ENHANCING WELL-BEING BY DESIGN: THE ROLE OF CO-HOUSING AND NATURE

RESEARCH PLAN

ZOÏ HESEN

MSc 3 Dewelling Graduation studio
Designing for Health and Care in an Inclusive Environment

GRADUATION PLAN

Defining guidelines for desiging a healthy living environment to enhance well-being



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AR3AD110 Dwelling Graduation studio Designing for Health and Care in an Inclusive Environment

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1.1 Problem Statement

The home environment significantly influences well-being by shaping health behaviors and decisions. As a social and physical space, it is where individuals develop health habits and make lifestyle choices. Therefore, designers and planners can incorporate elements that promote healthier living.¹

RELEVANCE

In neighborhoods like Tarwewijk in Rotterdam, health outcomes are lower than the national average. By comparing the statistics from buurtatlas.vzinfo.nl² for the Netherlands, Rotterdam, and Tarwewijk, it can be concluded that indicators related to psychological and physical health are generally worse in Tarwewijk than the national average. Specifically, issues such as stress, overweight, smoking, physical activity, self-reported health, mental health, anxiety/depression, and suicidal thoughts are more prevalent in this neighborhood than across the Netherlands. Figure 1 presents an overview of these statistics, indicating whether the figures are worse, equal, or better compared to the national average.

Moreover, biodiversity in Rotterdam has declined over the past decades, negatively impacting the city's environment, health, and economy, highlighting the urgent need for action. As biodiversity is vital for human well-being and ecological balan-

ce, supporting interdependent plant and animal species, Rotterdam has recognized this issue and set ambitious goals to enhance its ecological richness. To guide these efforts, the city has developed a comprehensive biodiversity action plan.³

	even worse	worse	equal	better	even better
stress					
overweight					
smoking					
extensive alcohol use					
meeting the physical activity guidelines					
people playing sports					
walking or biking to school or work					
self-reported health					
mental health issues					
anxiety or depression					
suicial thoughts					

Figure 1. Figures of Tarwewijk compared to the rest of the Netherlands $\,$

¹Poland, Blake D., Lawrence W. Green, and Irving Rootman, eds. "Settings for Health Promotion: Linking Theory and Practice." Thousand Oaks, CA: SAGE Publications, Inc., 2000, 44. DOI:https://doi.org/10.4135/9781452232829

²Buurtatlas, "Gezondheid en leefstijl per buurt, wijk en gemeente". Buurtatlas.vzinfo.nl, z.d., https://buurtatlas.vzinfo.nl/#home.

³ Wijbenga, Bert. Samen werken aan rijke Rotterdamse stadsnatuur: Uitvoeringsagenda Biodiversiteit. Uitvoeringsagenda Biodiversiteit, 2021.

Furthermore, various news reports on the mental and physical health of (young) adults can be found on the Central Bureau of Statistics and NU.nl (Figure 2, 3 & 4). Both men and women are now less likely to rate their health as very good, and more young people are experiencing psychological issues.4,5 Additionally, 20% of young adults are dissatisfied with their social lives, a significant increase compared to before the COVID-19 crisis. 6 Although the prevalence of obesity in the Netherlands is lower than in most EU countries, 35% of adults over 20 in the Netherlands are moderately overweight, a substantial increase from the 28% reported in the early 1980s.7

RESEARCH GOAL

This research aims to develop design guidelines that foster a healthy living environment in the Tarwewijk neighborhood of Rotterdam. The focus is on creating co-housing buildings that not only enhance residents' well-being but also contribute to local biodiversity. By integrating nature into the design, the study will explore how ecological strategies can positively impact residents. Understanding these design interventions will help create living spaces that promote healthier, more sustainable lifestyles for the community, ultimately aiming to prevent future issues related to well-being.

Tevredenheid met sociale leven nog niet op niveau van voor corona

29-7-2024 06:30



Figure 2. News article | source: cbs: "Tevredenheid met sociale leven nog niet op niveau van voor corona".

Jongvolwassene negatiever over eigen gezondheid

4-6-2024 06:30



🖰 Hollandse Hoogte

Figure 3. News article \mid source: cbs: "Jongvolwassene negatiever over eigen gezondheid".

Obesitas afgelopen 40 jaar verdrievoudigd

4-3-2024 00:00



Figure 4. News article | source: cbs: "Obesitas afgelopen 40 jaar verdrievoudigd".

- ⁴ DPG Media Privacy Gate, "Jongvolwassenen zijn steeds vaker negatief over hun eigen gezondheid", Nu.nl, z.d., https://www.nu.nl/gezondheid/6315324/jongvolwassenen-zijn-steeds-vaker-negatief-over-hun-eigen-gezondheid.html?referrer=https%3A%2F%2Fwww.google.com%2F
- ⁵ Centraal Bureau voor de Statistiek, "Tevredenheid met Sociale Leven Nog Niet op Niveau van Voor Corona", Cbs.nl, 29 juli 2024. https://www.cbs.nl/nl-nl/nieuws/2024/31/tevredenheid-met-sociale-leven-nog-niet-op-niveau-van-voor-corona.
- ⁶ Centraal Bureau voor de Statistiek, "Jongvolwassene Negatiever Over Eigen Gezondheid". Cbs.nl, 4 juni 2024. https://www.cbs.nl/nl-nl/nieuws/2024/23/jongvolwassene-negatiever-over-eigen-gezondheid.
- 7 Centraal Bureau voor de Statistiek, "Obesitas Afgelopen 40 Jaar Verdrievoudigd". Cbs.nl, 3 maart 2024. https://www.cbs.nl/nl-nl/nieuws/2024/10/obesitas-afgelopen-40-jaar-verdrievoudigd.

1.2 Theoretical Framework

FRAME OF REFERENCE

Research from fields of landscape and spatial planning, public health and the environment, and health services, analyzed the positive impact of green and blue infrastructures, such as parks and gardens, on health in the article 'Natural Environments - Healthy Environments?'. Residents in greener environments report better health outcomes, with gardens strongly linked to individual well-being. Conversely, those in urbanized areas with less greenery experience more health issues and higher risks of mental illness, while greener spaces reduce these problems. All types of greenspaces, including agricultural areas, benefit health, indicating that the quantity of greenery is more critical than its type. Overall, increasing urban green and blue spaces correlates with improved public health outcomes.8

More research on the topic of natue and well-being is described in the book 'Forests, Trees and Human Health'. Different researchers from the overarching fields of spatial planning and design, environmental and nature studies, and social sciences, collectively contributed to understanding the interactions between well-being and the natural environment. Chapter 5 'Health Benefits of Nature Experience: Psychological, Social and Cultural Processes' highlights the benefits of nature exposure on

well-being, emphasizing its role in aiding psychological recovery, reducing stress, and enhancing mental wellness. Regular exposure provides preventative and therapeutic effects while fostering social ties and community cohesion. Nature also enriches cultural life by offering spaces for recreation and expression.

Extensive research by Potvin and Soubhi, both researchers in the fields of medical research, health care and epidemiology, has demonstrated that the home environment has a significant impact on well-being. In 'Settings for Health Promotion: Linking Theory and Practice', they identified the home as crucial for shaping health behaviors and well-being, serving as a social and physical space where individuals learn health habits and make important health decisions. They propose the idea that health-promoting environments suggest a mutual influence between people and their surroundings. Consequently, the design and features of a place, like the home, play a significant role in shaping the health and habits of its residents. 12

The sustainability consulting firm Terrapin Bright Green which is committed to creating a healthier world, has published the book '14 Patterns of Biophilic Design'. Various researchers from the the Terrapin Bright Green frim, togheter wilth fields of

⁸ De Vries, Sjerp, et al. "Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health." Environment and planning A35.10 (2003): 1717-1731. DOI: 10.1068/a35111

⁹ Hartig, Terry, et al. "Health benefits of nature experience: Psychological, social and cultural processes." Forests, trees and human health (2011), 133. DOI: 10.1007/978-90-481-9806-1_5

¹⁰ Ibid., 137

¹¹ Poland, Blake D., Lawrence W. Green, and Irving Rootman, eds. "Settings for Health Promotion: Linking Theory and Practice." Thousand Oaks, CA: SAGE Publications, Inc., 2000, 44. DOI:https://doi.org/10.4135/9781452232829

¹² Ibid., 77-78

the built environment, biology and health sciences have contributed to this work, demonstrating that biophilic design reduces stress, enhances creativity and well-being, and accelerates healing. The research outlines how integrating natural elements improves satisfaction with built environments, linking nature, human biology, and design to optimize health benefits in daily life. 14 Patterns are described that detail how each pattern contributes in specific ways. Additionally, design considerations for various scales, including urban and building levels are discussed. ¹³

With a greater focus on a smaller scale, focussing on co-housing principles, researchers from the fields of public health, biomedical research, experimental and health sciences, and epidemiology conducted a scoping review on the effects of co-housing, revealing several health benefits linked to this model. Co-housing may enhance health through psychosocial factors, including increased social support, a stronger sense of community, and improved emotional and financial security, particularly in reducing social isolation. Although direct studies on health outcomes in co-housing are limited, evidence suggests a positive association with self-reported improvements in physical and mental health and overall quality of life. The review highlights significant research gaps and emphasizes the emotional and social connections formed in these communities, which provide ongoing psychosocial benefits. While promising, more rigorous research is needed to confirm these findings.14

Additionally, Peters and Haller, from the discipline of architectural science, illustrate in 'How Our Homes Impact Our Health' that shared spaces in residential buildings are vital for residents' well-being. Common areas, such as rooftops and lounges, foster social interaction, helping to alleviate isolation, especially as people spend more time at home. These spaces promote recovery and mental health by providing environments for relaxation and engagement. Shared outdoor areas connect residents to nature, known for its mental health benefits, while integrating greenery enhances overall well-being. Furthermore, at the scale of the dwelling itself, the article discusses how home floor plans can significantly enhance residents' experiences. For instance, incorporating balconies or gardens creates vital connections to nature, with views of greenery and the sky contributing positively to well-being. Natural views, such as trees and the sky, promote recovery, reduce stress, and enhance living environment satisfaction. In urban areas, it is crucial for architects to maximize sightlines to nature to optimize these benefits.15

¹⁵ Terrapin Bright Green (...).14 Patterns of Biophilic Design, Improving Health & Well-Being in the Built Environment, 3.

Warner, Elyse, Emma Sutton, and Fiona Andrews. "Cohousing as a Model for Social Health: A Scoping Review." Cities & Health 8, no. 1 (2024): 107–19. DOI:https://doi.org/10.1080/23748834.2020.1838225.

¹⁵ Peters, Terri, and Anna Halleran. "How our homes impact our health: using a COVID-19 informed approach to examine urban apartment housing." Archnet-IJAR: International journal of architectural research 15.1 (2021). DOI:https://doi.org/10.1108/ARCH-08-2020-0159

DEFINITIONS

Green and blue infrastructures

Blue and Green Infrastructures (BGI) refer to networks of natural areas, water bodies, and environmental features that provide ecosystem services. Green infrastructure focuses on vegetation and green spaces, while blue infrastructure centers on water systems. Together, they enhance air and water quality, support wildlife, and improve quality of life, forming a key part of sustainable urban and rural planning.16

Biodiversity

The variety of living organisms, including animals, plants, fungi, and microorganisms, that interact within ecosystems to sustain balance and support life. It provides essential resources like food, clean water, and medicine. 17 In the built environment, biodiversity creates habitats, improves air and water quality, enhances human wellbeing, and increases urban resilience to climate change.18

Biophilic design

The practice of designing spaces that support human health by connecting people with nature, aims to create environments that are inspiring, restorative, and functional. It integrates the built space with the surrounding ecosystem and takes into account local context, health conditions, cultural factors, and user experiences to strengthen the connection with nature and foster a sense of belonging.19

Co-housing

Co-housing combines private and shared spaces, with residents managing common facilities and activities to promote social interaction and community. It aims to improve quality of life, reduce isolation, and support physical and mental health.²⁰

Well-being

The overall state of functioning as a healthy person across various aspects of life. It is a holistic concept that includes multiple dimensions of health and satisfaction. Well-being is best understood as a combination of three key components: psychological well-being (mental and emotional health), social well-being (the quality of relationships and social connections), and physical well-being (physical health and functioning).21

Scales

The research defines three scales. The urban scale focuses on the neighborhood's spatial, social, and ecological context, examining interactions among buildings, public spaces, and the community. The building block scale examines a single block or adjacent buildings, focusing on shared spaces and relationships between buildings and greenery. Finally, the interior and dwelling scale centers on individual housing units, emphasizing connections to outdoor and common areas

 $^{{\}bf ^{16}} Gho frani, Zahra, Victor Sposito, and Robert Faggian. \\ {\bf ^{14}} A comprehensive review of blue-green infrastructure concepts. \\ {\bf ^{17}} International Journal of the concepts and the concepts are the concepts and the concepts are the concepts and the concepts are the concepts are$ Environment and Sustainability 6.1 (2017). DOI: 10.1680/ icembgi.65420.003

7 Worldwildlife, "What is biodiversity?" Worldwildlife.org, n.d., https://www.worldwildlife.org/pages/what-is-biodiversity

¹⁸ Ghofrani, Zahra, Victor Sposito, and Robert Faggian. "A comprehensive review of blue-green infrastructure concepts." International Journal of Environment and Sustainability 6.1 (2017). DOI: 10.1680/icembgi.65420.003

Terrapin Bright Green (...).14 Patterns of Biophilic Design, Improving Health & Well-Being in the Built Environment.
 Warner, Elyse, Emma Sutton, and Fiona Andrews. "Cohousing as a Model for Social Health: A Scoping Review." Cities & Health 8, no. 1 (2024): 107-19. DOI:https://doi.org/10.1080/23748834.2020.1838225.

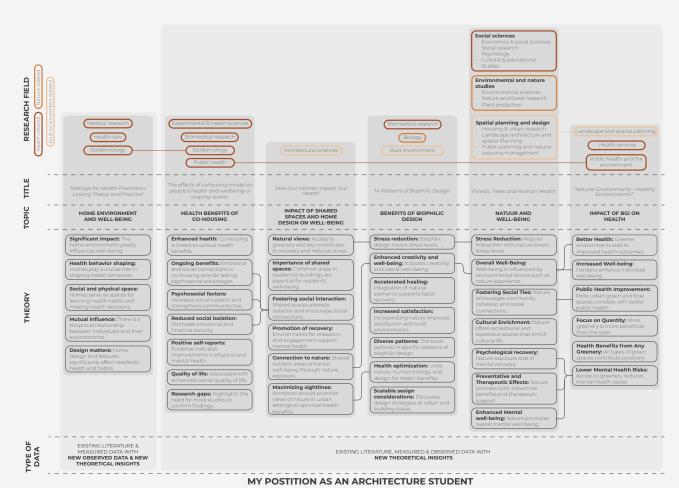
²¹ Pressman, Sarah D., Tara Kraft, and Stephanie Bowlin. "Well-being: physical, psychological, and social." Encyclopedia of behavioral medicine. Cham: Springer International Publishing, 2020. 2334-2339. DOI: https://doi.org/10.1007/978-3-030-39903-0_75

1.3 Hypothesis

As an architecture student involved in exploring how nature and co-housing impact well-being, I see the importance of translating research into design strategies to improve quality of life.

Figure 5 contains a map of the relevant literature, showing contributing disciplines, theories, data types, and my position within these frameworks. This knowledge can be applied across various scales

At the urban scale, green and blue infrastructure, like parks and water bodies, reduces stress, promotes activity, and supports social interaction. At the building block scale, co-housing and shared spaces strengthen community bonds and reduce loneliness. Biophilic design also supports well-being by integrating nature. Finally, at the interior/dwelling scale, floor plans that include elements like gardens, balconies, and sky views connect residents with nature, promoting holistic health and well-being.



ide further elaboration through fieldwork building on existing liter

Compare fieldwork findings to the existing literature.

Figure 5. Map of research field.

1.4 Research Questions

MAIN QUESTION

'How can the design of a healthy living environment on different scales enhance overall well-being of residents in the Tarwewijk, and in how far could nature and co-housing play a role in this?'

To answer this question, the sub-questions are organized into three different scales: urban scale (1), building block scale (2), and the interior (including the dwelling itself) (3). The urban scale will address nature, while the building block and interior scales will address both nature and co-housing.

SUB QUESTIONS

- **1.** How can the integration of blue and green infrastructure in the built environment enhance the overall well-being of Tarwewijk residents?
 - **1.1** How do green and blue infrastructures impact people's well-being?
 - **1.2.** Which cities have successful examples of green and blue grids, and what is their impact on the living environment?
 - **1.3.** What green requirements must new developments in the Tarwewijk meet according to Rotterdam's guidelines?
 - **1.4.** Does the target group in Rotter-dam-Zuid, including the Tarwewijk, have a need for more green spaces in their living environment?
- **2.** How can design strategies for co-housing, including nature and shared spaces, contribute to the well-being of residents?
 - **2.1.** What are the benefits of co-housing in relation to the well-being of residents?
 - **2.2.** What role do shared spaces in the building play in enhancing well-being?
 - **2.3.** How can greenery be integrated into the residential building to contribute to well-being?
- **3.** How can design of the dwelling contribute to the well-being of residents?
 - **3.1.** How can greenery at the dwelling scalecontribute to the well-being of residents?
 - **3.2.** How can dwelling design promote social interaction?

1.5 Methodology

This research will employ various methodologies, including desk research (literature review), fieldwork (interviews, observations, and mapping in Tarwewijk), and analysis of reference projects. Since the building is located within the building block, there will be overlap between these two scales, leading to their combination in the methods description.

DESK RESEARCH

At the urban scale, desk research will examine the benefits of blue and green infrastructures on well-being, existing infrastructures, Rotterdam's biodiversity and nature inclusivity guidelines and their impact on residents and local biodiversity. At the building block and interior scales, the research will explore the benefits of co-housing and shared spaces on well-being, as well as the benefits of incorporating nature within buildings and providing views of greenery from homes.

PROJECT ANALYSIS

At the urban scale, existing blue-green infrastructure projects will be analyzed, and a site visit with observations will be conducted. At the building block and interior scales, co-housing projects will be analyzed in preparation for fieldwork.

FIELDWORK

At the urban scale, fieldwork will be conducted in Tarwewijk, including interviews with residents about their need for neighborhood greenery and mapping existing greenery, complemented by observations of its use. At the building block and interior scales, co-housing projects will be visited, with interviews or surveys conducted on residents' experiences with co-housing, shared spaces, and nature, supported by related observations.

The fieldwork research questions are theory-based, derived from the literature, and findings will be compared with the theoretical framework. Responses will be collected anonymously, ensuring no personal data is used.

1.6 Range

CONTEXT

The aim is to develop design strategies for residential buildings in the form of co-housing, inspired by courtyard housing, and combining ground-level homes with apartments to enhance residents' psychological, social, and physical well-being. The study examines three scales: urban, building block, and interior (including individual dwellings). The urban scale is defined by the Tarwewijk neighborhood in Rotterdam. The building block scale focuses on the northern part of Polslandstraat in Tarwewijk, where planned demolitions, resident relocations, and increasing insecurity are current issues. This is the area for which design principles will be developed.



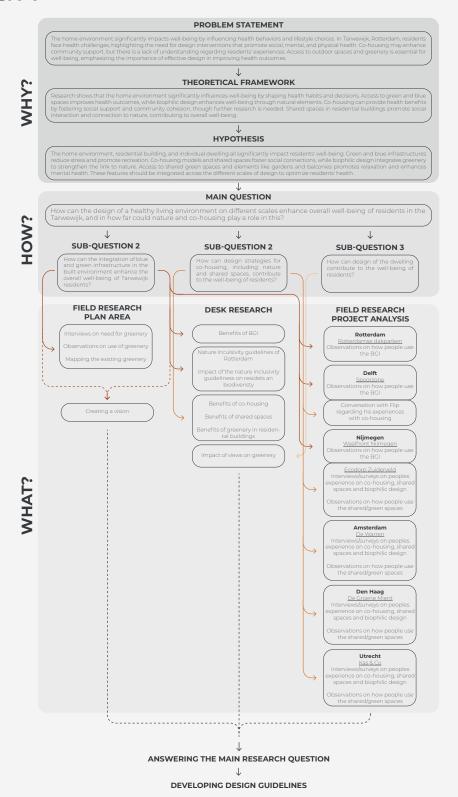
TARGET GROUP

The area has renewal potential, as it was once a vibrant community that can thrive again by attracting long-term residents. The target group includes people open to co-housing and valuing neighborly connection. This group, whether current Tarwewijk residents or newcomers, can collectively enhance social cohesion in the redesigned environment.

SCOPE

To limit the research scope, this study will focus on nature and co-housing, as these areas impact well-being. While the strategies examined may also mitigate climate change, the climate aspect will remain secondary to maintain focus. Fieldwork will be conducted in Tarwewijk, supplemented by related project analyses from other cities aligned with the theoretical framework. Recent developments reflecting these ideas provide an opportunity to explore whether residents experience the positive impacts suggested by theory, helping to validate or refine these assumptions. Sub-question two will likely receive the most attention, with interviews informing key conclusions about residents' experiences in co-housing and green spaces, which are central to my research and design guidelines.

1.7 Research Plan



1.8 Time Planning

! Will be further filled out during the research

Week 1.10										
То Do		 Prepare everything for fieldwork week Ecodorp Zuiderveld: Independent visit (if no response) and distribute surveys 								
Daily	Mon 04/11	Tue 05/11	Wed 06/11	Thu 07/11	Fri 08/11	Sat/Sun				
schedule			- Ecodorp zui- derveld							

Week 2.1	FIELDWORK WEEK							
То Do	 Groene Mient Den Haag: Visit and Interview with Gita CW Houtwijk Den Haag: Distribute surveys (may be skipped) Dakparken Rotterdam: visit and observations (2x) Tarwewijk: interviews and observations Kas & Co Utrecht: Independent visit (if no response) and distribute surveys Spoorzone Delft: visit and observations (2x) Waalfront Nijmegen: visit and observations (2x) Mapping: greenery in tarwewijk (map including pictures and drawings of use) (2x) Flip: conversation with Flip about co-housing projects. 							
Daily	Mon 11/11	Tue 12/11	Wed 13/11	Thu 14/11	Fri 15/11	Sat/Sun		
schedule	DakparkenSpoorzoneMappingTarwewijk?	Flip 9.00 CW Houwtwijk Groene Mient (avond)	 Kas & Co 11.00 Dakparken Spoorzone Mapping Tarwewijk? 	Waalfront Visualize raw material	Waalfront Visualize raw material			

Week 2.2	DESK RESEARCH + PROCESSING RESULTS FIELDWORK WEEK							
То Do	 Visualize raw material of fieldworkweek Tutoring: show raw material of fieldwork Desk (1) research on: BGI benefits Nature inclusivity Guideliness Rotterdam Impact nature inclusivity Guideliness Vision on BGI structures in Tarwewijk Survey Check: Check if enough responses have been received for the surveys and determine if more need to be distributed 							
Daily	Mon 18/11	Tue 19/11	Wed 20/11	Thu 21/11	Fri 22/11	Sat/Sun		
schedule	Visualize raw material	· Tutoring	Survey check Visualize raw material	· Desk (1)	· Desk (2)			

Week 2.3	DESK RESEAR	DESK RESEARCH								
To Do	Benefit: Benefit: Desk (3) re Benefit: Benefit: Survey Ch	Benefits of greenery in residential buildings Benefits of views on greenery								
Daily	Mon 25/11	Tue 26/11	Wed 27/11	Thu 28/11	Fri 29/11	Sat/Sun				
schedule	- Desk (2)	· Tutoring	· Desk (3)	· Finilise desk research	Processing results					

Week 2.4	PROCESSING RESULTS AND DATA UNIFICATION/VISUALISATION								
To Do	· Analyse · Data visua	Data unification of Desk an Field research Analyse results of surveys Data visualisation (Ongoing) Processing results: of survey							
Daily schedule	Mon 02/12	Tue 03/12	Wed 04/12	Thu 05/12	Fri 06/12	Sat/Sun			

Week 2.5	PROCESSING	PROCESSING RESULTS AND DATA UNIFICATION/VISUALISATION								
То Do	· Analyse	 Data unification of Desk an Field research Analyse results of surveys Data visualisation (Ongoing) Processing results: of survey 								
Daily schedule	Mon 09/12	Tue 10/12	Wed 11/12	Thu 12/12	Fri 13/12	Sat/Sun				

Week 2.6	BUFFER WEEK FOR DELAY							
То Do								
Daily schedule	Mon 16/12	Tue 17/12	Wed 18/12	Thu 19/12	Fri 20/12	Sat/Sun		

CHRISTMAS E	BREAK						
Mon 23/12	Tue 24/12	Wed 25/12	Thu 26/12	Fri 27/12	Sat/Sun		
CHRISTMAS E	BREAK						
Mon 30/12	Tue 31/12	Wed 01/01	Thu 02/01	Fri 03/01	Sat/Sun		
DEFINING GU	IDELINES			<u>'</u>	'		
Mon 06/01	Tue 07/01	Wed 08/01	Thu 09/01	Fri 10/01	Sat/Sun		
FINALISE RES	EARCH						
Mon 13/01	Tue 14/01	Wed 15/01	Thu 16/01	Fri 17/01	Sat/Sun		
P2 EXAMINAT	IONS	<u>'</u>			'		
			Thu 23/01	Fri 24/01	Sat/Sun		
	Mon 23/12 CHRISTMAS E Mon 30/12 DEFINING GU Mon 06/01 FINALISE RES Mon 13/01	CHRISTMAS BREAK Mon 30/12 Tue 31/12 DEFINING GUIDELINES Mon 06/01 Tue 07/01 FINALISE RESEARCH	Mon 23/12	Mon 23/12 Tue 24/12 Wed 25/12 Thu 26/12	Mon 23/12		

Week 2.10	P2 EXAMINATIONS							
То Do								
Daily schedule	Mon 27/01	Tue 28/01	Wed 29/01	Thu 30/01	Fri 31/01	Sat/Sun		

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FIGURES

Figure 2. News article - cbs, "Tevredenheid met sociale leven nog niet op niveau van voor corona", 29 july 2024, https://www.cbs.nl/nl-nl/nieuws/2024/31/tevredenheid-met-sociale-leven-nog-niet-op-niveau-van-voor-corona.

Figure 3. News article - cbs, "Jongvolwassene negatiever over eigen gezondheid", 4 june 2024, https://www.cbs.nl/nl-nl/nieuws/2024/23/jongvolwassene-negatiever-over-eigen-gezondheid.

Figure 4. News article - cbs, "Obesitas afgelopen 40 jaar verdrievoudigd", 4 march 2024, https://www.cbs.nl/nl-nl/nieuws/2024/10/obesitas-afgelopen-40-jaar-verdrievoudigd.