 case study building.  
60



## Data analysis

The data analysis is multi-staged:

- Each data type (photo-production, discussion, observations, and architectural spatial analysis) will be analysed separately
- The data set from each individual RAC building will be analysed as a group and, in the small and mediums Household models, as a sub-group by household.
- And, finally the outcomes from each RACF will be compared and analysed in a cross-case study analysis.

Photo-production, prompted discussions, observation and desktop architectural spatial analysis data will be managed and thematically coded using QSR NVivo 12. Thematic coding is a method for identifying and analysing patterns of meaning within the data across several transcripts or datasets (Braun & Clarke, 2006). The researchers will analyse the participants' comments, photographs, responses to space/s (observations) and spatial planning and design to identify recurrent themes. During the coding process, the researchers will be looking for consistencies and inconsistencies across the dataset.

Initially, the primary research team member will analyse the transcripts using the Braun & Clarke six step approach (as shown in Table 1). **The second and third researchers will independently analyse a subset of transcripts thematically. To establish validity, the research team will meet to agree on coding structures and decide on any anomalies or coding differences. The final key themes will be agreed upon.**

The triangulation of photo-production, prompted discussion, observations and a desktop architectural spatial analysis data, grounded in an extensive QoL literature review will;

- Reveal the socio-spatial factors within the case study buildings that may contribute to the residents' ability to feel at home and their quality of life.
- Provide documentation, analyses, and interpretation of the design, layout and lived experiences of RAC design models against key social-spatial themes.
- Compare the architecture, layout and lived experiences of traditional, medium and small household models of care through a socio-spatial lens.
- Establish which building typology supports the residents' ability to find a home with the RACF.

## Ethical considerations

This research obtained university human research ethics committee approval in February 2020. The research is industry funded, therefore to minimise any coercive influence from the industry partner all data collection and analysis will be conducted independently. Furthermore, participation in this research is completely voluntary and all participants are free to leave the research at any time without giving a reason and with no negative consequences.

Acknowledging the Australian NHMRA National Statement on ethical conduct in human research, the research team recognise this research involves multiple method of inquiry and require more than one consent strategy. The research employs different consent strategies for the photo production and prompted discussion and the observations. The photo-production and prompted discussion will use informed consent, confirmed by the completion of a written consent form and ongoing consent throughout the prompted-discussion confirmed orally. The observational data collection will utilise an opt-out method of consent.

## Consent - Photo-Production and Prompted Discussion

1  
2  
3 The researchers will verbally invite the residents, family members, and direct care staff to participate  
4 in the photo-production and one-on-one prompted discussions. If potential participants (residents and  
5 family members) are interested in the study, each participant will be given a participant information  
6 sheet and consent form. The researcher will guide the potential participant through the consent  
7 documentation to ensure comprehension of the document before the participant agrees to participate in  
8 the research. If direct care staff show an interest in participating in the study, they will be provided with  
9 a participant information sheet and consent form in person or via email. If any participants are not able  
10 to provide informed consent they will not be included in the research.  
11  
12

13 Informed consent will be an ongoing process with consent validation sought before all stages of the  
14 research. Ongoing informed consent will be checked before any research conversation and the  
15 participant will be reminded of their right to withdraw at any time without explanation or to withdraw  
16 consent to use any photographs that include them in any publications or presentations about the  
17 research. Should the researchers, family members or care staff consider that consent of the resident  
18 participants has not been adequately communicated; the resident will be thanked for their interest and/or  
19 involvement to that stage but will not be included in the research.  
20  
21

22 Additionally, the researchers acknowledge that there is the potential to perceive a power imbalance. To  
23 mitigate this perceived risk all potential participants will be informed that, participation in this study is  
24 completely voluntary and they are free to withdraw from the research at any stage without giving a  
25 reason and with no negative consequences. All participants will be provided with the researcher/s'  
26 contact information and an opportunity to ask questions and discuss any aspect of the study with the  
27 researchers.  
28  
29

### 30 **Consent - Observations**

31 The research team will observe how overall spaces within the RACF are being used, if any physical  
32 changes have been made and how or if residents have personalised their spaces. The observations are  
33 generalised in regard to space without reference to individuals and so no individuals will be recruited.  
34 Therefore, for the observational data collection will employ an opt-out approach to consent.  
35  
36

37 The research team acknowledges the Australian Nation Statement opt-out guidelines, to ensure all  
38 people within the RACF are aware research is being undertaken and possibly recorded via photography.  
39 The research team will make a general announcement one month before, and again one week before,  
40 the research commences and again on the day/s the research is being undertaken. The research team  
41 will send a general email to all staff and use posters located throughout the RACF to outline the research,  
42 research area, times and dates and the contact details of the researcher/s. Plain language statements will  
43 also be made available at an appropriate location as determined by RACF management.  
44  
45

### 46 **Validity and reliability/rigour**

47 To enhance trustworthiness of the qualitative findings, the research will follow the Lincoln and Guba  
48 (1985) five principles of rigour for qualitative research:  
49

- 50 • Credibility – this will be achieved by research team member checking with the participants  
51 around the prior to ending the interviews. Furthermore, the credibility of the research is  
52 increased through thorough documentation of all data collections methods.
- 53 • Dependability – the “decision trail” is achieved when other research team members analyse  
54 a selected number of transcripts separately. The primary researcher will verify coding with  
55 another research team member. At this stage the codes will either be adjusted or confirmed  
56 based on consensus to ensure agreement and accuracy of the data analysis. Additionally, all  
57 researcher team members will discuss the themes, confer and resolve differences in coding  
58 structures. This process will be clearly documented to ensure credibility.  
59  
60

- Confirmability – this links to the chosen qualitative descriptive methodology which does not seek to ‘interpret’ the data but rather through the prompted discussion aims to ‘describe’ the experiences of the participants
- Transferability –refers to the applicability of findings to other settings. Specifically by documenting how to information provided by the participants and the analysis process, documentation of limitations and how these were addressed (or at least acknowledged).
- Authenticity – the researcher will achieve authenticity by using seminal quotes and key photos to illuminate the themes.

## DISCUSSION

This research contributes, and is significant, to the disciplines of aged care, nursing, architecture and user studies, by providing new knowledge about the influences of the physical environment on residents, and providing an opportunity to create strategic and innovative models that may contribute to RACF operations, policy and architectural practice. This research also makes a broad contribution to the discipline of health architecture by providing new knowledge conceptualising the relationship between aged care and the built environment. The research will increase the understanding of architectural design and how it is implicated in attaining high-quality solutions for aged care, therefore inform future practice.

Specifically, aged-care providers will benefit in both practical and philosophical ways. Practically, the findings will identify key aspects of their building types that have positive or negative effects on residents’ Quality of Life. The findings of this research will assist in developing new building briefs to support QoL and the resident’s ability to ‘find home’. Better briefing documents result in better buildings and in turn better environments for residents. Philosophically, organisations and their residents’ will benefit from further consideration of Quality of Life indicators and the conceptual idea of finding home within a residential aged care setting.

This research will provide a novel approach to understanding ways by which residents of residential aged care facilities engage with their surroundings and make those surroundings into a place ‘called home’. The use of diversity of research data collection methods will create a holistic picture of elements of their surroundings that resident call ‘home’. The interaction between staff, residents and the architectural structure of each facility provides clarity in understanding more fully the aforementioned WHO definition of QoL as it applies to this sector of the population in the areas of physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment. There is much need for more research within the interface between architectural design, a sense of place and interpersonal interactions to create meaning and social connectedness within RACF.

### Limitation

The photo production and prompted discussion participant exclusion criteria is a limitation of this study. All RACF residents diagnosed with frontotemporal dementia, Lewy body disease, or other neurodegenerative diseases will be excluded from the photo production and prompted discussion section of this research.

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### Conflict of interests

No conflict of interest has been declared by the authors.

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**Table 1: Phases of Thematic Analysis (Braun & Clarke 2006)**

Phase	Description of the process
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking in the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.