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IMPATTO DELLE MALOCCLUSIONI SULLA QUALITÀ DELLA VITA NEGLI ADOLESCENTI

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PH.D. THESIS

TITLE

IMPACT OF MALOCCLUSIONS ON THE QUALITY OF LIFE IN ADOLESCENTS

TUTOR

Prof.
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Dr. Berfin Karbeyazgün Çınar

To my family

and

for those who chose the hard way
and never gave up

Candidate's declaration

I hereby declare that this thesis submitted to obtain the academic degree of Philosophiæ Doctor (Ph.D.) in Clinical and Experimental Medicine is my own unaided work, that I have not used other than the sources indicated, and that all direct and indirect sources are acknowledged as references.
Parts of this dissertation have been submitted in international journals and/or conference articles.

Napoli, October 10, 2024

Berfin Karbeyazgün Çınar

Abstract

Oral health-related quality of life (OHRQoL) refers to the impact of oral health on an individual's overall well-being, encompassing physical, emotional, and social dimensions. In adolescents, OHRQoL is particularly significant as oral health, especially in relation to aesthetics and orthodontic treatment, can influence self-esteem, social interactions, and daily functioning. The overall aim of this thesis was to investigate impacts of malocclusions on adolescents' OHRQoL, by assessing both adolescents' self-perception and parental/caregiver perceptions of their OHRQoL. It further examines the role of cultural and social factors in shaping these perceptions and their overall influence on the adolescents' OHRQoL. This thesis comprises three studies.

In Study 1, the Parental-Caregiver Perception Questionnaire (P-CPQ-16) and the Family Impact Scale (FIS-8) were utilized to assess the perspectives of parents/caregivers regarding their children's OHRQoL and if it impacts on family life. As these tools had not been previously translated into Italian, it was necessary to conduct a process of translation, cross-cultural adaptation, and validation to ensure their suitability for use among Italian adolescent populations. The findings demonstrated that the Italian versions of the PCP-Q-16 and the FIS-8 are reliable instruments for future research. Another finding was that although parents/caregivers reported differences in their children's OHRQoL based on the severity of malocclusion and dental caries, these perceptions did not have a significant impact on family life, suggesting that other external factors may moderate this relationship.

Study 2 examined the associations between adolescents' self-esteem, their perception of dento-facial aesthetics, psychosocial impacts of dental aesthetics on OHRQoL and their orthodontic treatment need. The study emploted validated instruments, including Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), Orofacial Esthetic Scale (OES), Rosenberg Self-Esteem Scale (RSES) and Index of Orthodontic Treatment Need (IOTN). Results demonstrated that while self-esteem and perceived orthodontic treatment need significantly influenced adolescents' OHRQoL, the severity of skeletal malocclusion did not.

Study 3 explored the impact of cultural differences on OHRQoL was examined by comparing Belgian and Italian adolescents seeking orthodontic treatment, as well as the perceptions of their parents/caregivers regarding their childrens' OHRQoL. The study determined notable differences, with Italian adolescents reporting lower OHRQoL compared to their Belgian counterparts. Similarly, Italian parents/caregivers perceived their children's OHRQoL as lower than Belgian parents/caregivers did. In both countries, parents underestimated their children's overall and emotional well-being related to OHRQoL.

Overall, the findings from these studies underscore the need to consider both subjective and cultural dimensions when assessing OHRQoL in adolescents. Adolescents' own OHRQoL report can be complemented with parent/caregiver's perspectives; although they should not be used as an alternative.

Keywords: oral health related quality of life, orthodontic treatment need, adolescent, parental perception, cultural differences

Sintesi in lingua italiana

La qualità della vita correlata alla salute orale (OHRQoL) si riferisce all'impatto della salute orale sul benessere generale di un individuo, comprendendo dimensioni fisiche, emotive e sociali. Negli adolescenti, l'OHRQoL riveste particolare importanza poiché la salute orale, in particolare in relazione all'estetica e ai trattamenti ortodontici, può influenzare l'autostima, le interazioni sociali e il funzionamento quotidiano. L'obiettivo generale di questa tesi è stato quello di indagare l'impatto delle malocclusioni sulla qualità della vita correlata alla salute orale (OHRQoL) negli adolescenti, valutando sia l'autopercezione degli adolescenti che la percezione dei genitori/caregiver riguardo alla loro OHRQoL. La tesi esamina inoltre il ruolo dei fattori culturali e sociali nel modellare queste percezioni e la loro influenza complessiva sulla OHRQoL degli adolescenti. La tesi si compone di tre studi.

Nel primo studio, il Parental-Caregiver Perception Questionnaire (P-CPQ-16) e la Family Impact Scale (FIS-8) sono stati utilizzati per valutare le prospettive dei genitori/caregiver riguardo all'OHRQoL dei loro figli e se questa influenzi la vita familiare. Poiché questi strumenti non erano stati precedentemente tradotti in italiano, è stato necessario condurre un processo di traduzione, adattamento transculturale e validazione per garantirne l'idoneità all'uso tra adolescenti italiani. I risultati hanno dimostrato che le versioni italiane del PCP-Q-16 e del FIS-8 sono strumenti affidabili per ricerche future. Un altro risultato ha evidenziato che, sebbene i genitori/caregiver abbiano riportato differenze nell'OHRQoL dei propri figli in base alla gravità della malocclusione e della carie dentale, tali percezioni non hanno avuto un impatto significativo sulla vita familiare, suggerendo che altri fattori esterni potrebbero moderare questa relazione.

Il secondo studio ha esaminato le associazioni tra l'autostima degli adolescenti, la loro percezione dell'estetica dento-facciale, l'impatto psicosociale dell'estetica dentale sull'OHRQoL e il loro bisogno di trattamento ortodontico. Lo studio ha impiegato strumenti validati, tra cui il Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), l'Orofacial Esthetic Scale (OES), il Rosenberg Self-Esteem Scale (RSES) e

l'Index of Orthodontic Treatment Need (IOTN). I risultati hanno dimostrato che, mentre l'autostima e la percezione del bisogno di trattamento ortodontico influenzano significativamente l'OHRQoL degli adolescenti, la gravità della malocclusione scheletrica non lo fa.

Il terzo studio ha esplorato l'impatto delle differenze culturali sull'OHRQoL, confrontando adolescenti belgi e italiani in cerca di trattamento ortodontico, nonché le percezioni dei loro genitori/caregiver riguardo all'OHRQoL dei loro figli. Lo studio ha rilevato differenze significative, con gli adolescenti italiani che hanno riportato un OHRQoL inferiore rispetto ai loro coetanei belgi. Allo stesso modo, i genitori/caregiver italiani hanno percepito l'OHRQoL dei loro figli come inferiore rispetto ai genitori/caregiver belgi. In entrambi i paesi, i genitori hanno sottovalutato il benessere complessivo ed emotivo dei loro figli in relazione all'OHRQoL.

Nel complesso, i risultati di questi studi sottolineano la necessità di considerare sia le dimensioni soggettive che culturali nella valutazione dell'OHRQoL negli adolescenti. Il report dell'OHRQoL degli adolescenti può essere integrato con le prospettive dei genitori/caregiver, sebbene queste non debbano essere utilizzate come sostituto.

Parole chiave: qualità della vita correlata alla salute orale, bisogno di trattamento ortodontico, adolescente, percezione genitoriale, differenze culturali

Ringraziamenti

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Teşekkür ederim.

Contents

List of Acronyms

The following acronyms are used throughout the thesis.

WHO	World Health Organization
QoL	Quality of Life
HRQoL	Health Related Quality of Life
OHRQoL	Oral Health Related Quality of Life
PCP-Q-16	The Parental-Caregiver Perceptions Questionnaire
FIS-8	Family Impact Scale
DMFT/dmft	Decayed Missing Filled Teeth index
DAI	Dental Aesthetic Index
CPQ_{11-14}	Children Perception Questionnaire
OFA	Oro-Functional Alterations
ED	Eating Disturbances
EWB	Emotional Well-Being
SWB	Social Well-Being
IOTN-DHC	Dental Health Component of the Index of Orthodontic Treatment Need
SD	Standard Deviation
GDP	Gross Domestic Product

List of Figures

List of Tables

Chapter 1

Introduction

Quality of Life

According to the World Health Organization (WHO), quality of life (QoL) is 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[1]. This broad definition encompasses various dimensions, including physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationship to salient features of the environment. QoL is, therefore, a subjective and multifaceted construct that is influenced by a complex interplay of various factors.

Subjective factors are related to individual views of well-being, such as happiness, fulfillment, and contentment, whereas objective factors are measurable characteristics including income, education, physical health, housing, and employment[2]. Stress, mental health, and self-esteem are examples of psychological variables that have a big impact on quality of life. According to Evans et al.[3], social interactions and social support networks are equally significant since they offer both practical and emotional support that can lessen the detrimental effects of stress and disease. Moreover, environmental elements that significantly affect QoL include the standard of living, accessibility to healthcare, and the safety and cohesion of the community[4].

Health Related Quality of Life

According to the WHO, Health-Related Quality of Life (HRQoL) reflects an individual’s perception of how their health impacts their overall quality of life, including physical functioning, psychological state, level of independence, social relationships, and their relationship to salient features of their environment[5]. HRQoL goes beyond mere physical health; it integrates how health conditions affect an individual's ability to live a fulfilling life and how they perceive their own well-being.

Health-Related Quality of Life in Adolescents

Adolescence is a time filled with major change, rapid growth, and physiological development in addition to the numerous individual, cognitive, social, and contextual transformations that take place. These changes are critical for developing independence and adapting to the complex social world that adolescents are entering[6]. While many adolescents navigate this developmental phase successfully without experiencing significant trauma, maintaining a satisfactory level of well-being, research indicates that life satisfaction and QoL tend to decline during adolescence[7].

Several factors influence HRQoL, ranging from demographic characteristics to psychosocial and clinical variables in adolescents. Psychosocial factors such as self-efficacy, self-esteem, loneliness, and stress are particularly strong determinants of HRQoL in adolescents. For instance, self-efficacy and self-esteem are positively associated with better HRQoL, acting as protective factors against adverse events like stress[8]. Additionally, family relationships play a crucial role; parental affection, promotion of autonomy, and family activities are strongly linked to higher HRQoL among adolescents[9]. Clinical variables also have a major impact on HRQoL, especially in adolescents with chronic disorders. Because controlling one's health requires both physical and mental effort, adolescents with chronic diseases such as diabetes frequently have reduced HRQoL[10, 11]. Moreover, gender differences are evident, with girls generally reporting lower HRQoL compared to boys, particularly as they age[8].

Oral Health Related Quality of Life

Overall QoL is greatly impacted by oral health, which is an essential part of general health. In recent decades, the idea of Oral Health-Related Quality of Life (OHRQoL) has become more widely recognized as a multifaceted construct that evaluates how one's oral health affects their everyday life in the social, psychological, and physical domains. The WHO recognizes OHRQoL as a vital aspect of health, underscoring its importance in understanding the broader implications of oral health beyond clinical indicators alone[12].

OHRQoL is defined as a person's perceived impact of their oral health on their overall quality of life. It reflects the interplay between oral health conditions, such as dental caries, periodontal disease, tooth loss and malocclusion, and their effects on functional, psychological, and social well-being[12].

Locker introduced the concept of OHRQOL and adapted the World Health Organization's model of the International Classification of Impairments, Disabilities, and Handicaps to oral health and this led to a significant increase in research efforts over the next two decades[13].

Therefore OHRQoL had become a valuable tool in both clinical practice and public health research, providing insights into how oral diseases affect daily activities like eating, speaking, and social interactions, as well as their broader psychological impacts, including self-esteem and emotional well-being[14].

Various factors influence OHRQoL, ranging from clinical conditions to psychosocial and demographic variables.

The presence of oral diseases has a direct impact on OHRQoL[15]. Kragt et. al. have shown that early childhood caries can predict lower OHRQoL later in life, highlighting the long-term effects of early oral health experiences[16]. Similarly, in older adults, factors such as xerostomia (dry mouth), orofacial pain, and poor chewing ability are significantly associated with impaired OHRQoL[17]. Additionally, psychological well-being, including self-esteem and emotional health, plays a crucial role in OHRQoL. Oral conditions that affect appearance, such as tooth loss or malocclusion, can lead to embarrassment and social withdrawal, negatively impacting an individual’s self-esteem and social interactions[18].

Demographic factors such as age, gender, and socioeconomic status also play a significant role in influencing OHRQoL. Research has shown that older adults often experience a decline in OHRQoL due to age-related oral health issues, such as tooth loss and periodontal disease[19]. Additionally, it has been demonstrated that OHRQoL is directly correlated with socioeconomic characteristics associated with the area of residence, satisfaction with oral health, and dental care[20]. Individuals from lower-income backgrounds typically report poorer oral health and lower OHRQoL[21]. Furthermore, women often report lower OHRQoL compared to men which can be attributed to higher levels of dental anxiety, greater concerns about oral aesthetics, and more frequent experiences of oral discomfort among women[22].

Oral Health Related Quality of Life in Adolescents

Adolescence is a time of vulnerability which is marked by changes in hormones, behavior, and psychology. Research shows alterations in eating patterns and aesthetic sensibilities. Oral health issues are prevalent in this age range such as caries, malocclusion, gingivitis and periodontal disease[23].

Dental caries is one of the most common chronic diseases in children and adolescents and is a significant predictor of OHRQoL. The impact of untreated dental caries is evident in the daily lives of affected children, causing pain, discomfort, and difficulties in eating, speaking, and sleeping[24]. These issues not only affect the child's physical health but also their ability to perform well in school and engage in social activities. Feldens et al. found that the severity of dental caries significantly impacted the OHRQoL of adolescents[21]. The study revealed that untreated dental caries and missing teeth were associated with worse OHRQoL across all domains, including functional limitation, physical pain, psychological discomfort, and social disability.

Additionally, psychosocial factors, such as self-esteem, body image, and social interactions, are closely tied to OHRQoL in adolescents. Oral health issues that affect appearance, such as dental caries and malocclusion, can lead to social anxiety and reduced participation in social activities thereby negatively affects OHRQoL[25]. Thus, adolescents' negative habits and low OHRQoL were substantially correlated with lower levels of protective psychosocial characteristics[26]. Scapini et al. also found that socioeconomic status and family structure significantly influenced OHRQoL, with adolescents from lower-income households and non-nuclear families reporting worse OHRQoL[27].

The Role of Malocclusion in OHRQoL of Adolescents

Studies suggest that malocclusion affects a significant portion of adolescents, approximately 70% of all children and adolescents have some degree of malocclusion[28]. It is reported that up to 88% of children and adolescents in certain regions may exhibit some form of malocclusion, with Class I malocclusion being the most common, followed by Class II and Class III malocclusions[29].

In adolescence social relations shift from the family environment to that of friends. Therefore, physical appearance and concerns with self-image are issues of great significance for the adolescent, who seeks endorsement of his or her characteristics when those characteristics come under peers' scrutiny[30]. Malocclusion can lead to various functional issues, such as difficulties in chewing and speaking, as well as aesthetic concerns. Individuals with malocclusion may experience embarrassment or self-consciousness about their appearance, leading to social withdrawal or anxiety. This is especially pertinent during adolescence, a developmental stage characterized by heightened self-awareness and sensitivity to peer perceptions. The psychosocial impact of malocclusion can therefore be profound, contributing to a lower OHRQoL[31]. Thus, comprehending whether malocclusion affects quality of life requires an understanding of oral health self-perception[32].

The psychosocial impact of malocclusion extends beyond mere aesthetics. Apparent malocclusions, such as, crowded incisors, excessive overjet with incomplete lip closure and large gaps between incisors, have been associated to increased bullying and reduced self-esteem in adolescents[33, 34], which can exacerbate feelings of inadequacy and social anxiety. These negative experiences can have lasting effects on an individual's self-esteem and confidence, influencing their social development and mental health. Seehra et. al. showed that orthodontic treatment can potentially improve the OHRQoL of adolescents who are subjected to bullying due to their malocclusion[35].

In a study by Feu et. al., it was reported that adolescents who sought orthodontic treatment reported worse OHRQoL compared to their peers who did not seek treatment[36]. The study found that those with more severe malocclusions experienced greater aesthetic impairment, which contributed to lower OHRQoL. Interestingly, girls in the orthodontic group reported significantly worse impacts on their quality of life, indicating that gender may play a role in how malocclusion affects adolescents. Scapini et al. found similar results with girls with malocclusion reporting significantly worse OHRQoL than boys, even after controlling for the severity of the condition and other variables[27]. This discrepancy is likely due to the heightened emphasis on physical appearance for females, particularly during adolescence, when societal and cultural expectations around beauty and aesthetics are most intense[37].

Orthodontic treatment is often sought to correct malocclusion, with the goals of improving both function and aesthetics. Even though receiving orthodontic treatment can significantly enhance

one's OHRQoL, there are certain difficulties in the procedure itself. The initial stages of treatment can be associated with discomfort, pain, and functional limitations. Various studies in literature reported that OHRQoL was negatively impacted during orthodontic treatment[38–40].

On the other hand, access to orthodontic treatment is significantly influenced from socioeconomic factors, which in turn affect OHRQoL. Adolescents from lower-income families may have limited access to orthodontic care due to the high costs associated with treatment[41]. This lack of access can exacerbate the negative impacts of malocclusion on OHRQoL, as these individuals may be unable to correct functional and aesthetic issues that contribute to lower self-esteem and social difficulties. Moreover, the psychological burden of malocclusion is often compounded by the social stigma associated with visible dental issues. Adolescents from disadvantaged backgrounds may face additional challenges in social integration, leading to further declines in OHRQoL[42].

In literature, numerous prior systematic reviews have demonstrated the detrimental effects of malocclusions on adolescents' OHRQOL[16, 43–46]. Conversely, other systematic studies found conflicting results on the influence of malocclusions on OHRQoL[47], and that there is insufficient evidence to support a deleterious impact on OHRQoL[48]. Given that a significant portion of orthodontic treatments is justified by the goal of enhancing OHRQoL, it is crucial to determine whether malocclusions indeed have a detrimental effect on OHRQoL. Gaining more comprehensive understanding of how malocclusions affect OHRQoL is essential for improving orthodontic care practices.

Parents/Caregivers as a Proxy in Measuring OHRQoL

Young patients may not always be able to effectively communicate their oral health experiences due to age, cognitive development, or emotional maturity. In such cases, parents and caregivers often serve as proxies, providing information on the child's behalf. While this approach is practical, it raises questions about the accuracy and reliability of proxy reports compared to self-reports by children[49].

When it comes to their children's health, parents/caregivers are vital decision-makers, and treatment options are strongly influenced by their perspectives[50]. Therefore, it is crucial to get

reports from parents/caregivers even in cases where adolescents are able to provide their own opinions.

Nevertheless, the accuracy of these proxy assessments can vary, while parents can provide reliable information on certain aspects of a child's oral health, such as observable symptoms and behaviors, they may not fully perceive the child's subjective experiences, such as pain intensity or emotional distress[49], which can be particularly relevant in domains like emotional well-being and social functioning.

These discrepancies can vary depending on the child's age, with younger children's parents generally providing closer approximations of their child's OHRQoL, while discrepancies tend to increase as children grow older and develop more complex social and emotional lives[51]. Abreu et al. found that there was a low level of agreement between adolescents' self-reports and the assessments given by their parents/caregivers regarding the impact of malocclusion on the adolescents' OHRQoL[52].

Parents/caregivers' perceptions of their children's OHRQoL can significantly impact the quality of care and the decisions made regarding treatments. Collecting parents' input can therefore complement the child's own report and provide a valuable foundation for clinical planning[53].

Implications for Public Health and Clinical Practice

The growing recognition of OHRQoL has significant implications for public health and clinical practice. Dental practitioners are increasingly encouraged to consider OHRQoL in their treatment planning, ensuring that interventions not only address clinical symptoms but also enhance patients' overall quality of life[14].

Determining whether malocclusions truly have a detrimental effect on OHRQoL is crucial because a significant number of orthodontic treatments are driven by the goal of improving OHRQoL. Improved orthodontic treatment is expected as more is understood about how malocclusions affect overall health-related quality of life.

Clinicians should integrate assessments of OHRQoL into routine orthodontic evaluations, recognizing that malocclusions can affect adolescents' psychological and social well-being as much as their physical health. This patient-centered approach ensures that treatment plans address

both the functional and psychosocial needs of the patient, leading to more holistic and effective care.

Considering the substantial negative effects of malocclusions on the quality of life of adolescents, public health strategies ought to take into account providing funding to increase access to orthodontic care, particularly for those from underprivileged backgrounds. This involves covering a share of the cost of orthodontic procedures, offering insurance, and making sure that orthodontic exams are a regular part of dental health programs provided in communities and schools.

Chapter 2

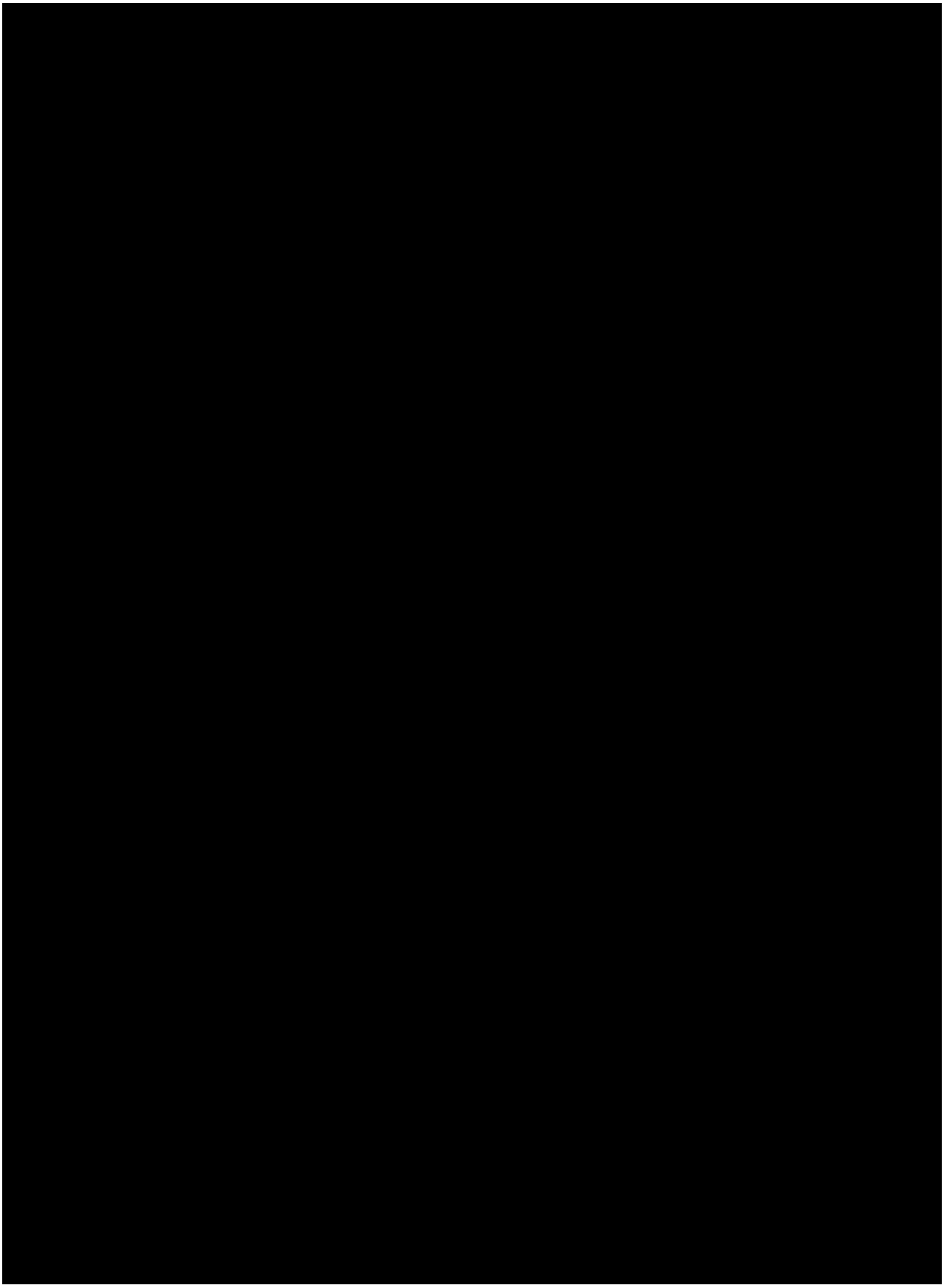
This chapter presents a study conducted to explore the perception of Italian parents/caregivers regarding their children's OHRQoL and how OHRQoL of the adolescents impacts their family life.

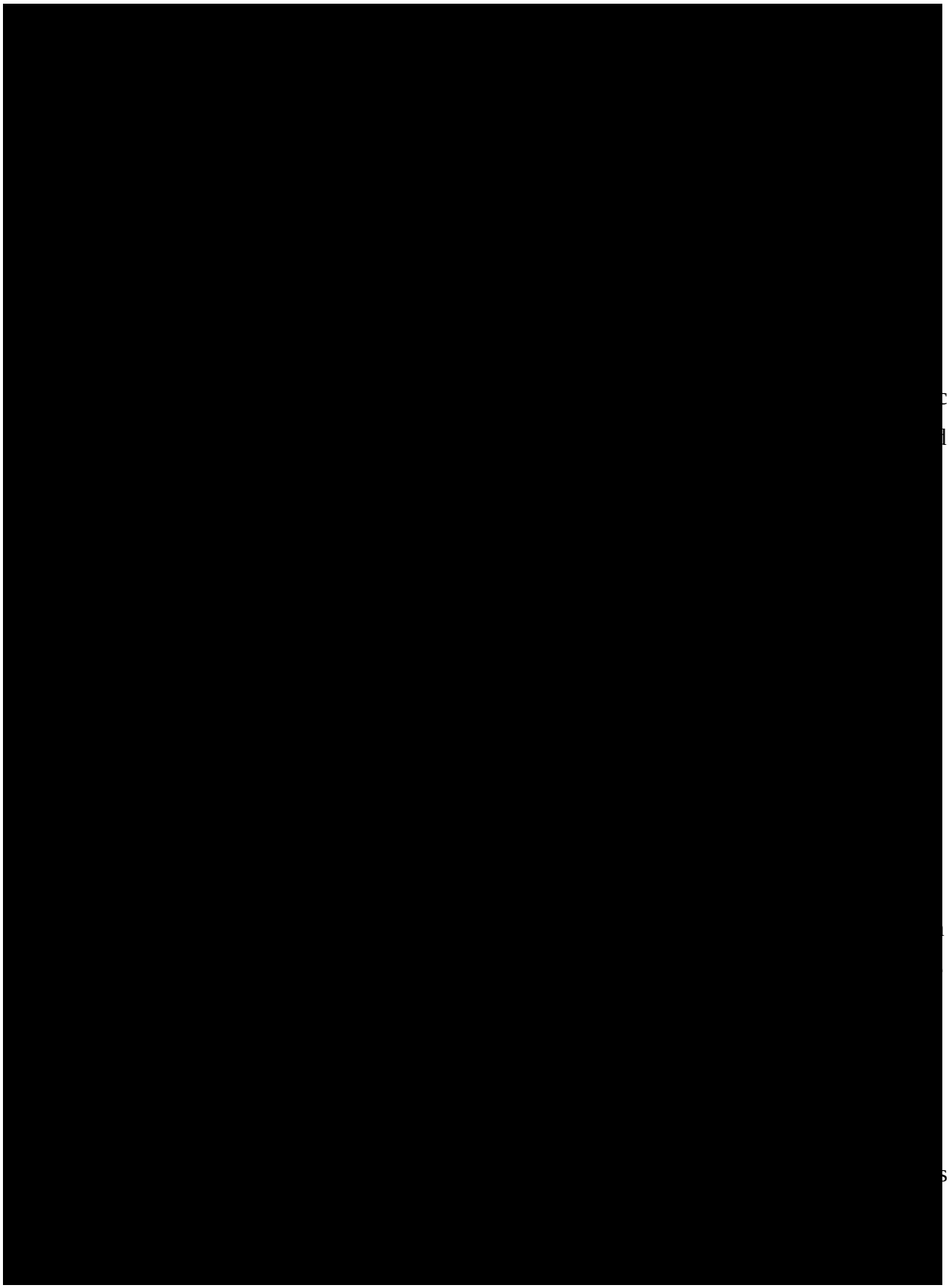
The Parental-Caregiver Perceptions Questionnaire (PCP-Q-16) and the Family Impact Scale (FIS-8) are widely used instruments for assessing the perceptions of parents/caregivers on their children’s OHRQoL and its impacts on the family life. However, these tools had not been previously translated into Italian. As a result, prior to the collection of data from patients, it was necessary to undertake a process of translation, cross-cultural adaptation, and validation was undertaken to ensure these questionnaires were suitable for use with Italian adolescent populations. This step was essential for maintaining both the validity and reliability of the instruments in a culturally relevant context.

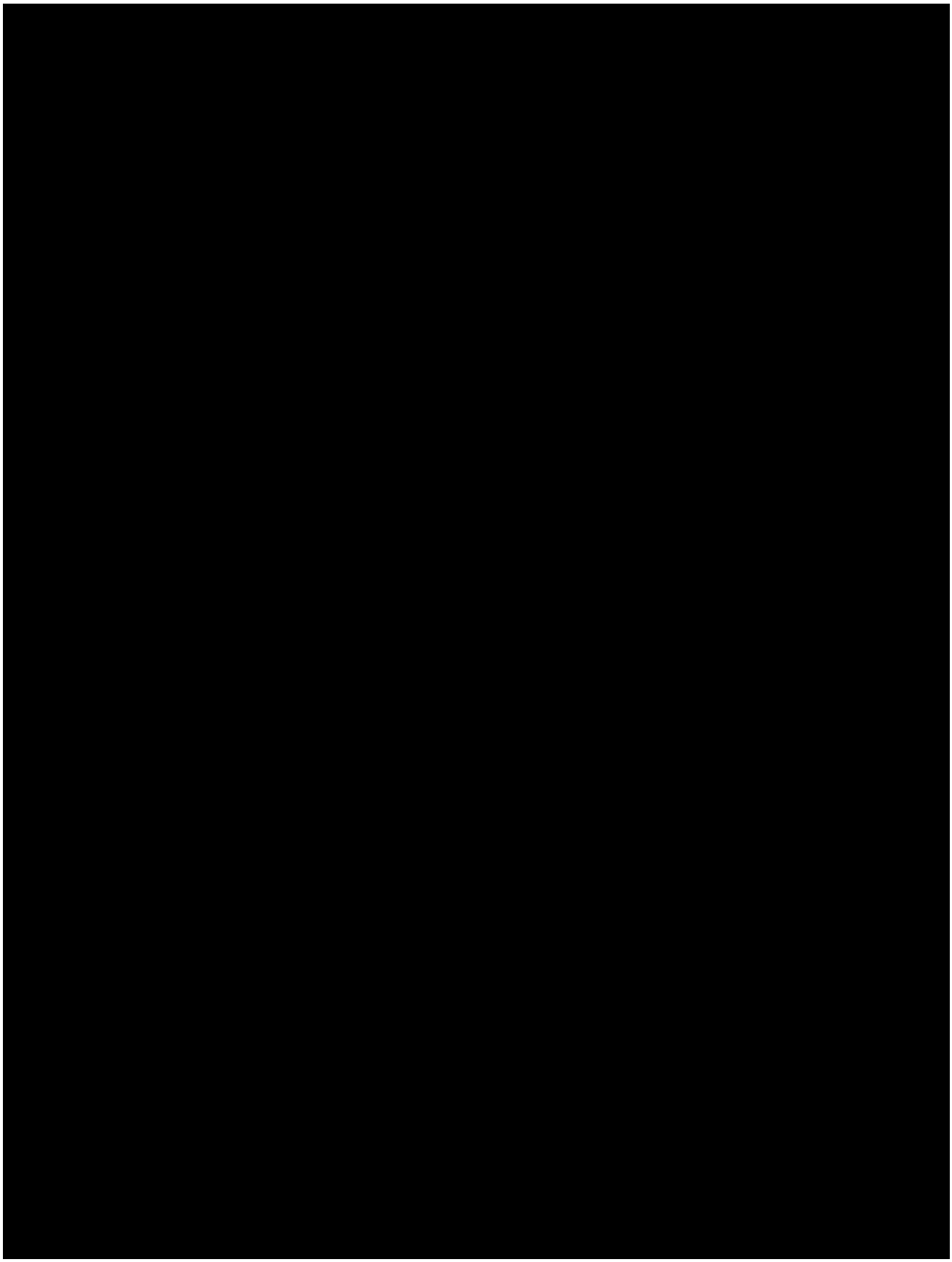
Following the cross-culturally adaptation of the PCP-Q-16 and FIS-8, the study explored parental/caregiver perceptions regarding their children's OHRQoL and examined how the OHRQoL of adolescents affected the quality of life within the family. This exploration is essential as it offers insights into both the individual and familial dimensions of oral health, contributing to a more holistic understanding of adolescent OHRQoL within the Italian cultural framework.

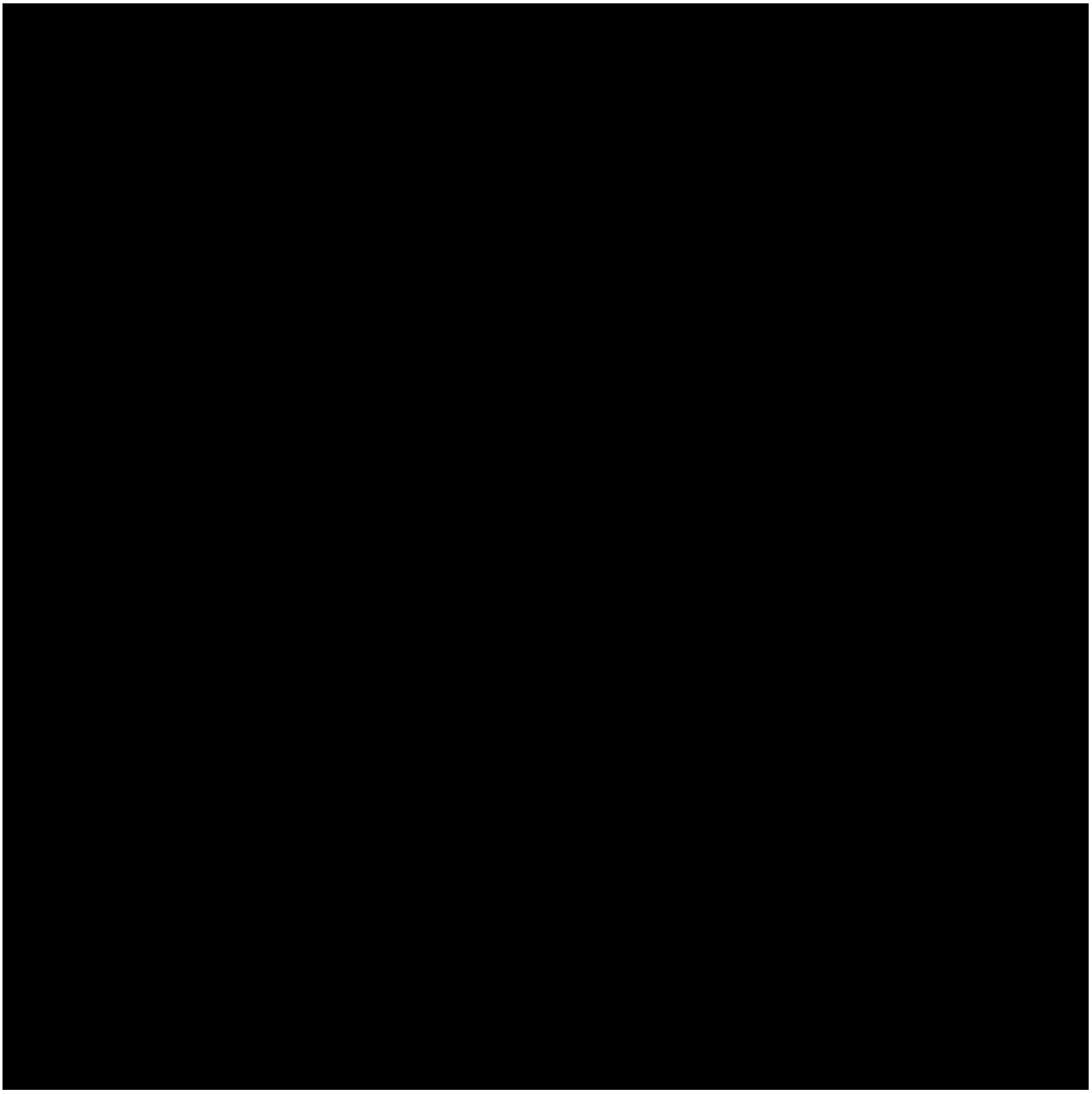
By translating, cross-culturally adapting, and validating the PCP-Q-16 and FIS-8, this study fills an important gap in the availability of tools for assessing OHRQoL among Italian adolescents and their families, enabling future research and clinical practice to be more culturally sensitive and accurate.

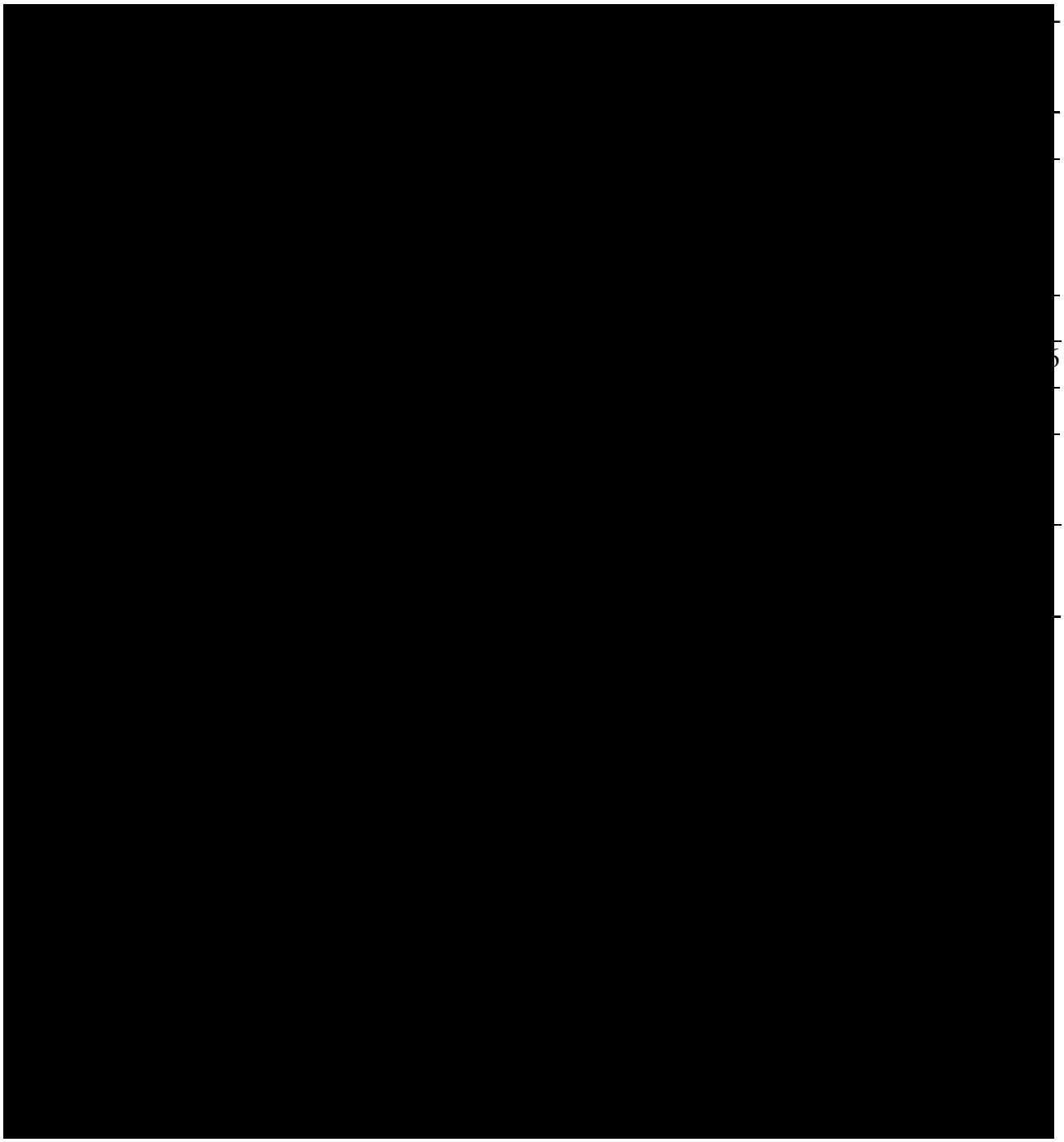
This study had been submitted as an original research paper to European Archives of Paediatric Dentistry on 22.09.2024.

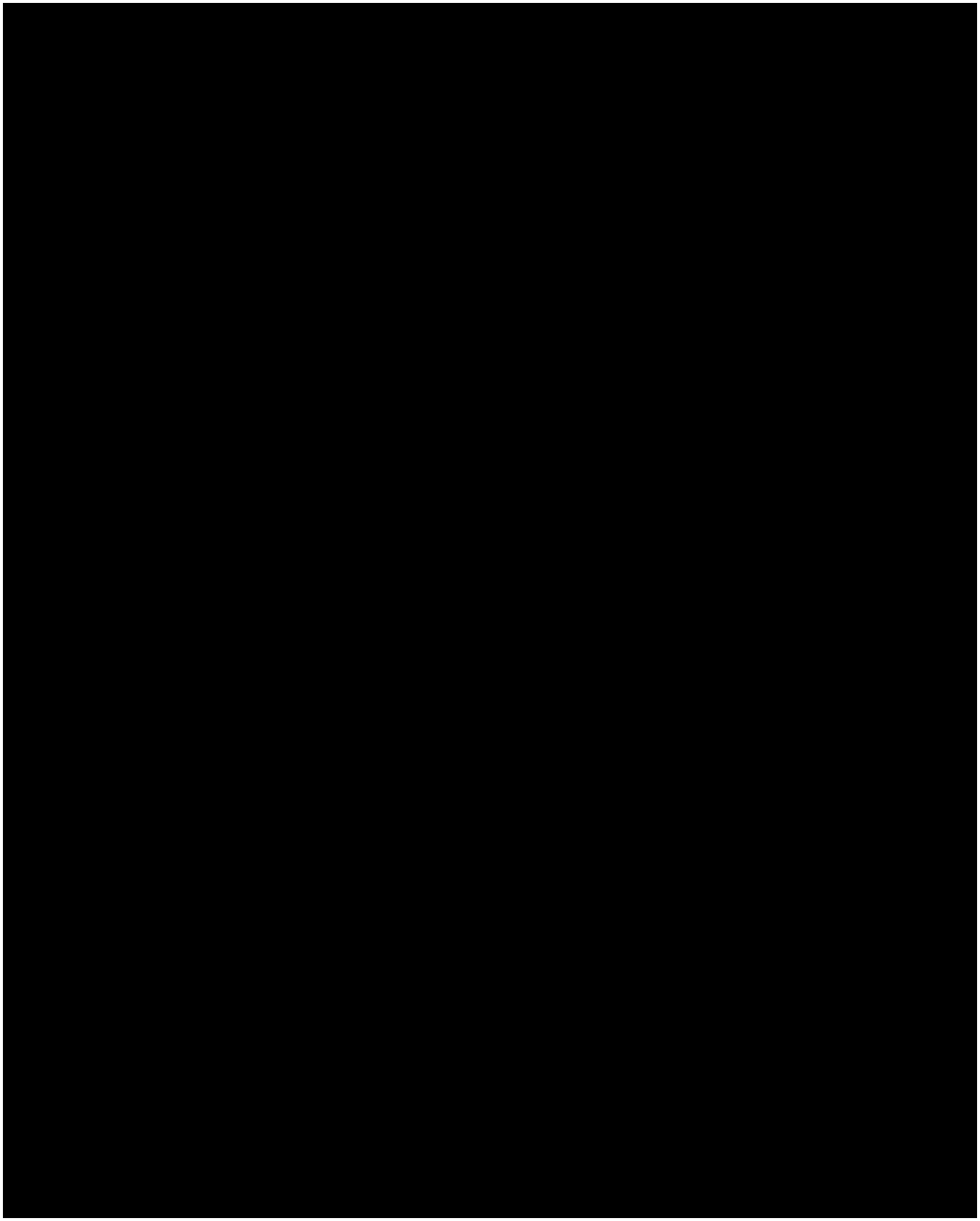


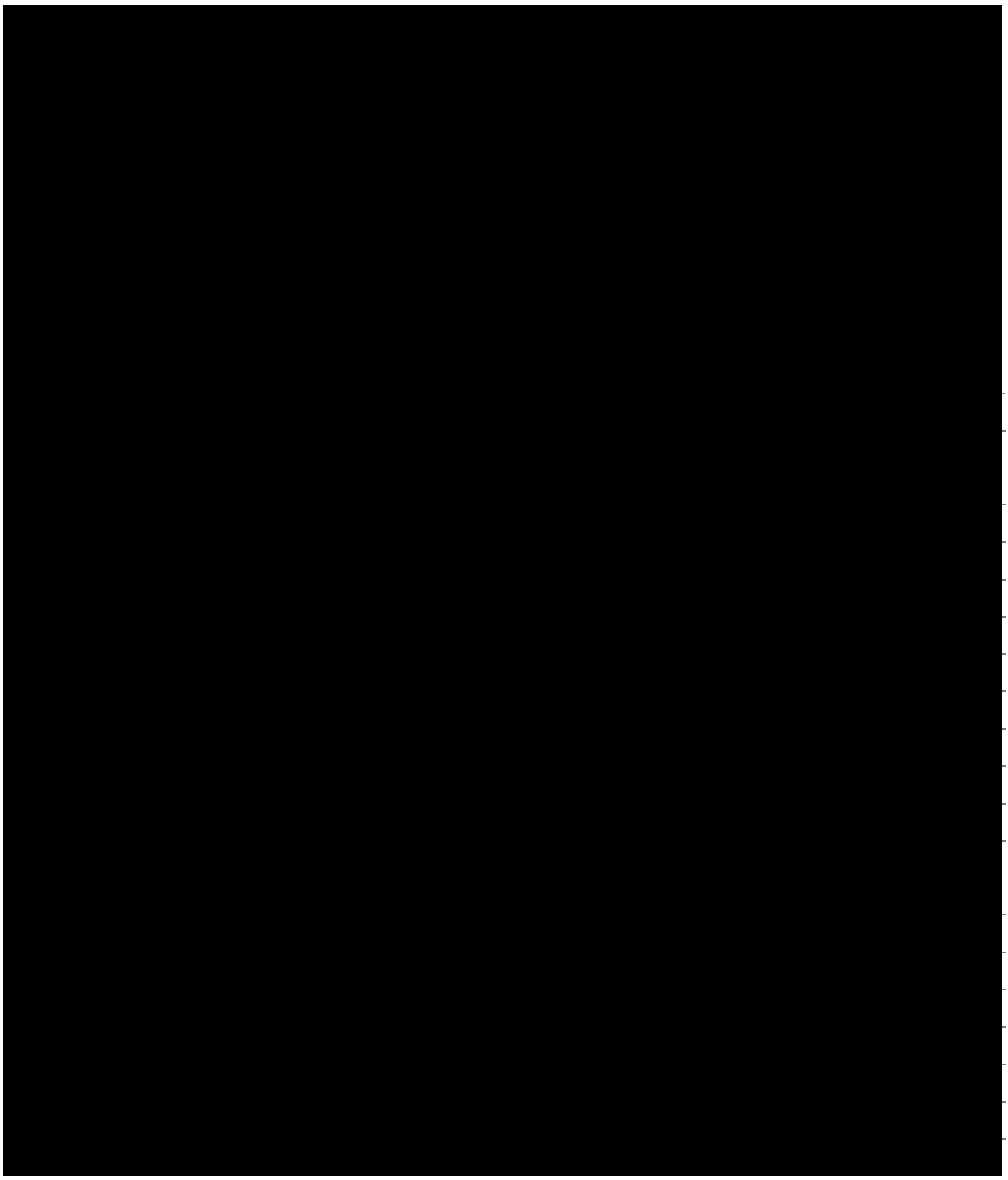


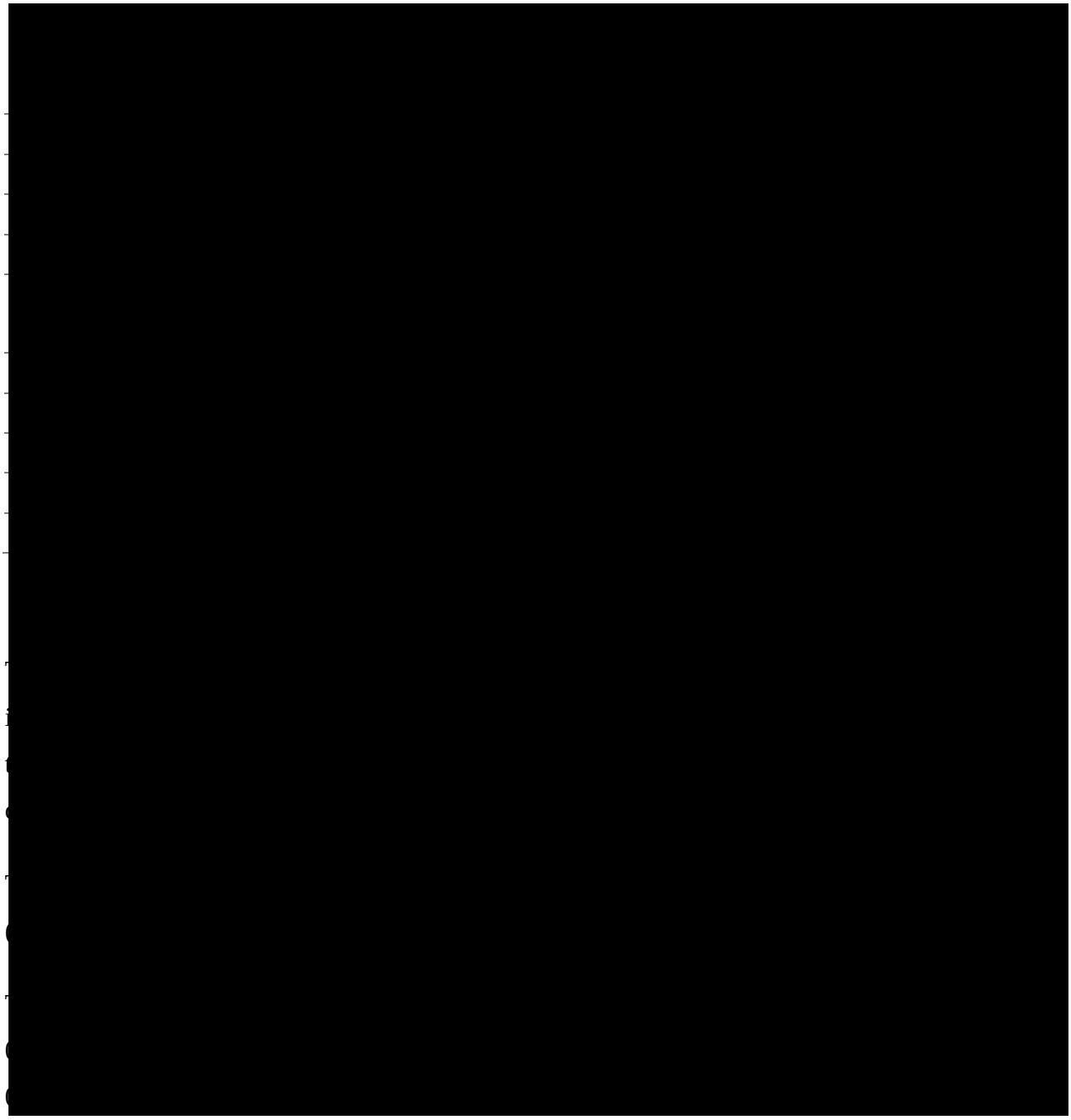


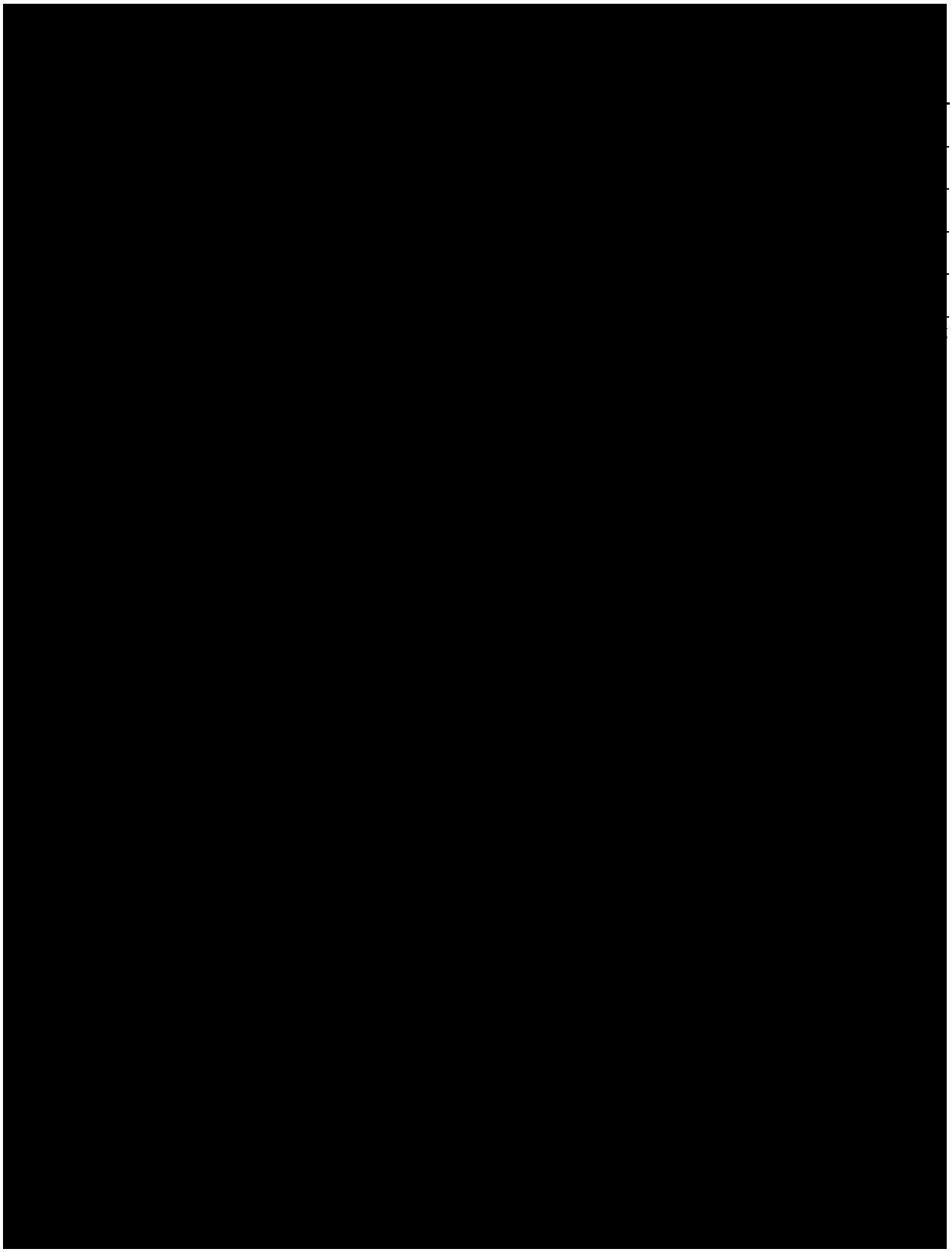


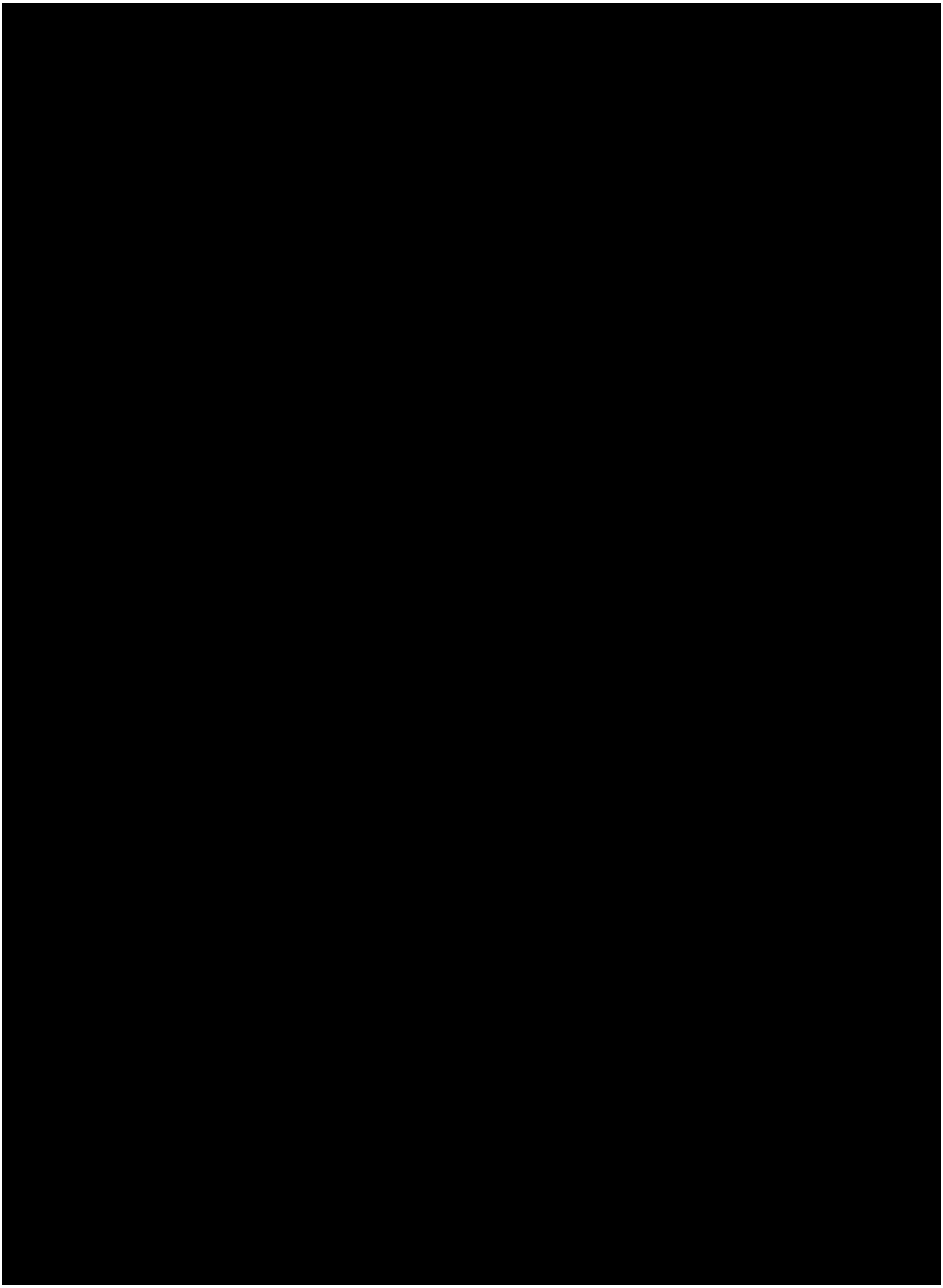


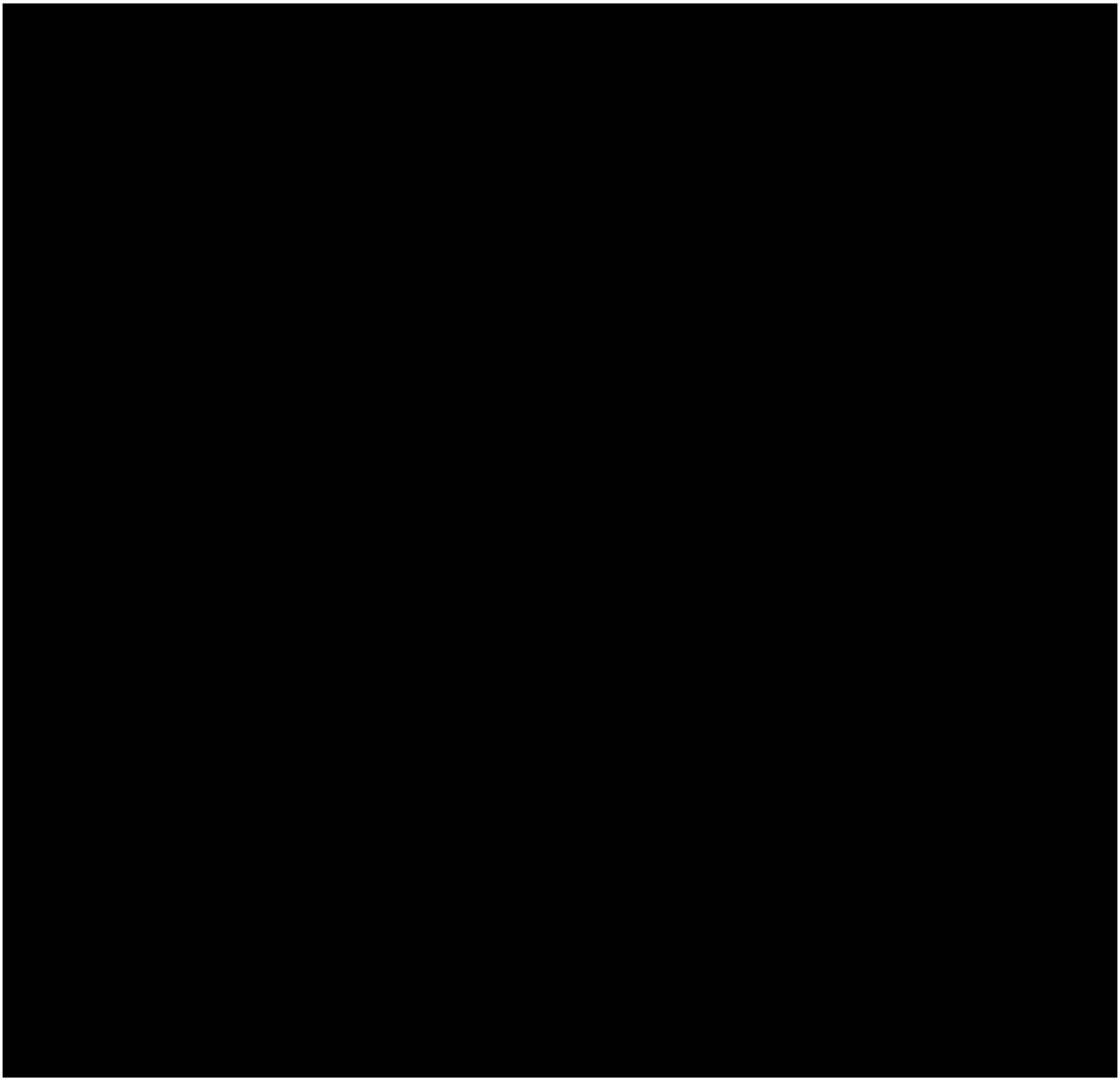


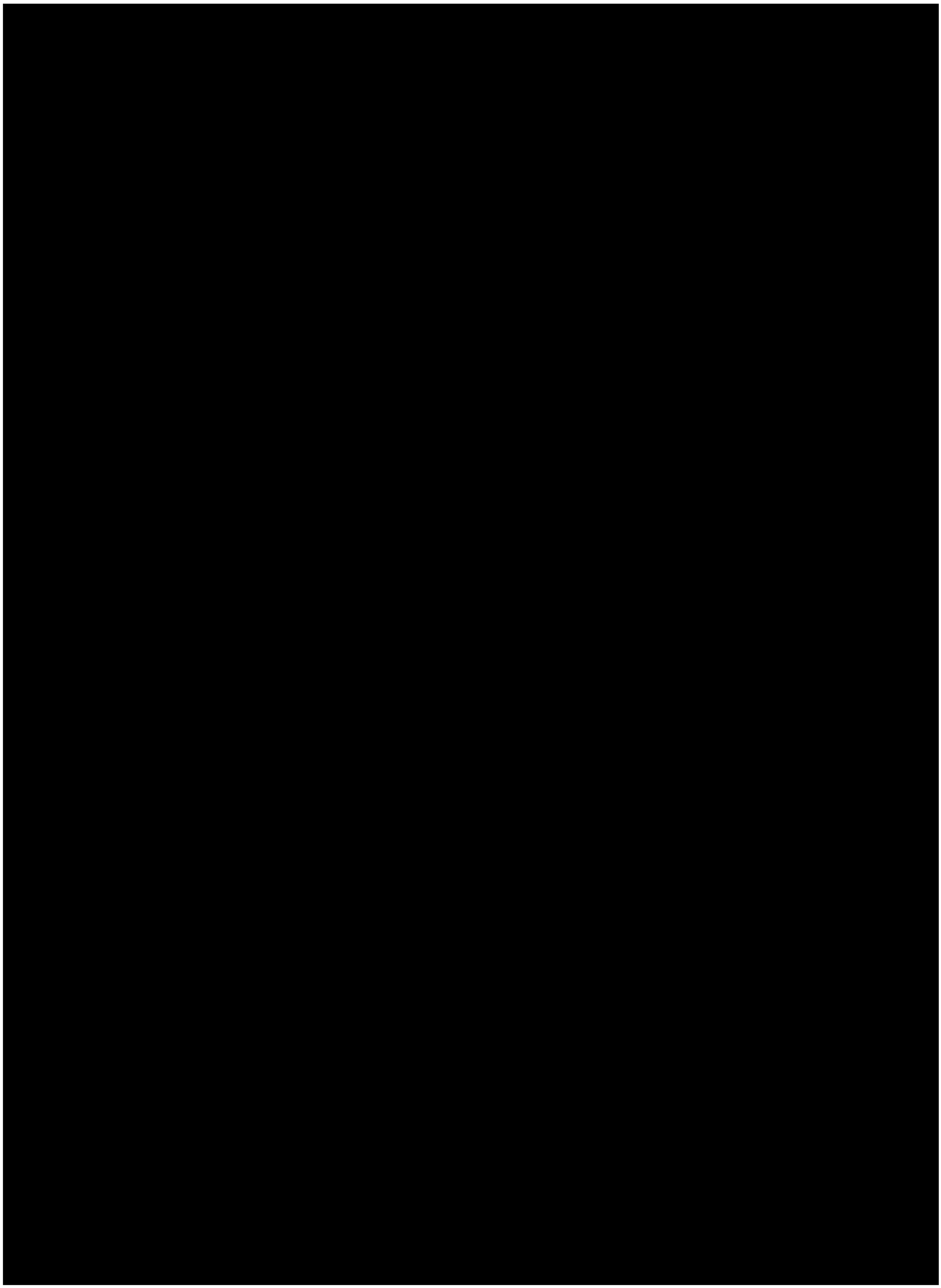


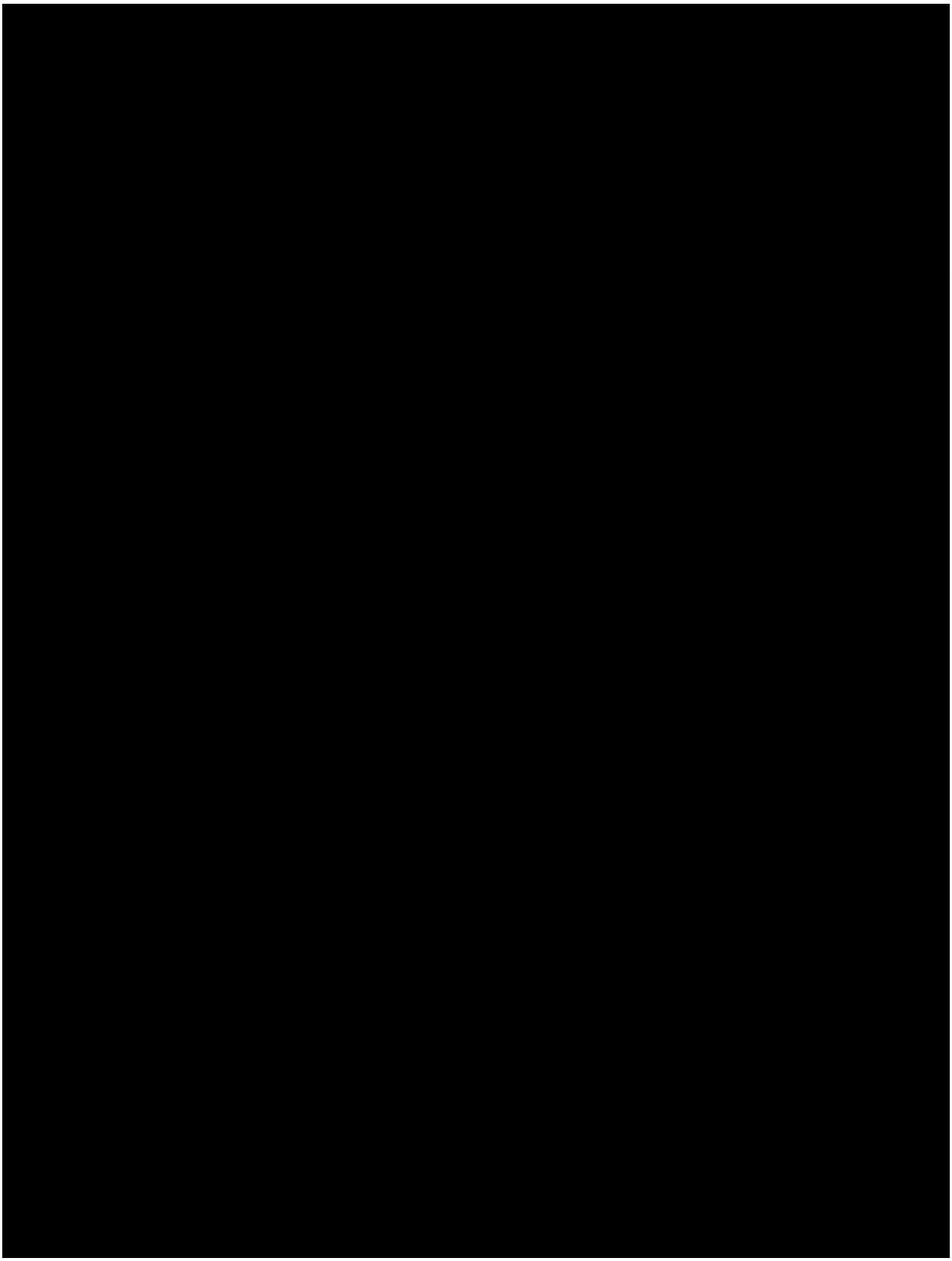


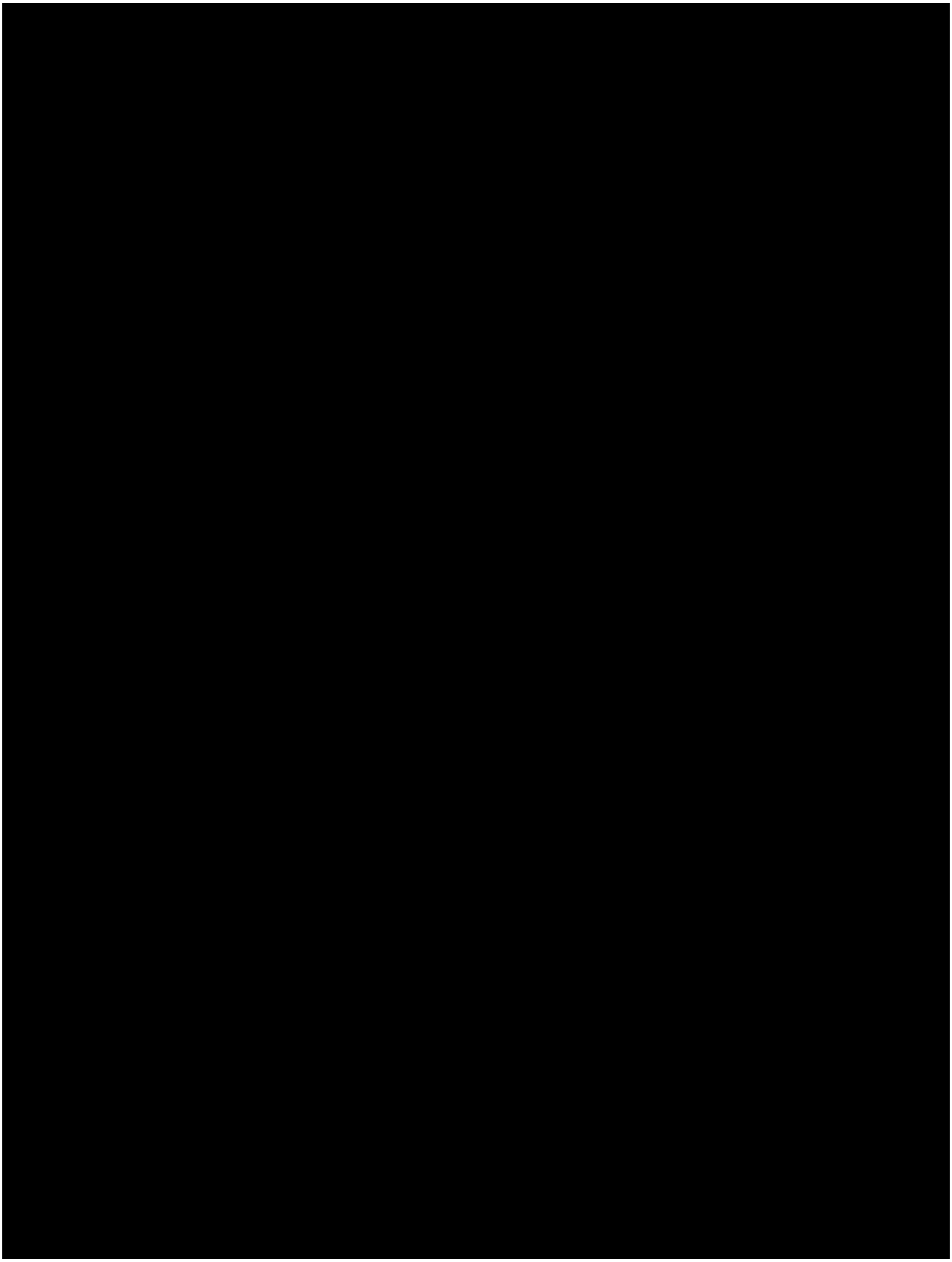


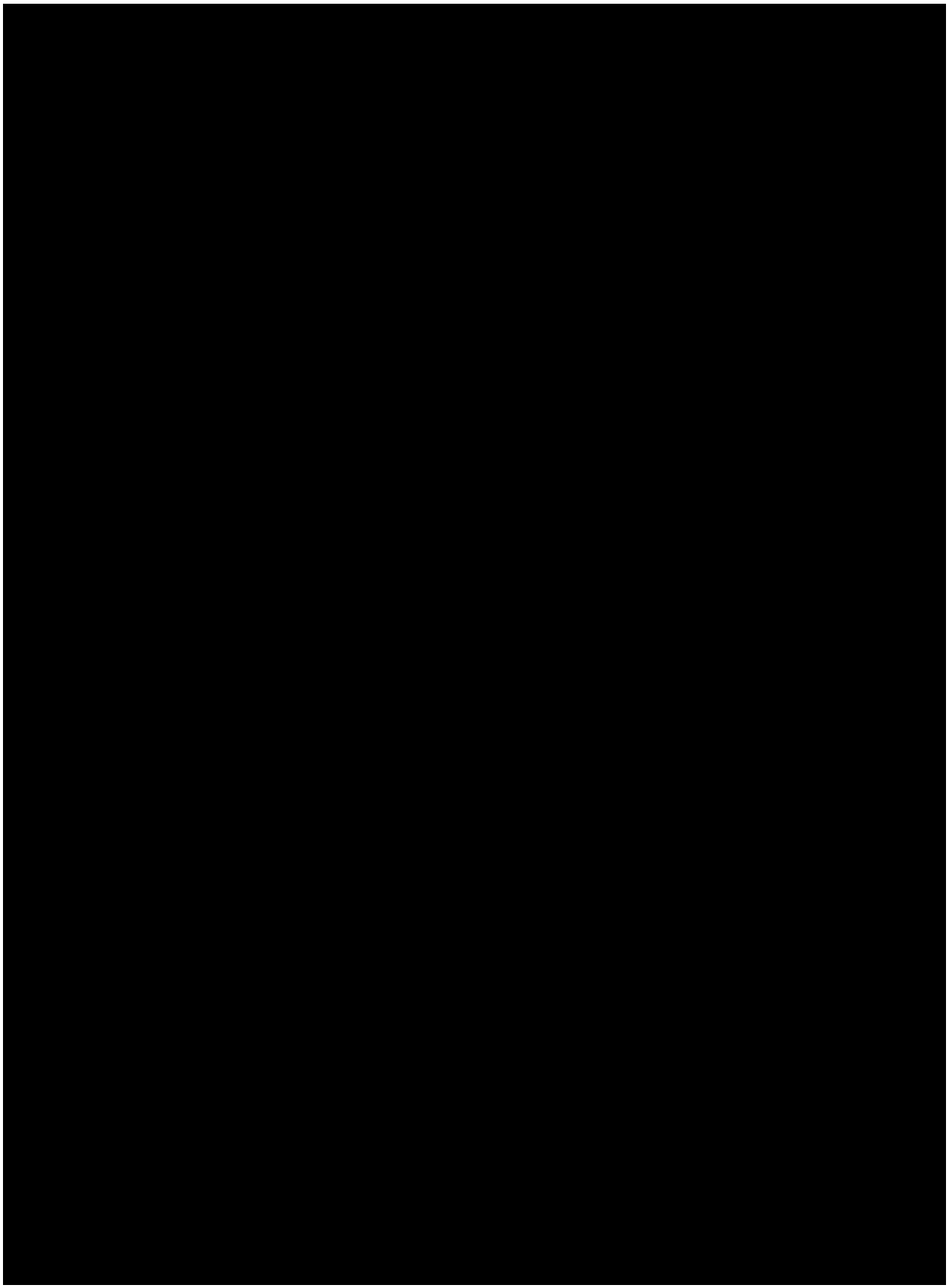


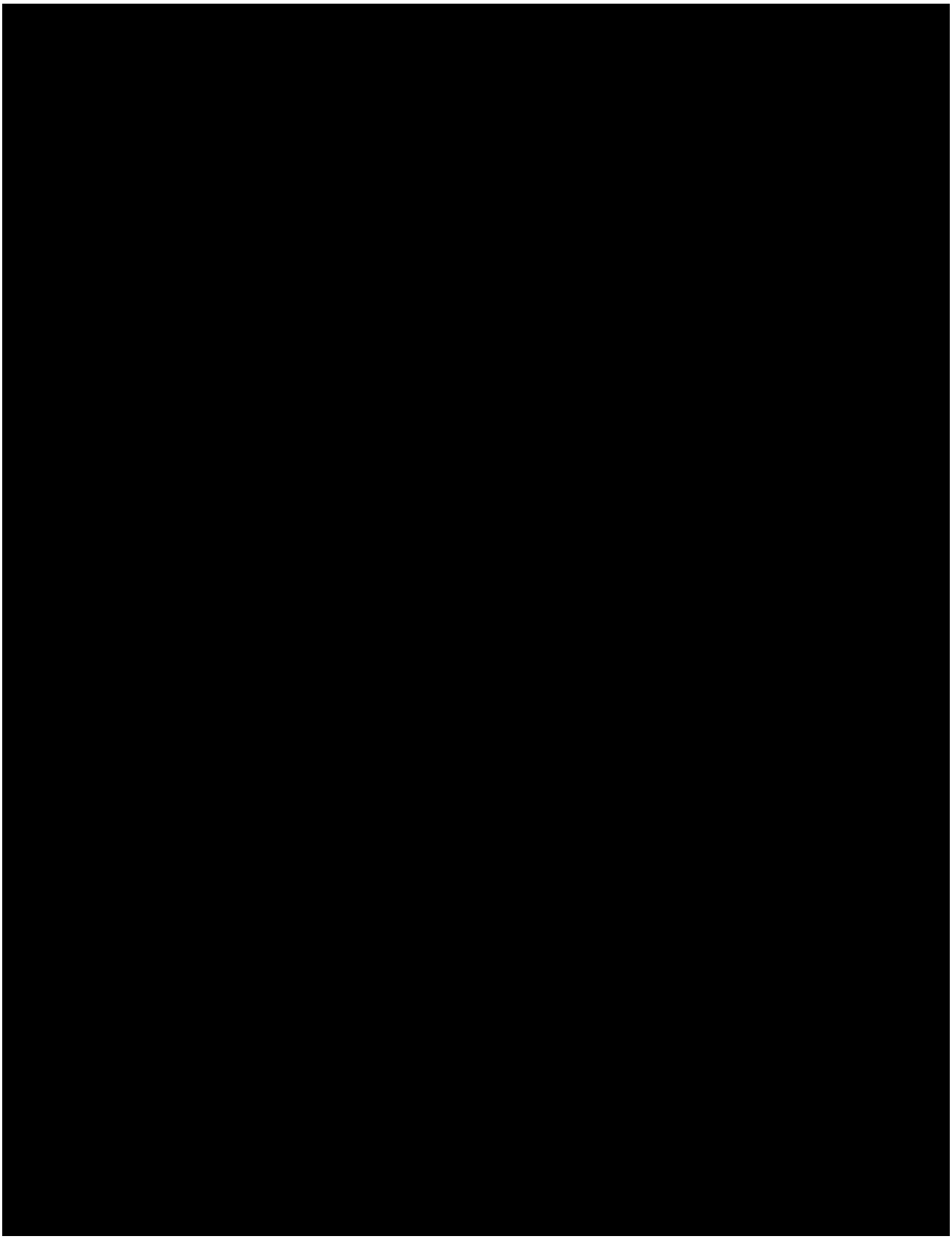


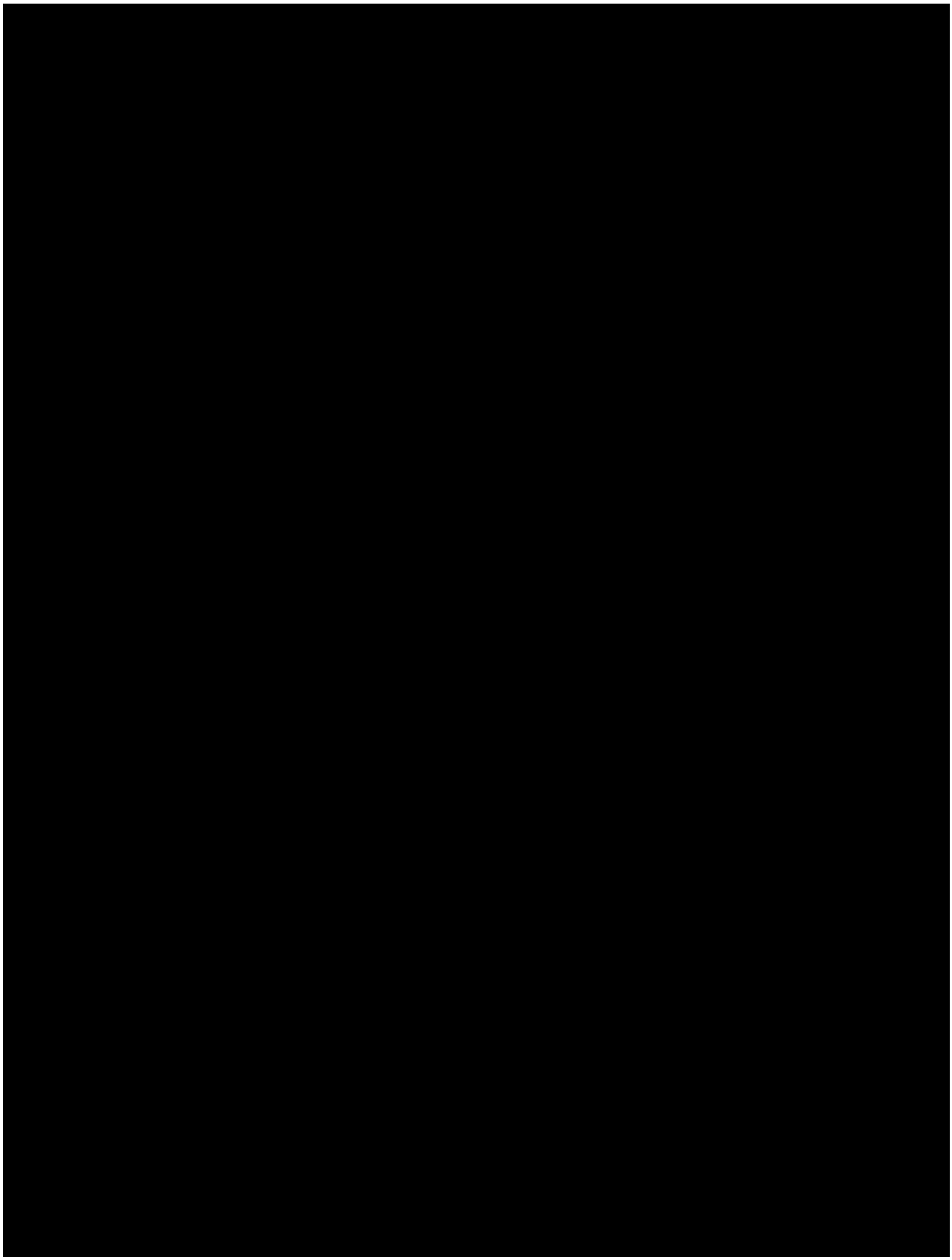


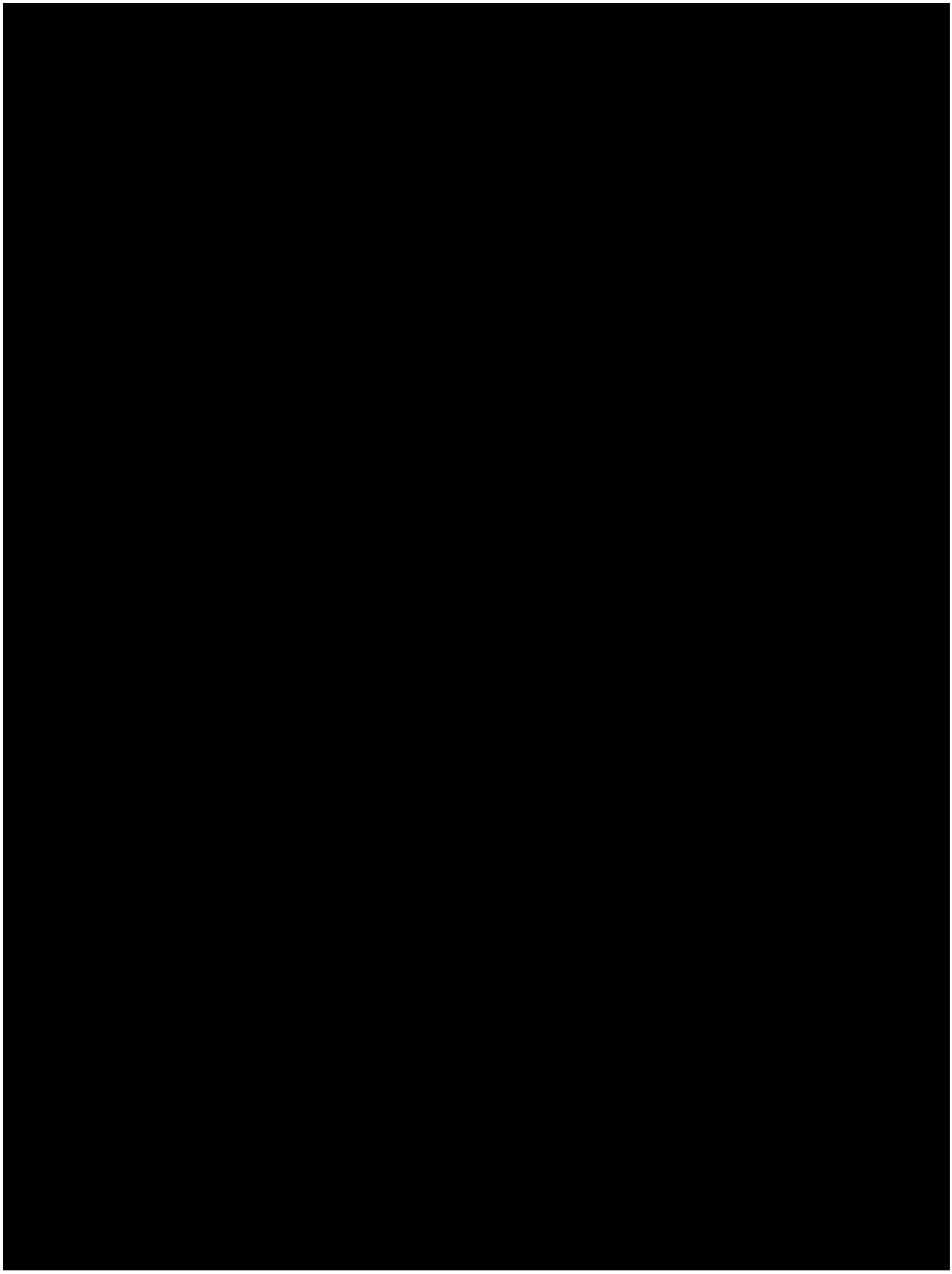


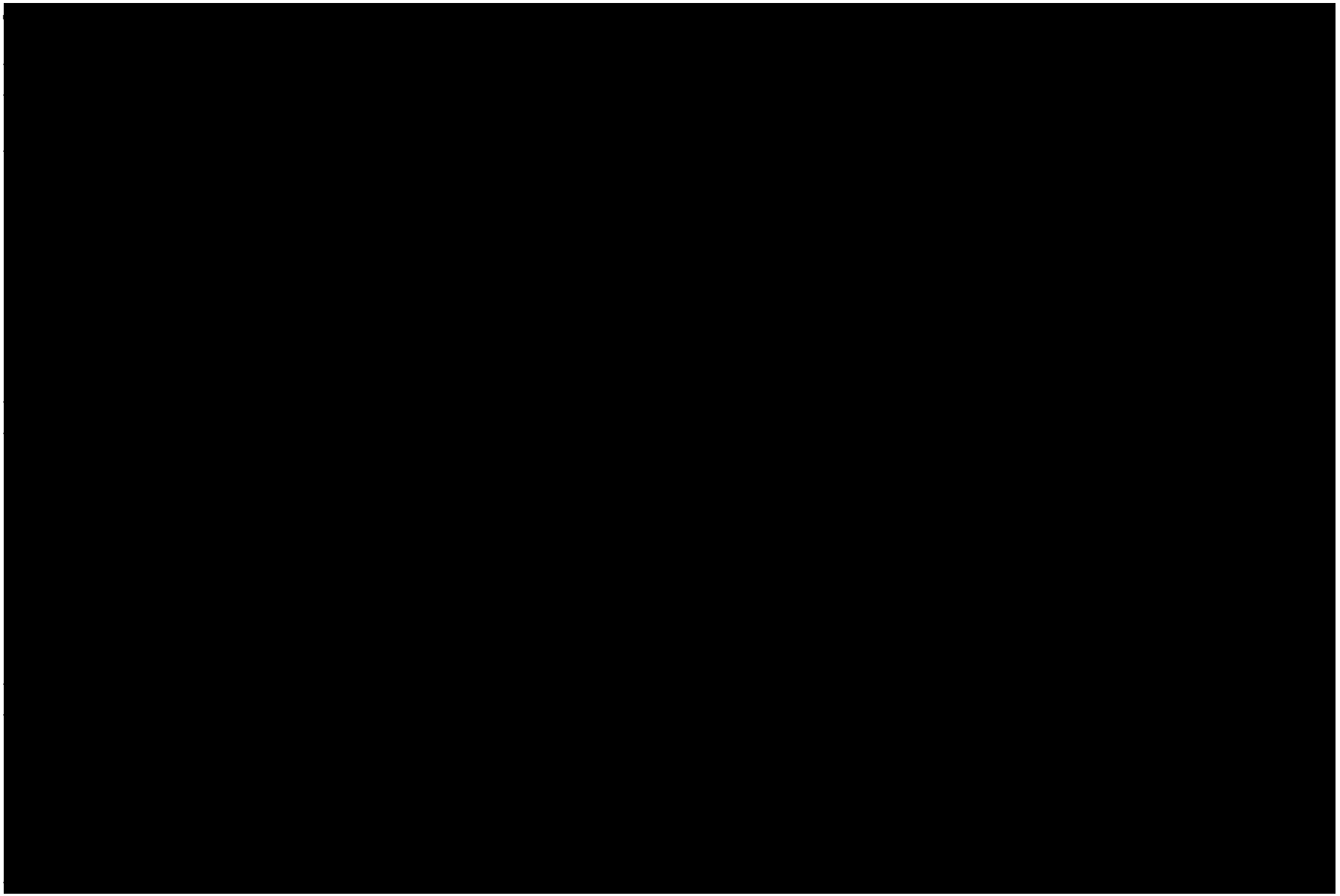


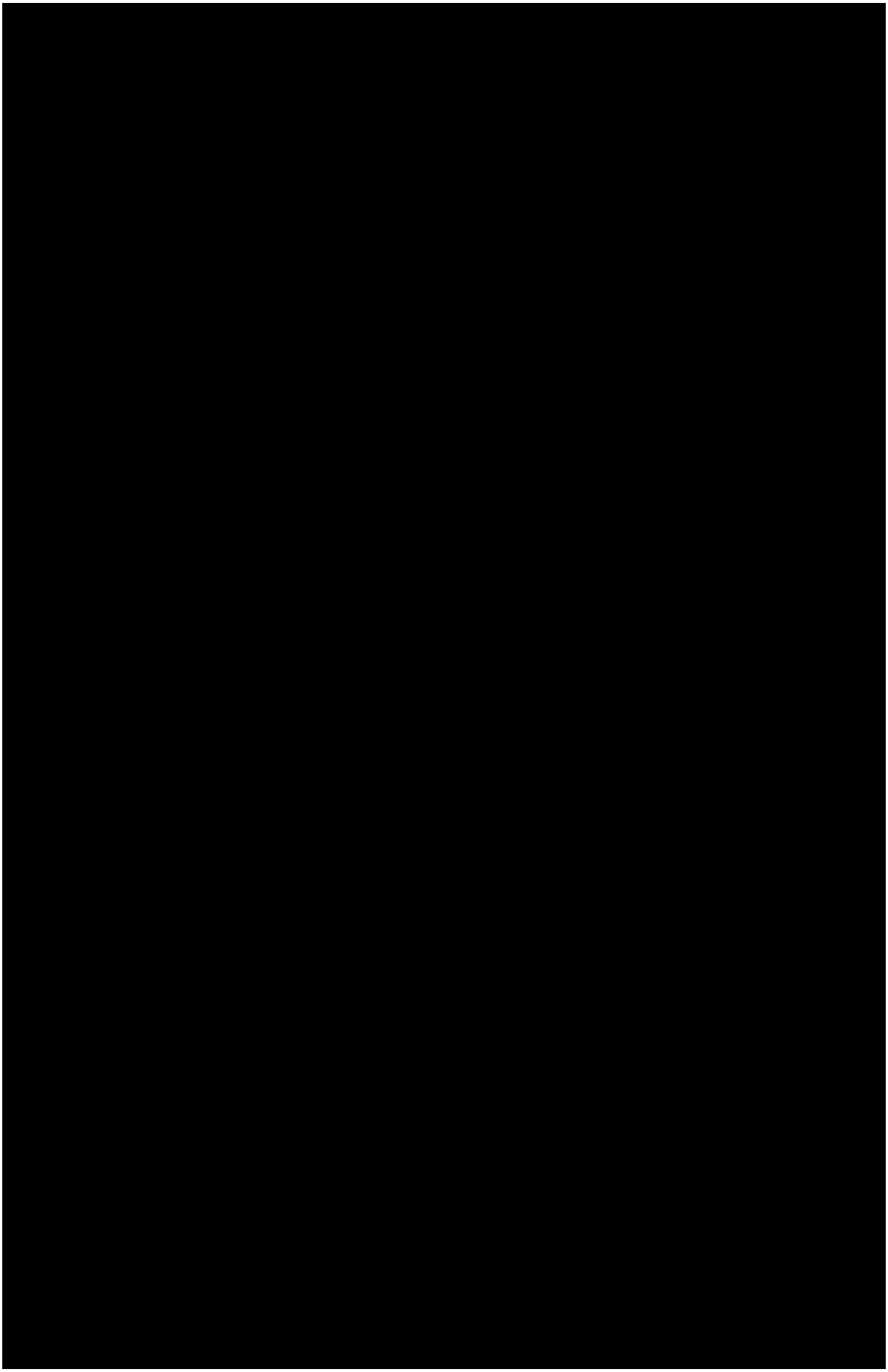












No/Little Need Vs Definite Need B= 0.205, 95% CI: -0.311 to 0.721, P=0.434). These results suggest that RSES did not have a significant impact on the relationships between these variables.

Discussion

The objective of this study was to understand the intricate relationships that exist between the psychological impacts of orthodontic treatment needs and the self-perceptions of adolescents regarding their dento-facial aesthetics, OHRQoL, and self-esteem in relation to the severity of their malocclusion. In this study, adolescents perceived their orthodontic treatment need lower compared to what clinician assessed. Additionally, significant correlations were found between psychosocial impacts of dental esthetics on OHRQoL with respect to subjective orthodontic treatment need and self-esteem.

Between instruments used in this study, PIDAQ and RSES are reliable tools that have been successfully used among adolescents in previous studies[104, 110]. Although OES is a tool that was created for adult patients[105, 111], the authors did not consider it necessary to adapt the tool for adolescents in this study, as the it consists of very simple and clear questions. The self-perceived and normative orthodontic treatment need had been detected with IOTN-AC and IOTN-DHC, respectively, which is a widely used validated index in previous studies[112, 113].

A significant proportion of adolescents classified by clinicians as having a definite need for orthodontic treatment according to the IOTN-DHC perceived their need for treatment as low or non-existent according to the IOTN-AC. This discrepancy is noteworthy, especially considering that many healthcare systems base their patient selection criteria on the IOTN-DHC, which may not accurately reflect adolescents' own perceptions of their orthodontic treatment needs. Therefore, it emphasizes how crucial it is to consider patients' subjective evaluations in addition to objective assessments when planning orthodontic treatments. Similar to our findings, Chauhan et al. found a statistically significant difference between the IOTN-DHC and IOTN-AC definite need groups, with adolescents being less critical in their aesthetic evaluations and thus perceiving a lower treatment need[114]. The reason for this discrepancy can be that IOTN-DHC evaluates a series aspect of the oral cavity, such as: ectopic teeth, hypodontia, deep traumatic bites or cross-bites that have implications for dental health;

however, they do not necessarily attract high aesthetic component grades. Therefore, IOTN-DHC brings together a series of parameters that are not understood by the patient, especially by an adolescent, so these components are not given the importance. IOTN-AC evaluates the aesthetic aspects of the malocclusion, only in a two-dimensional frontal view, and this highlights its subjective nature[115]. In fact, the reliability of IOTN-AC is in debate according to the previous studies in the literature[116–118]. In contrast to our findings, dos Santos et al. reported that children who self-declared to need orthodontic treatment (IOTN-AC) were likewise diagnosed using the normative criterion (IOTN-DHC)[119].

Based on these findings, it can be also explained why there is not a significant difference between self-esteem, psychological impact of dental esthetics, self-perceived orofacial aesthetics with respect to the normative orthodontic treatment need. Since the patient's self-perceived orthodontic treatment need is lesser than the normative orthodontic need, it does not have a negative effect on these aspects neither. In accordance to these findings, Gavric et al. also reported modest correlations between the IOTN-DHC and PIDAQ scores, where it was indicated the subjective perception of orthodontic treatment need has more impact on OHRQoL than does the objective orthodontic treatment need[90]. These outcomes conflict with the study results of Bellot-Arcís et al. where it was reported a significant linear association between PIDAQ and the grades of both IOTN components among Spanish adolescents[120]. There are controversial opinions in the literature regarding the relationship between self-esteem and normative orthodontic treatment need. Similarly to our findings, Akpasa [121] et al. did not report any significant association between self-esteem findings, and normative orthodontic treatment need while there are some studies in the literature that have found a significant relationship between self-esteem and normative orthodontic treatment need[90].

In line with the findings of Dalle et al.[122] there was no relationship found between abnormal skeletal malocclusion and OHRQoL in our study. This result might be due to the reduced aesthetic impact of the profile when viewed from the front, which is the perspective people typically see themselves in daily life[123]. Due to the fact that a reduced OVB, which indicates to an open bite and is therefore more evident from the frontal view, may possibly account for the lower OHRQoL observed in patients with reduced OVB. In a similar vein, poorer self-esteem was discovered in adolescents with

reduced OVJ, which is suggestive of an inverse (negative) overjet that can be more evident from the frontal view than a normal or increased OVJ.

In line with earlier research[99, 124], our findings showed that adolescents who perceived that they required orthodontic treatment also reported lower OHRQoL related to psychosocial impacts of dental esthetics. Therefore, despite the objective severity of the malocclusions, a person's subjective assessment of his/her dental aesthetics will have a negative impact on their OHRQoL[122]. Furthermore, the current research showed a relationship between psychosocial impacts of dental esthetics on OHRQoL and self-esteem, with adolescents reporting a worse OHRQoL as their self-esteem decreased. This outcome is consistent with various other research findings in the literature[32, 97, 125]. This relationship can be explained with the vital role of self-esteem in mediating the impact of psychological and physical conditions, which can be protective for individuals from the effects of various conditions[98, 126, 127]. Therefore, teenagers' high levels of self-esteem may shield them from the negative effects of malocclusion on their OHRQoL.

One of this study's objectives was to examine whether self-esteem moderates the association between normative orthodontic treatment need and OHRQoL. The results of other researches published in the literature are consistent with our finding that there is no moderating effect of self-esteem on the link between the OHRQoL and normative orthodontic treatment need [125, 128, 129].

The authors of the present study have found a paucity of studies in the literature with OES on adolescent patients. The most related study was done by Pavicic et al. on the young adult patients where it was reported that there is not a relationship between PIDAQ and OES scores[130] which agrees to our findings. Further studies need to be done in the future to detect the relationship between self-perceived orofacial appearance, normative and subjective orthodontic treatment need and self-esteem.

As prior research has mainly evaluated the dental components of malocclusion, one of the study's strengths was examining the link between self-esteem, OHRQoL, and self-perception of malocclusion and dento-facial aesthetics with skeletal malocclusions using cephalometric parameters that evaluates maxillary and mandibular position both on the sagittal and on the vertical plane. On the other hand, the limit of this study was that the socioeconomic status was not evaluated, which could be a factor influencing the patients’ awareness of their oral condition or the perceived need for a parent to bring their child for orthodontic visits. However, it is important to note that perception and

attention to oral health can vary from individual to individual, regardless of socioeconomic status. Additionally, since this is a monocentric study involving patients seeking orthodontic treatment, the results may not be representative of other geographic regions with different cultural and social backgrounds, and may not fully reflect the perception of oral health in the broader population.

Conclusions

The use of objective indices to detect orthodontic treatment need, such as the IOTN-DHC, do not correlate with the adolescents' perceived need for orthodontic treatment. Therefore, before starting an orthodontic treatment it is important to try to understand what patient's wishes and objectives are because they may not coincide with those of the orthodontist. OHRQoL is impacted by adolescents' self-esteem and their perception of the need for orthodontic treatment, however not by their skeletal malocclusion characteristics.

Chapter 4

This chapter presents a retrospective study conducted in collaboration with University of KU Leuven.

The aim was to understand the impact of cultural differences on the OHRQoL of Belgian and Italian adolescents seeking orthodontic treatment, as well as on the perception of their parents/caregivers of their children's OHRQoL.

Nowadays in our clinics we a variety of patients from different socio-cultural backgrounds, therefore research across varying cultural contexts is crucial for its clinical implications.

This study had been submitted as an original research paper to European Journal of Orthodontics on 26.08.2024.

Cultural Influences on the Oral Health-Related Quality of Life of Adolescents Seeking Orthodontic Treatment and Caregiver Perception: A Comparative Study between Belgium and Italy.

Background

The concept of quality of life and its intricate connection with health has long been a focal point of scientific research. QoL is often defined as the level of satisfaction individuals have with their physical, emotional, and mental well-being, as well as their interactions within familial, social, and professional spheres [131] and it is impacted by cultural, personal, and self-reliant values, beliefs, aspirations and life experiences [132]. Subsequently, OHRQoL is a multidimensional concept used to describe the influence of oral health status and various dental disorders on an individual's quality of life, comprising aspects such as functional impairment, pain, discomfort and the psychological impacts these conditions can have [133, 134].

Research has found that OHRQoL is strongly correlated with factors such as socioeconomic status, place of residence, education level, and individual characteristics like age, gender and ethnicity [135, 136]. Therefore, OHRQoL assessments are especially sensitive to sociodemographic traits, varying significantly across the cultural contexts in which they are used [137–141]. For instance, the differences in health-related quality of life observed between Jordanian and British orthognathic patients were attributed to their different cultural norms and healthcare systems [138]. Additionally, German adolescents with immigrant backgrounds had a poorer OHRQoL than peers with non-immigrant parents [140], and a study involving four different ethnic groups in the United Kingdom revealed that ethnicity significantly impacts oral symptoms [142]. Also, an evaluation of the efficacy of the 16-item short-form impact version of the Child Perception Questionnaire$_{11–14}$ (CPQ$_{11-14}$) across different communities in Brazil, Brunei, and New Zealand reported no connection between caries experience and OHRQoL, suggesting that variations in OHRQoL may have resulted from slight differences in the subjective oral health of these communities, stressing how psycho-social factors can influence OHRQoL across populations.[139]

Although the OHRQoL of children and adolescents is the most studied [103, 143, 144], young age groups might not fully comprehend their health condition or be able to express

their experiences with clarity. Therefore, it is also crucial to take into consideration the perception of parents/caregivers of their children's OHRQoL [145]. Given the young age of its patient population, this is especially important in the orthodontic field, where studies report parental willingness to be the most influential factor determining a patient's motivation for orthodontic treatment [146].

However, literature reports different levels of agreement between parents' and children's perception on the children's OHRQoL [53, 147]. Studies reveal that parents are better aware of the oral symptoms and functional limitations associated with their children's OHRQoL [53, 145, 148], but not of the social or emotional well-being related to OHRQoL. This is especially marked during adolescence, as the child gains independence and interacts more with the external environment. Jaeken et. al., reported no correlation between children-parent reports on OHRQoL prior to orthodontic treatment, but during and after treatment this correlation became moderate [149].

Since adults generally make decisions about their children's health, assessing parents' perceptions about oral health problems and their influence on children's OHRQoL is crucial [50, 150]. However, their own experiences, cultural backgrounds, and socio-economic contexts can introduce variability in how parents perceive and report their children's OHRQoL [49, 151]. Paula et. al. found that children's OHRQoL was significantly impacted by parental socioeconomic characteristics and home environment [152]. Children from higher-income households typically have better oral hygiene, access to healthcare and can afford preventive treatments, which improves their quality of life [153, 154]. Al-Hayyan et. al. evaluated parental perception of their children's OHRQoL in two different populations, showing no significant differences in populations with similar cultural backgrounds [155], although this topic has not been studied in depth.

Dental malocclusion, especially during adolescence, can have lasting effects on physical health, psychological well-being and social interactions [156], as studies conducted separately in Italy [157] and Belgium [125] confirm. While there is a substantial amount of research comparing OHRQoL of adolescents [158–160], there is a notable lack of literature performing a comparative analysis of adolescents and their parents/caregivers perception about their OHRQoL among different populations. On the other hand, cultural values and national identity have been shown to affect health perceptions and behaviors in European countries [161, 162].

The aim of this research is to ascertain how cultural differences might affect the OHRQoL of adolescents seeking orthodontic treatment and whether there are notable differences in

parental perception of their children's OHRQoL between two Italian and Belgian populations.

Materials and Methods

This retrospective comparative cohort study was conducted after obtaining Ethical Approval with data collected at the section of Orthodontics of University Hospitals Leuven, Leuven, Belgium (Ethical approval number ML5739) and the section of Orthodontics of the University Naples Federico II (Ethical approval number 14623). The Belgian cohort has been previously published [149].

Data collection

The Italian and Belgian cohorts of adolescents and parents/caregivers were recruited during a first dental examination between September 15 to December 22, 2023 and between April 22, 2009 to December 31, 2016, respectively. Exclusion criteria were patients with intellectual or physical problems, genetic disorders, history of current or past orthodontic treatment, significant oral surgery or insufficient understanding of the Italian or Dutch language, respectively.

The OHRQoL of Belgian adolescents was assessed with the Children Perception Questionnaire (CPQ_{11-14}) [54] and the Belgian parents/caregivers' perceptions of their children's OHRQoL were assessed with the Parental Perception Questionnaire (PCP-Q) [62]. The OHRQoL of Italian adolescents was assessed with 16-item short version of the Children Perception Questionnaire (CPQ_{11-14}-16) [163] and the Italian parents/caregivers' perceptions about their children's OHRQoL was assessed with the 16-item short form of the Parental Perception Questionnaire-16 (PCP-Q-16) [64]. The questionnaires were completed by the patient and one of their parents/caregivers during the above mentioned intake consultation, after obtaining their written informed consent.

CPQ_{11-14}-16 and PCP-Q-16 encompass 16 questions which test the frequency of specific problems related to lips, teeth, and jaws over the preceding three months. They are divided in 4 domains as: Oro-Functional Alterations (OFA) (6 items), Eating Disturbances (ED) (2 items), Emotional Well-Being (EWB) (4 items), Social Well-Being (SWB) (4 items). A 5-point Likert scale is used to rate the responses (never: 0; once/twice: 1, sometimes: 2, often: 3, and everyday/almost every day: 4). The sum of all scores is used to determine

the overall score as well as the subdomain scores. A lower overall score is indicative of a higher OHRQoL. The data of the Belgian sample, corresponding to the full versions of CPQ_{11-14} and PCP-Q, were consequently adapted to the 16-item short versions respectively, allowing comparisons with the Italian sample.

Additionally, the objective orthodontic treatment need of each participating adolescent was assessed with the Dental Health Component of the Index of Orthodontic Treatment Need (IOTN-DHC) [109]. IOTN-DHC considers various aspects of occlusion (e.g. overjet, cross-bite, displacement of teeth, and open bite) in order to grade the orthodontic treatment need from 1 (treatment is not necessary) to 5 (high treatment need).

Statistical Analysis

As a first step, the comparability of the Belgian and Italian samples was statistically checked. For this, the patients' age, sex and IOTN-DHC grade and the parents' relation to the patient (mother/father) were displayed as means and standard deviation (SD) or percentages for each group independently. Outliers were then excluded and data was checked for normality with D'Agostino and Pearson test. Then, the characteristics of the Belgian and Italian samples were statistically compared to check their homogeneity. Continuous data (e.g. age) were analyzed using the Mann-Whitney test, ordinal data (e.g. IOTN-DHC grades) were analyzed through the Chi-square test, and categorical data (sex and relation of parent to patient) were analyzed via the Fisher's exact test. Afterwards, to determine if the differences in OHRQoL between the two samples were statistically significant, Mann-Whitney test was used, based on the subdomains and total scores of CPQ_{11-14}-16 and PCP-Q-16. In order to evaluate the agreement between the questionnaires of parents/caregivers and children for each domain, the intraclass correlation coefficient (ICC) was determined by non-parametric Spearman correlation, after confirming non-normal distribution with D'Agostino & Pearson test. The agreement level for ICC is interpreted as: <0.2, poor; 0.21 – 0.40, fair; 0.41 – 0.60, moderate; 0.61 – 0.80, substantial; and 0.81 – 1.0, excellent to perfect [164]. Wilcoxon matched pairs signed rank test was done to determine whether there is a statistically significant difference between the responses of parents/caregivers and patients. Data analysis was conducted using version 10.1 of Graphpad Prism software (GraphPad Software, San Diego, CA, USA).

Results

The characteristics of the samples are presented in Table 3.1. The Belgian cohort comprised 791 pairs of healthy adolescents (aged 11 to 17 years) and parents/caregivers, while in the Italian sample 101 healthy adolescents (aged 10 to 17 years) were included along with their parent/caregiver. Approximately half of the patients of both samples were female and presented with IOTN-DHC Grade 4-5, which indicates a definite need for orthodontic treatment. In both the Belgian and Italian samples, mothers made up the majority of the respondents (80.11% and 73.68%, respectively). This distribution (p=0.177), the patients' age (p=0.643), sex (p=0.833) and IOTN-DHC grades (p=0.937), were not significantly different between the Belgian and Italian samples.

Table 3.1 Comparison of the characteristics of the Belgian and Italian samples.

		Belgian Sample	Italian Sample	*P-value*
Patients (Adolescents)	Number of patients	791	101	
	Female patients (%)	51.2	52.4	0.833
	Male patients (%)	48.8	47.5	
	Mean Age in years (SD)	12.7 (1.2)	12.9 (2.1)	0.643
	Patients with No/Little OTN (%)	25.73	24.75	
	Patients with Moderate OTN (%)	29.30	27.72	0.937
	Patients with Definitive OTN (%)	44.96	47.52	
Parents or Caregivers	Mother (%)	80.11	73.68	0.177
	Father (%)	19.89	26.32	

Abbreviations: IOTN: Orthodontic Treatment Need; SD: Standard Deviation

The mean, standard deviations, median and interquartile ranges of the CPQ_{11-14}-16 and PCP-Q-16 scores of the Belgian and Italian samples, as well as their statistical comparisons are presented in Table 3.2. Italian adolescents presented significantly higher total score (p<0.0001), and higher scores on the domains emotional (p=0.0003) and social well-being (p<0.0001) compared to their Belgian counterparts, suggesting a lower OHRQoL. Furthermore, Italian parents/caregivers showed significantly higher scores on all subdomains and overall OHRQoL scores except on 'eating disturbances'. Therefore, they perceive their children's total OHRQoL, as well as in relation to oro-functional limitations, social and emotional well-being, more negatively compared to Belgian parents/caregivers. However, when it came to eating disturbances, Belgian parents/caregivers had a lower perception of their children's OHRQoL.

Table 3.2 Comparison of subdomains and overall score of CPQ_{11-14}-16 and PCP-Q-16 between Belgium and Italy

	Domains	Belgian Sample				Italian Sample				*P-value*
		Mean (SD)	*Median(IQR)*	*Range*	*25-75 %*	*Mean (SD)*	*Median(IQR)*	*Range*	*25-75 %*	
CPQ_{11-14}-16	Oro-Functional Alterations	4.75 (3.3)	4 (5)	0.0-14.0	2.0-7.0	5.28 (3.4)	5 (4)	0.0-16.0	3.0-7.0	0.109
	Eating Disturbances	2.01 (1.25)	2 (2)	0.0-7.0	1.0-3.0	2.05 (1.66)	2 (2)	0.0-8.0	1.0-3.0	0.579
	Social Well-Being	1.04 (1.48)	1 (2)	0.0-9.0	0.0-2.0	2.86 (2.72)	2 (3)	0.0-11.0	1.0-4.0	<0.0001*
	Emotional Well-Being	1.64 (2.28)	1 (2)	0.0-13.0	0.0-2.0	3.16 (3.6)	2 (6)	0.0-13.0	0.0-6.0	0.0003*
	Total	9.39 (6.01)	8 (7.5)	0.0-36.0	5.0-12.5	13.38 (8.99)	11 (11.5)	0.0-39.0	7.0-18.5	<0.0001*
P-CPQ-16	Oro-Functional Alterations	4.83 (4.57)	4	0.0-25.0	1.0-7.0	7.31(5.2)	6 (6)	0.0-30.0	4.0-10.0	< 0.0001*
	Eating Disturbances	2.92 (2.95)	2 (2)	0.0-10.0	1.0-4.0	1.78 (2.09)	2(2)	0.0-10.0	0.0-2.0	< 0.0001*
	Social Well-Being	1.16 (2.46)	0 (0.5)	0.0-16.0	0.0-1.0	3.53 (3.61)	2 (5.5)	0.0-16.0	0.5-6.0	< 0.0001*
	Emotional Well-Being	2.08 (3.44)	0 (2)	0.0-20.0	0.0-3.0	4.36 (4.08)	4 (6)	0.0-16.0	1.0-7.0	< 0.0001*
	Total	10.9 (9.94)	8 (9.5)	0.0-57.0	4.0-13.5	17 (12.3)	15 (18.5)	0.0-57.0	6.5-24.0	< 0.0001*

Abbreviations: CPQ11-14: Child perception questionnaire; P-CPQ-16: Parental-Caregiver Perception Questionnaire-16; * P<0.05.

The responses of children and parent/caregivers were positively correlated in all subdomains and overall scores, both in Belgium and Italy, ranging between 0.203-0.396 and 0.300-0.414, respectively (Table 3.3). There were significant differences between the responses of children and parent/caregivers in total scores and emotional well-being in both groups. When checking the scores given by parents and adolescents on Table 3.2, it can be observed that both Belgian and Italian parents/caregivers underestimate (they think is lower) their children's overall and emotional well-being related OHRQoL compared to what their children reported. Belgian and Italian parents also significantly underestimated their children's eating disturbances and oro-functional alterations respectively. However, the responses of the Belgian cohort did not show any significant differences in oro-

functional alterations (p=0.482) and social well-being (p=0.217) domain while the responses of Italian cohort did not show any significant responses in eating disturbances (p=0.108) and social well-being (p=0.097).

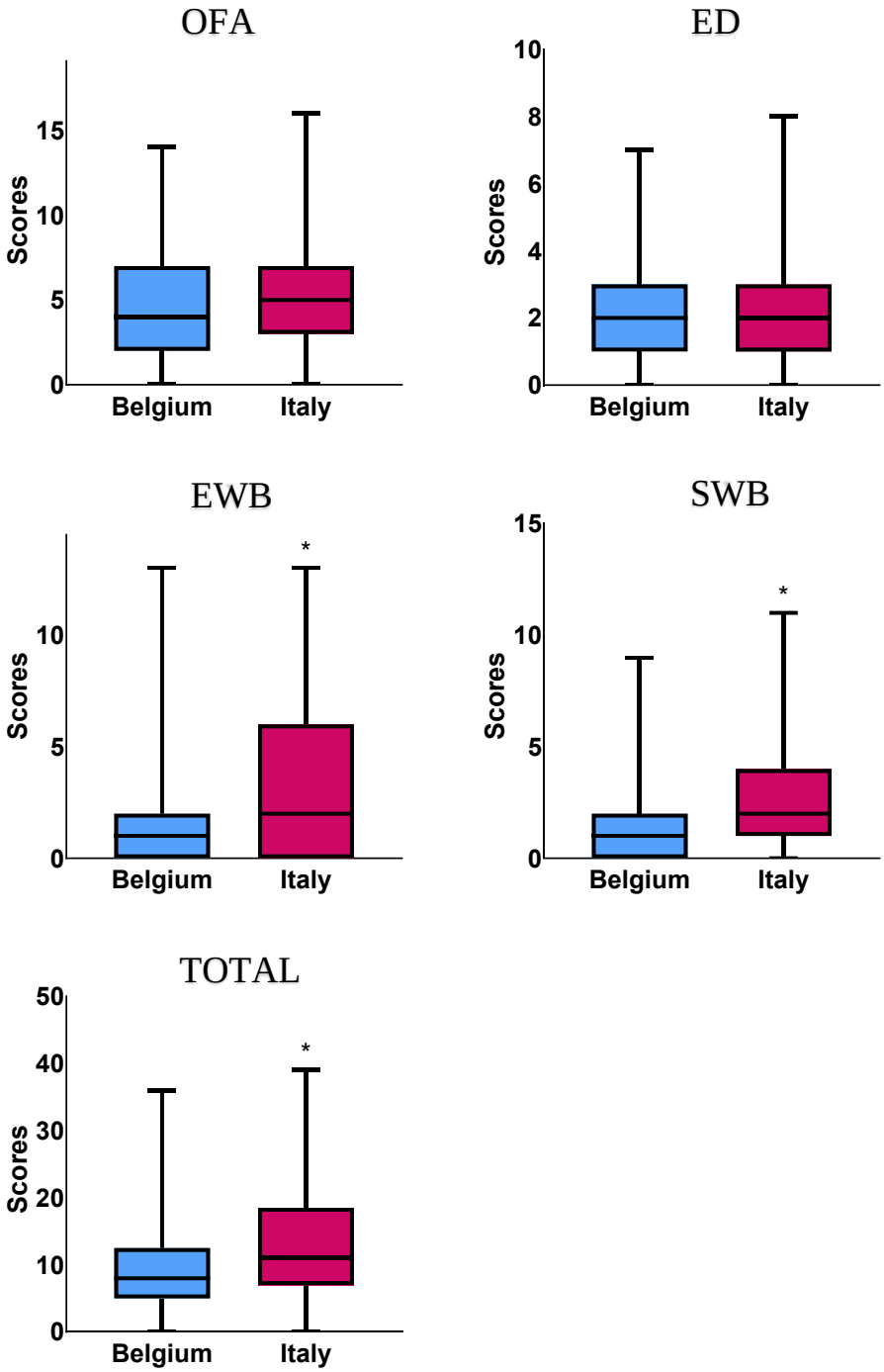
Table 3.3 Correlation between patient and parent perception as well as differences between subdomains and overall score of CPQ_{11-14}-16 and PCP-Q-16 in Belgium and Italy

	Belgium			Italy		
	Spearman's correlation		Wilcoxon test	Spearman's correlation		Wilcoxon test
	r	*P-value*	*P- value*	r	*P-value*	*P- value*
Oro-Functional Alterations Domain	0.318	<0.0001*	0.482	0.300	0.001*	0.0005*
Eating Disturbances Domain	0.203	<0.0001*	<0.0001*	0.308	0.0008*	0.108
Social Well-Being Domain	0.396	<0.0001*	0.217	0.414	<0.0001*	0.097
Emotional Well-Being Domain	0.363	<0.0001*	0.038*	0.322	0.0005*	0.009*
Total	0.363	<0.0001*	0.006*	0.381	<0.0001*	0.007*

Abbreviations: CPQ_{11-14}: Child perception questionnaire; P-CPQ-16: Parental-Caregiver Perception Questionnaire-16; * P<0.05.

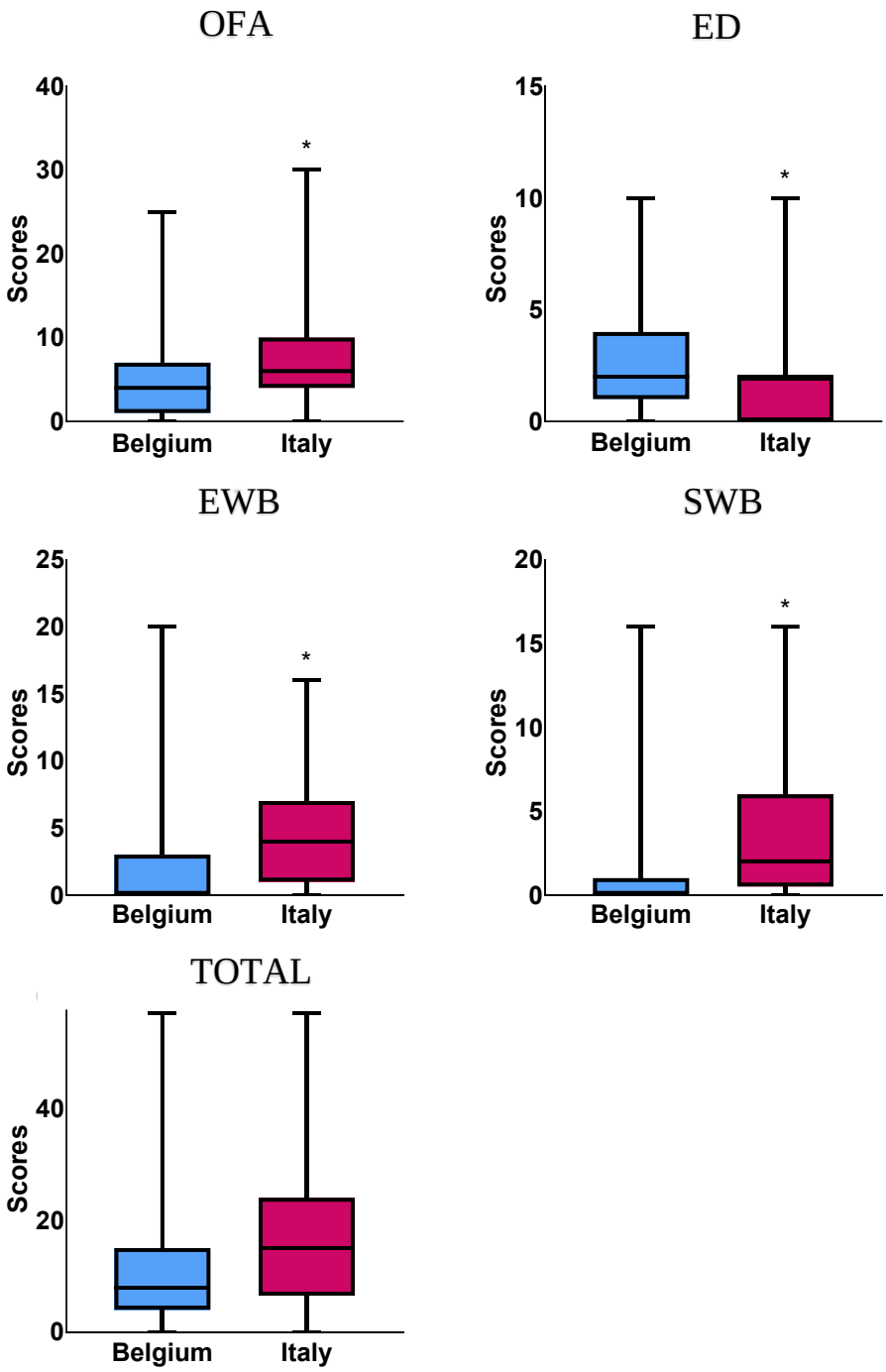
The box plot analysis of Figure 1 further illustrates the differences between patient groups. Particularly, in the social well-being domain, 75 % of the Belgian patients scored below 2, which translates into a very good OHRQoL. In contrast, for this domain, 75% of the Italian patients scored above 1, which is comparatively worse. Additionally, the variations between the Belgian and Italian parent/caregiver perceptions are further demonstrated by the box plot analysis presented in Figure 3.2. Particularly in the social well-being domain, 75% of the Belgian parents/caregivers scored below 1, which translates into a very good OHRQoL, in contrast, 75% their Italian counterparts of scored above 0.5.

Figure 1. Graphical representation of the different CPQ_{11-14} scores between Belgian and Italian samples.



Abbreviations: Note that the colour bars refer to the interquartile ranges, the horizontal black lines reperesent the median and the vertical lines represent the range. *p<0.05. CPQ11-14: Child Perception Questionnaire; OFA: Oro-Functional Alterations; ED: Eating Disturbances; SWB: Social Well-Being; EWB: Emotional Well-Being.

Figure 2. Graphical representation of the different PCP-Q-16 scores between Belgian and Italian samples.



Abbreviations: Note that the colour bars refer to the interquartile ranges, the horizontal black lines reperesent the median and the vertical lines represent the range. *p<0.05. P-CPQ-16: Parental-Caregiver Perception Questionnaire-16; OFA: Oro-Functional Alterations; ED: Eating Disturbances; EWB: Emotional Well-Being; SWB: Social Well-Being.

Discussion

This retrospective cohort study compares the OHRQoL of Belgian and Italian adolescents seeking orthodontic treatment, as well as the parents/caregivers' perceptions of their children's OHRQoL. Despite the disparity in sample size between populations, there were no significant differences in their demographic nor clinical characteristics (age, sex, IOTN-DHC grades or parent/caregiver's relation to adolescent), rending the populations comparable [165].

Belgium and Italy, despite being two countries within the European Union, present distinct social, economic and cultural characteristics due to their unique historical and cultural backgrounds, shaping their particular national identities [166, 167]. These differences extend to the oral health status of their populations and the organization of their healthcare systems, including their dental services [168, 169]. In Italy, the National Health Service (Sistema Sanitario Nazionale - SSN) covers the cost of basic dental care services, limiting the accessibility to esthetic or orthodontic treatments [170]. In Belgium, private practitioners offer the majority of dental treatment, and the government reimburses most preventive and restorative procedures for children under the age of 18, with orthodontics receiving a reimbursement of around 30% of the total cost below the age of 15 [171].

In addition to these variations in healthcare services between the two nations, it is crucial to acknowledge the significant disparities between the northern and southern regions of Italy. These are largely attributed to the regionalization of healthcare and socioeconomic differences [172]. Reports consistently state that the north of Italy performs better in various quality of life measures, and healthcare outcomes than the south of Italy, where the sample of this study was collected [173]. In analogy, when examining the differences across the regions of Belgium, it has been reported that subjects living in Wallonia present lower health-related quality of life than those living in Flanders where this study's sample was collected [174].

Our comparative analysis showed that Italian adolescents presented a significantly lower total OHRQoL, as well as on the domains emotional and social well-being of the CPQ_{11-14}-16. Several studies have reported OHRQoL to depend on malocclusion severity [45, 87]. The fact that malocclusion severity did not differ significantly between both populations, supports the hypothesis that cultural, socioeconomic or health care system inequalities, may be behind the differences found. For instance, while collecting the Belgian sample (2009-2016), the per capita Gross Domestic Product (GDP) in the

Flemish Region of Belgium ranged from 30,000 to 34,000 Euros [175]. The most recent information the authors could find for the GDP per capita in the Campania Region of Italy was from 2021, indicating a figure of 19,580 Euros [176]. Socioeconomically disadvantaged populations have been found to present lower OHRQoL, potentially due to lesser psychosocial resources (such as sense of control, perceived stress or satisfaction with life) [177, 178]. In consistence with our findings, Cellini et al. reported that the Italian population had a lower health-related quality of life than the Belgian population, and they linked this to the disparities in the welfare systems and general income of the two countries [179]. Furthermore, a Canadian study on children revealed that malocclusion was especially linked to lower OHRQoL in more disadvantaged groups [180].

In contrast to our findings, the study by Ravaghi et. al. [177] reported no correlation between socioeconomic factors and OHRQoL related to malocclusion. Furthermore, a different study demonstrated that cross-cultural differences have no impact on adult OHRQoL [181]. These differences show the potential for variability in outcomes based on different study designs, populations, and methodology, as well as the complexity of factors impacting OHRQoL. Adolescence is a critical period for social development, where acceptance by peers gains vital importance. During this time, physical attributes, including malocclusion, can significantly influence self-perception and social interactions and may lead to bullying [182, 183]. Adolescents with severe malocclusion and low self-esteem often have greater aesthetic concerns [100]. Additionally, it should be noted that the sample collection periods differed, with the Italian sample being collected after the onset of COVID-19. Pohl et. al. had shown a worsening in OHRQoL among adolescents following COVID-19 [184]. This could be one of the contributing factors of the lower OHRQoL in Italian adolescents compared their Belgian counterparts in this study. It's important to note that even though a lower overall OHRQoL was found on the Italian sample compared to their Belgian peers, the mean CPQ scores of the Italian sample oscillate around 13 which still indicate a satisfactory level of perceived OHRQoL [64] and therefore they do not necessarily indicate poor OHRQoL in an absolute sense.

Regarding the parent/caregiver perception of their children's OHRQoL, the Italian cohort perceived their children's OHRQoL as worse than their Belgian counterparts, except for the OHRQoL associated with eating disturbances. Claes et. al. found that the concept of family occupies a more significant role in the social world of Italian adolescents than it does in the lives of Belgian adolescents, where it occupies a middle position [185]. This

strong family-centric culture in Italy might lead to higher expectations and more critical evaluations by parents regarding every aspect of their children's lives, including health and wellbeing [186]. Therefore, Italian parents/caregivers may be more prone to perceive and report any problems of their children more acutely, leading to a perception of poorer OHRQoL. On the other hand, there may be a more balanced or individual-centric approach to parenting in Belgium, where families play a medium role in the lives of adolescents. Therefore, Belgian parents/caregivers might encourage more independence in their children, which can result in a relatively less critical perception of their children's OHRQoL. The differing parental perceptions observed between the two samples may be attributable also to their distinct socio-economic contexts. A comprehensive study involving 23 EU countries, including Belgium and Italy, demonstrated that children from countries with higher national wealth and lower income inequality were at lower risk for low QoL and wellbeing [187]. Considering the relatively lower socioeconomic status of Italian adolescents in this context, it is plausible that their parents/caregivers perceived their children's OHRQoL to be inferior compared to their Belgian peers. These results contradict a study by Spurrier et al. which found that parents in lower-income households where lack of resources is the norm may view family members' problems as the standard rather than the exception and fail to see the negative effects on daily activities or social functioning [188]. The only domain where Belgian parents/caregivers had a lower perception of their children's OHRQoL compared to their Italian counterparts, was eating disorders. This domain included two food-related questions which were about; "food caught in or between the teeth" and "food stuck in the roof of the mouth". This difference between two populations could be caused by the distinct dietary habits of Belgian and Italian adolescents. According to recent studies, Belgian adolescents consume more fast-food meals on a frequent basis [189] while consuming less vegetables than their Italian counterparts [190].

Results showed a poor to moderate positive correlation between the responses of adolescents and parents/caregivers both in Belgium and Italy, where moderate agreement was only seen on the social well-being domain of the Italian cohort. A prior study found greater agreement between parents and the children regarding health-related quality of life in case of chronic illness of the child [191]. One can then infer that the agreement levels of our study are rather meaningful since both cohorts included healthy adolescent participants. A limitation of this study was that participants were exclusively recruited from university hospitals, which may not provide a comprehensive representation of the

general populations of Belgium and Italy. According to the significant differences in OHRQoL scores, Belgian parents/caregivers perceived their children's eating disturbances related OHRQoL significantly worse than their children, while their Italian counterparts perceived oro-functional alterations significantly worse than their children which contradicts two previous studies [52, 145]. Interestingly, both Belgian and Italian parents/caregivers think their children's overall and emotional well-being related OHRQoL is worse than what their children reported, which is consistent with several studies [192, 193] and this could be a driving factor in parents' decision to seek orthodontic treatment for their children in both countries. This difference could also be attributed to the typical developmental dynamics of adolescence. Adolescents tend to spend more time away from their parents and share less about their experiences [194], which could lead to a gap in parents' understanding of their emotional well-being.

Conclusions

The different results of self-perceived OHRQoL of adolescents seeking orthodontic treatment as well as the different perceptions of parent/caregivers between Belgium and Italy underscore the impact of cultural factors, such as socioeconomic status, healthcare systems and cultural norms, on health outcomes for individuals, specifically on OHRQoL.

Parent/caregiver perception can be used to supplement, but not to replace, the children's report of their own OHRQoL; however, the cultural context in which the children are being examined should be taken into account. Future research should aim to expand these observations across varying cultural contexts, contributing to a more comprehensive understanding of how different socio-cultural environments shape perceptions of OHRQoL, ultimately aiding in the development of more effective patient-centered treatment strategies.

Chapter 5

Conclusions

Firstly, this research found that parents/caregivers may perceive variations in their children's OHRQoL according to the severity of malocclusion and dental caries, nevertheless these did not significantly impact on family's overall quality of life. Thus, impacts of children's OHRQoL on family life may be lessened by additional confounding variables, such as social, environmental, and personal situations.

The second key finding of this research underscores the discrepancy between objective clinical indices and adolescents' own perceptions of their need for orthodontic treatment. The severity of adolescents' skeletal malocclusions is not directly correlated with their OHRQoL, however it is associated with their self-esteem and whether or not they believe they require orthodontic treatment. These results underline the importans of determining the subjective experience of the patient in order to provide treatments that not only meets clinical standards but also addresses the patient's psychological and emotional needs.

Finally, differences in the self-perceived OHRQoL of adolescents and their parent/caregiver perceptions of adolescents' OHRQoL between Belgium and Italy highlight the influence of cultural factors on OHRQoL. These factors may include socioeconomic status, healthcare systems, and cultural norms. Children's self-reports of their own OHRQoL can benefit from parental perceptions, but they shouldn't be used instead of them. During the examination of adolescents, their cultural environment should also take in consideration.

In conclusion, this research emphasizes the need for patient-centered treatment strategies that account for both the individual and cultural dimensions of OHRQoL. Future research should aim to expand these observations across a broader Italian population or diverse cultural contexts.

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