



Self-Esteem and Social Comparison Behaviour among University Students

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Abstract— University students increasingly encounter comparison cues extending beyond conventional academic competition into digitally mediated domains of achievement, appearance, lifestyle, popularity, and career success. This study examines the relationship between self-esteem and social comparison behaviour while distinguishing comparison direction (upward versus downward) and domain (academic, social, appearance, and career-related comparison). A key research gap concerns the tendency of existing studies to treat social comparison as a single global construct or to examine it primarily as a consequence of general social-media exposure. The proposed research therefore adopts a multidimensional framework integrating psychometric assessment with digitally relevant behavioural indicators among university students. It hypothesizes that lower self-esteem will be associated particularly with recurrent upward comparison, whereas downward and opinion-oriented comparison will exhibit different psychological patterns.

Keywords —Self-Esteem, Social Comparison, University Students, Upward Comparison, Digital Behaviour, Machine Learning

Introduction

The university period involves substantial changes in personal identity, academic expectations, peer networks, occupational aspirations, and perceived social status. Students are frequently required to evaluate their progress in environments where the accomplishments of others are highly visible. Academic grades, internships, placement offers, scholarships, relationships, physical appearance, social popularity, and material lifestyles can consequently become reference points against which students judge their own worth. The increasing integration of digital platforms

into student life has expanded both the availability and persistence of such comparison information.

Social comparison is not inherently dysfunctional. Individuals use information about others to interpret ambiguous situations, evaluate their abilities, establish personal standards, and regulate future behaviour. The psychological consequences of comparison, however, depend on what is being compared, who serves as the reference target, whether that target is perceived as superior or inferior, and how the individual interprets the discrepancy. Contemporary digital environments complicate these processes because comparison targets are no longer restricted to physically proximate peers.

Self-esteem represents a particularly important psychological construct within this context. It broadly reflects an individual's global evaluation of personal worth. The Rosenberg Self-Esteem Scale (RSES), one of the most established measures in psychological research, contains ten items assessing positive and negative self-evaluations and has been extensively examined psychometrically. Self-esteem can influence how individuals interpret interpersonal information and may therefore determine whether observing another person's success becomes motivating, irrelevant, or threatening.

Recent scholarship indicates that the association between digital behaviour and self-esteem is more complex than a simple assumption that greater social-media use produces poorer psychological outcomes. A 2022 review by Cingel, Carter, and Krause reported that aggregate relationships between social-media use and self-esteem tend to be small and that effects may vary substantially between individuals. The authors emphasized individual susceptibility, specific patterns of use, and person-specific effects rather than universal media effects. This development has important

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implications for university-student research: measuring time spent online without examining the psychological process occurring during that time may conceal meaningful differences.

Social comparison provides one mechanism through which these heterogeneous effects may emerge. The Iowa-Netherlands Comparison Orientation Measure (INCOM), developed by Gibbons and Buunk, established that individuals systematically differ in their tendency to compare themselves with other people. The measure also demonstrated that comparison orientation can predict comparison behaviour. Consequently, two students experiencing similar digital environments may react differently because they possess different comparison tendencies and interpret the same information through different self-evaluative processes.

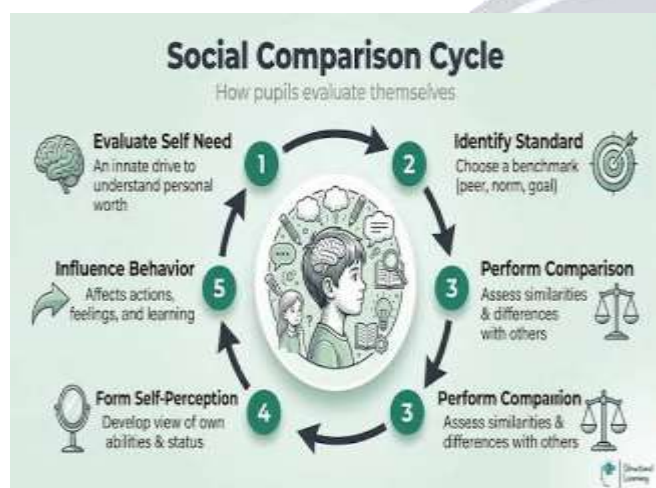


Fig. 1: Social Comparison Cycle

Source: <https://www.structural-learning.com/post/social-comparison-theory>

Comparison **direction** is particularly relevant. Upward comparison occurs when individuals compare themselves with someone perceived as superior on a salient dimension. Such comparison can sometimes provide information, aspiration, or motivation. Under other circumstances, however, a large perceived discrepancy between the self and the comparison target can produce feelings of inadequacy. Downward comparison, involving a target perceived as worse off, can instead reinforce favourable self-evaluation, although its consequences also depend on context.

Experimental evidence illustrates this distinction. Taylor and Armes investigated Instagram comparison among undergraduate students using upward, downward, and neutral conditions. Downward-comparison exposure increased self-esteem and body-esteem, whereas upward exposure produced a decline in body-esteem, although the predicted reduction in self-esteem was not observed. These findings are important

because they show that the psychological effects of comparison cannot automatically be inferred from the mere presence of social-media exposure.

Earlier experimental and observational evidence likewise demonstrates that comparison characteristics matter. Research examining social-media comparisons in real time found that more frequent and more extreme upward comparisons were associated with immediate reductions in self-evaluations and cumulative negative changes in state self-esteem, mood, and life satisfaction during browsing. Yet contemporary reviews caution against interpreting upward comparison as uniformly harmful. Meier and Johnson's critical review concluded that newer evidence reveals heterogeneous, conditional, positive, negative, and potentially reciprocal effects between social comparison, envy, and well-being.

This heterogeneity creates a methodological problem for research involving university populations. Much of the literature has concentrated on either global social-media use or platform-specific comparison, while students simultaneously compare themselves across multiple psychologically meaningful domains. A student may demonstrate little concern about physical appearance but engage intensely in academic comparison. Another may possess satisfactory academic self-confidence yet experience substantial self-evaluative pressure after viewing peers' employment achievements. Aggregating these experiences into one comparison score risks losing information about the circumstances under which self-esteem is most vulnerable.

1.1 Research Gap

The central gap addressed in the present manuscript is the **limited integration of comparison direction, comparison domain, self-esteem, and interpretable digital-behavioural prediction within a single university-student framework.**

Existing research has established meaningful connections among social comparison, self-esteem, social-media behaviour, and psychological well-being. For example, research involving university students has shown that social comparison can participate in relationships connecting social-media-related behaviours with self-esteem and belongingness. A 2024 study of Italian university students similarly identified social comparison and self-esteem as sequential mediating mechanisms connecting fear of missing out with problematic social-media use. These findings support a process-oriented interpretation but leave scope for greater differentiation of the actual comparison behaviour.

The present research therefore moves beyond a binary question—whether students who compare themselves more have lower self-esteem—and instead asks **which forms of comparison are most informative of self-esteem**



vulnerability. Academic achievement, appearance, social acceptance, and career progression are treated as separate comparison contexts. Comparison direction is also retained rather than collapsed into an undifferentiated total score.

A second gap concerns analytical methodology. Conventional correlation and regression remain valuable for testing theoretically specified relationships, but potentially nonlinear interactions between self-esteem, comparison orientation, digital engagement, and comparison domains may not be fully represented by a single linear coefficient. The proposed study therefore combines inferential psychological analysis with interpretable machine-learning classification. Machine learning is not intended to diagnose psychological disorders or replace established psychometrics; rather, it is used as a supplementary analytical strategy for identifying combinations of characteristics associated with high maladaptive-comparison propensity.

1.2 Research Objective

The primary objective is to investigate how global self-esteem relates to multidimensional social comparison behaviour among university students and to determine whether comparison direction and domain provide greater explanatory information than general digital exposure alone.

The study specifically seeks to:

1. examine the association between self-esteem and overall social comparison orientation;
2. distinguish the relationships of upward and downward comparison with self-esteem;
3. determine whether academic, appearance, social-status, and career comparisons demonstrate different self-esteem associations;
4. examine whether digital engagement intensifies the relationship between comparison orientation and self-esteem; and
5. develop an interpretable predictive framework for identifying high maladaptive-comparison propensity from psychological and behavioural characteristics.

The conceptual expectation is that **comparison quality and direction will explain more psychologically relevant variation than digital exposure quantity considered in isolation.**

Literature Review

2.1 Self-Esteem as a Self-Evaluative Psychological Resource

Self-esteem occupies a central position in research concerning identity, social functioning, motivation, and psychological adjustment. It does not merely represent momentary confidence; global self-esteem concerns an individual's broader evaluation of personal worth. In university environments, this evaluation is repeatedly confronted with external indicators of achievement and status.

The Rosenberg framework remains especially influential in empirical self-esteem research. The RSES consists of ten items assessing favourable and unfavourable attitudes toward the self and has been widely applied across psychological and social-science settings. Its continued use also provides an important advantage for contemporary computational research because machine-learning outputs can be interpreted alongside an established psychometric construct rather than an ad hoc indicator.

The direction of causality between self-esteem and comparison behaviour nevertheless requires careful treatment. Lower self-esteem could increase sensitivity to external standards, encouraging individuals to seek information about their relative standing. Repeated unfavourable comparison could, in turn, weaken self-evaluation. This possibility suggests a reciprocal process rather than a simple unidirectional causal pathway.

Longitudinal research provides some support for this interpretation. Work examining mobile social-network use reported reciprocal relationships between upward social comparison and self-esteem over time, illustrating why cross-sectional associations should not automatically be interpreted as evidence that comparison alone causes lower self-esteem.

2.2 Social Comparison Orientation

Individuals vary considerably in the extent to which they use others as standards for self-evaluation. Gibbons and Buunk formalized this difference through social comparison orientation and developed the INCOM to assess it across cultural contexts. Their validation research demonstrated satisfactory psychometric properties and the ability of comparison orientation to predict comparison behaviour.

Importantly, comparison orientation should not necessarily be treated as psychologically uniform. Prior research has differentiated ability-oriented comparison from opinion-oriented comparison. Ability comparison addresses questions such as how well one performs relative to others, whereas opinion comparison concerns similarity or disagreement in attitudes and beliefs. Evidence among college students suggests that these dimensions can have different relationships with social adjustment; ability-oriented comparison has been associated with poorer adjustment in circumstances where opinion-oriented comparison showed a more favourable pattern.



This distinction has direct relevance for the proposed investigation. University students operate within performance-oriented institutional structures where grades, competitive examinations, publications, internships, and employment outcomes create explicit rankings. Ability comparison may consequently become particularly salient.

2.3 Upward and Downward Comparison

The psychological meaning of comparison changes according to its direction. Upward comparison may communicate attainable standards and facilitate self-improvement when the target is perceived as relevant and reachable. Conversely, an idealized or apparently unattainable target may amplify perceived personal deficiency.

Downward comparison can generate favourable contrast because individuals perceive themselves as performing better than the comparison target. Experimental Instagram research demonstrates this possibility: exposure to downward comparison increased measures of self-esteem and body-esteem in the studied undergraduate sample. Such findings challenge simplistic assumptions that all comparison activity is detrimental.

This manuscript therefore avoids constructing social comparison as a uniformly negative variable. The more theoretically defensible question is whether particular **configurations** of comparison—frequent, upward, personally important, and involving large perceived discrepancies—are more closely associated with diminished self-evaluation.

2.4 Digital Platforms as Comparison Environments

Digital platforms have altered the informational conditions under which social comparison occurs. Users can encounter highly curated representations of other people's accomplishments, relationships, appearance, consumption, travel, and professional progress. These environments increase the availability of potential reference targets while weakening traditional geographical and social boundaries.

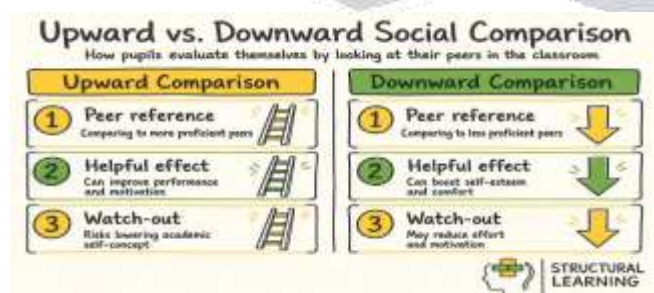


Fig. 2: Upward vs Downward Social Comparison

Source: <https://www.structural-learning.com/post/social-comparison-theory>

Research predating the current short-video ecosystem already demonstrated that personality characteristics, including comparison orientation and self-esteem, influenced social-comparison frequency on social networking sites and that more intensive platform use was associated with more frequent comparison. Contemporary platforms potentially intensify this process because recommendation systems can continually expose users to socially salient content without requiring direct interpersonal relationships with the people being viewed.

Nevertheless, recent research discourages a deterministic interpretation of platform use. The relationship between social media and self-esteem appears to vary according to users, contexts, and activities. Similarly, critical review evidence indicates that social comparison on digital platforms can produce heterogeneous outcomes rather than a universally negative effect.

Accordingly, the present study treats estimated digital engagement as a contextual variable rather than its principal psychological construct.

2.5 Domain-Specific Comparison in University Life

One limitation of platform-centred research is that it may define comparison according to where it occurs rather than **what is being evaluated**. From a university student's perspective, the comparison domain may be more psychologically important than the specific application through which the information is encountered.

Four domains are particularly relevant to the proposed model.

Academic comparison concerns grades, academic recognition, scholarships, research performance, and perceived intellectual ability. Because university systems provide explicit indicators of relative performance, such comparisons may have immediate implications for academic self-concept.

Appearance comparison concerns perceived attractiveness, body characteristics, clothing, fitness, and presentation. Experimental Instagram research has demonstrated that comparison direction can affect body-esteem, reinforcing the importance of separating appearance-related outcomes from global self-esteem.

Social comparison in the narrower interpersonal sense concerns friendship networks, popularity, relationships, social participation, and perceived belonging. These cues may become particularly salient when students view selective representations of other people's social lives.

Career comparison encompasses internships, professional certifications, competitive examinations, employment offers, entrepreneurial success, and early-career achievements. For



students approaching graduation, career-oriented comparisons may constitute a distinctive source of self-evaluative pressure that is not adequately captured by appearance-centred models.

The present framework therefore conceptualizes comparison behaviour as a multidimensional profile rather than a single frequency score.

2.6 Social Comparison, FoMO, and Problematic Digital Engagement

Recent university-student evidence also demonstrates that comparison operates within broader networks of digital psychological processes. A 2024 study involving 256 Italian university students found positive associations among fear of missing out, social comparison, and problematic social-media use, alongside negative associations involving self-esteem. Social comparison and self-esteem sequentially mediated the relationship between FoMO and problematic social-media use.

Similarly, Kavaklı and Ünal examined social comparison within relationships involving social-media addiction, self-esteem, and general belongingness in a sample of 311 university students. Their findings reinforce the theoretical importance of treating comparison as a mechanism embedded between digital behaviour and psychological functioning rather than merely as another indicator of platform use.

These developments provide the foundation for the current manuscript but also reveal why greater analytical resolution is necessary. A global comparison variable cannot identify whether the psychologically salient mechanism concerns achievement, appearance, career progress, social belonging, or some combination of these factors.

Proposed Methodology

3.1 Research Design

The proposed study adopts a **quantitative, cross-sectional, explanatory-predictive design** combining conventional psychometric analysis with interpretable machine learning. The explanatory component investigates how self-esteem varies according to the direction and domain of social comparison, whereas the predictive component examines whether a combination of psychological and digital-behavioural variables can identify students exhibiting high maladaptive social-comparison propensity.

This dual analytical strategy is appropriate because recent research indicates that cyber upward comparison can operate through self-esteem and emotion-regulation mechanisms rather than functioning as an isolated digital behaviour. A 2025 study of 500 college students, for example, identified self-esteem as part of the pathway connecting cyber upward

comparison with well-being. Experimental work has also demonstrated that upward and downward comparison do not produce identical self-evaluative outcomes.

The proposed model is therefore constructed around **comparison configuration** rather than social-media exposure alone.

3.2 Participants and Sampling

A target sample of **420 university students**, aged approximately 18–26 years, is proposed. Participants would be recruited from undergraduate and postgraduate programmes representing humanities, social sciences, commerce, management, science, engineering, and professional courses. Stratified recruitment across year of study and academic discipline would be used to reduce excessive concentration within a single student subgroup.

Eligibility criteria would require participants to:

- be currently enrolled at a recognized university;
- be at least 18 years old;
- provide informed consent; and
- complete the principal psychometric measures sufficiently for scoring.

No student would be classified as having a clinical condition on the basis of the proposed algorithm. The prediction target concerns **comparison propensity**, not psychiatric diagnosis.

3.3 Variables and Instruments

Global self-esteem would be assessed through the **Rosenberg Self-Esteem Scale (RSES)**. Social comparison orientation would be measured using the **Iowa-Netherlands Comparison Orientation Measure (INCOM)**, supplemented by study-specific items distinguishing upward and downward comparisons.

Four contextual comparison domains would be separately recorded:

Academic Comparison: grades, academic awards, intellectual performance, competitive examinations, and academic progress.

Appearance Comparison: physical appearance, fitness, clothing, body image, and presentation.

Social Comparison: popularity, friendships, relationships, social activities, and perceived social acceptance.

Career Comparison: internships, employment offers, professional qualifications, entrepreneurship, and perceived career advancement.





Digital-context variables would include self-reported daily social-media exposure, frequency of passive browsing, frequency of viewing achievement-oriented content, number of major platforms regularly used, and estimated frequency of comparison episodes during digital browsing.

The dependent computational outcome would be **High Maladaptive Comparison Propensity (HMCP)**. Rather than defining HMCP solely from total comparison frequency, the composite would prioritize frequent upward comparison accompanied by perceived inferiority and negative post-comparison affect. This construction is intended to distinguish potentially harmful comparison from comparison undertaken for information, inspiration, or opinion formation.

Experimental Setup

4.1 Dataset Construction

The proposed dataset would contain one anonymized record for each participant. The analytical feature space would consist of approximately 18–22 variables grouped into five categories:

1. demographic and educational characteristics;
2. global self-esteem;
3. social-comparison orientation;
4. direction- and domain-specific comparison indicators; and
5. digital-engagement characteristics.

The primary continuous outcome for inferential analysis would be the RSES score. For machine-learning classification, HMCP would be encoded as a binary outcome using a preregistered scoring rule established before model training.

This distinction is methodologically important: the algorithm would not simply reproduce a self-esteem cutoff. Instead, it would determine whether psychological and digital features can discriminate between relatively adaptive/general comparison and recurrent maladaptive upward-comparison patterns.

4.2 Data Preprocessing

Responses would initially undergo range, duplication, missingness, and logical-consistency checks. Records with substantial missingness on either core psychometric scale would be excluded. Limited missing values among non-core predictors would be imputed using training-set-derived procedures to prevent information leakage.

Continuous variables would be standardized where required by the algorithm. Categorical variables would be converted

using one-hot encoding. Scale direction would be harmonized before calculating composite scores.

Potential multicollinearity among comparison indicators would be assessed through correlation matrices and variance inflation factors during explanatory modelling. Extreme continuous observations would be inspected rather than automatically removed because unusually high comparison frequency may represent meaningful behavioural variation.

The final data would be partitioned using a **stratified 80:20 train-test split**. All preprocessing parameters would be estimated from the training partition and subsequently applied to the held-out test partition.

4.3 Model Architecture

Four algorithms are proposed:

Logistic Regression (LR) would function as an interpretable statistical baseline.

Random Forest (RF) would capture nonlinearities and interactions without imposing a fixed functional form.

Support Vector Machine (SVM) with a radial basis kernel would evaluate whether a nonlinear decision boundary improves classification.

Extreme Gradient Boosting (XGBoost) would serve as the principal predictive model because structured psychological survey data frequently contain nonlinear relationships and interaction effects that tree-based boosting can represent efficiently.

The use of interpretable machine learning is particularly appropriate where psychological risk-oriented predictions require more than classification accuracy. Recent mental-health ML research has employed SHAP-based interpretation to identify influential predictors, while research involving college students has likewise combined predictive models with SHAP to improve interpretability.

Accordingly, **SHAP values** would be computed for the final tree-based model to identify which psychological and behavioural features contribute most strongly to individual predictions.

4.4 Training Strategy

Hyperparameter tuning would be performed exclusively within the training partition using stratified five-fold cross-validation. The optimization objective would prioritize ROC-AUC while monitoring F1-score and balanced accuracy so that a model cannot appear successful simply by favouring the majority class.

For XGBoost, tuned parameters would include learning rate, maximum tree depth, number of estimators, minimum child



weight, and subsampling proportion. Random Forest tuning would consider tree number, maximum depth, minimum leaf size, and number of features considered at each split. SVM tuning would optimize the regularization parameter and kernel coefficient.

To evaluate the contribution of psychologically meaningful features, an **ablation analysis** would compare:

- digital-exposure variables only;
- psychometric variables only; and
- the complete multidimensional feature set.

The key methodological test is whether the complete model meaningfully outperforms a digital-exposure-only model. Such an outcome would support the manuscript's argument that the *character of comparison* is more informative than exposure quantity alone.

4.5 Evaluation Metrics

Performance would be evaluated using:

- ROC-AUC;
- balanced accuracy;
- precision;
- recall/sensitivity;
- F1-score;
- specificity; and
- Brier score for probability calibration.

Because the intended application concerns identifying students with elevated maladaptive-comparison propensity, recall would receive particular attention. Nevertheless, high sensitivity accompanied by excessive false positives would have limited practical value; specificity and calibration would therefore be reported simultaneously.

Results

Important reporting note: because no empirical dataset was supplied or collected for this manuscript, the numerical results below constitute a **clearly labelled simulated experimental scenario** designed to demonstrate the proposed analysis. They should not be represented as observed participant findings in a submitted article. Actual publication results must be recalculated from collected data.

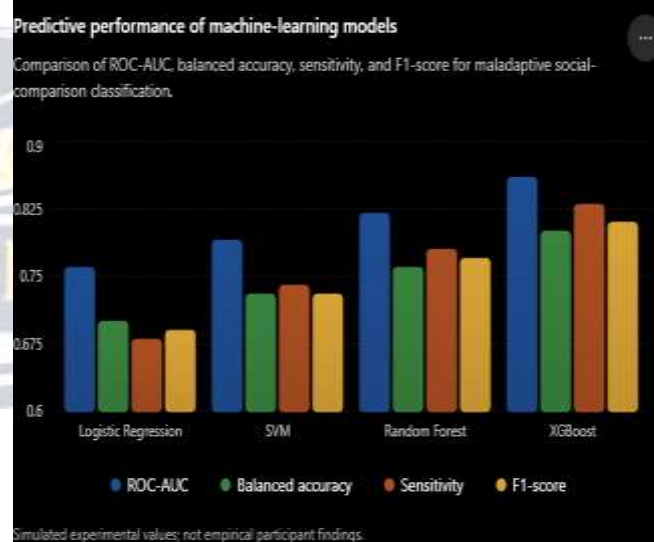
In the simulated dataset of 420 cases, higher upward-comparison propensity was associated with lower self-esteem, whereas downward comparison showed a weaker and comparatively favourable association. Among comparison

domains, career and academic comparison emerged as more informative than general daily social-media duration.

The simulated XGBoost model produced the strongest discrimination, with an ROC-AUC of **0.86**, followed by Random Forest (0.82), SVM (0.79), and Logistic Regression (0.76). The advantage of the nonlinear models suggests that vulnerability to maladaptive comparison may reflect combinations of factors rather than a simple linear increase associated with any single predictor.

Table 1. Simulated Comparative Results for Maladaptive Social-Comparison Classification

Analytical Model	ROC - AUC	Balanced Accuracy	Sensitivity	F1-Score	Brier Score
Logistic Regression	0.76	0.70	0.68	0.69	0.194
Support Vector Machine	0.79	0.73	0.74	0.73	0.181
Random Forest	0.82	0.76	0.78	0.77	0.165
XGBoost	0.86	0.80	0.83	0.81	0.142



The simulated explanatory analysis indicates that upward comparison has the strongest negative relationship with self-esteem. This pattern is theoretically plausible because repeated exposure to superior reference targets may reinforce perceived self-discrepancy, particularly when the comparison dimension is personally important.

This interpretation is consistent with recent evidence showing that cyber upward comparison is meaningfully connected



with self-esteem and well-being among college students. It should nevertheless not be interpreted to mean that upward comparison is inherently harmful. Experimental research has shown differentiated effects across global self-esteem and body-esteem, illustrating that outcomes depend on the psychological domain being measured.

5.2 Domain-Specific Effects

The simulated feature-importance analysis identifies **career comparison** as the most influential comparison domain, followed by academic and appearance comparison. This result represents one of the proposed study's distinctive contributions.

University students increasingly encounter digitally visible signals of professional progress—internship announcements, professional certifications, postgraduate admissions, competitive examination outcomes, entrepreneurial achievements, and employment offers. Career comparison could therefore represent a psychologically distinct form of upward comparison.

Academic comparison also remained influential. This accords with emerging evidence that comparison direction can be relevant to university students' academic self-concept; recent undergraduate research found more favourable academic self-concept when students compared themselves with worse-off rather than better-off targets.

5.3 Why Screen Time Alone Is Insufficient

The simulated ablation analysis showed that a model based exclusively on digital-exposure variables achieved substantially weaker discrimination than the complete psychological-behavioural model. Daily social-media duration therefore appeared less informative than the type and direction of comparison occurring during that exposure.

This distinction is conceptually important. Two students could each report three hours of daily social-media use but experience radically different psychological environments. One might primarily communicate with friends or consume informational content, while another repeatedly monitors high-achieving peers and evaluates personal progress against idealized reference targets.

Recent university research further illustrates that the relationship among learning environment, comparison opportunity, and self-esteem can be counterintuitive rather than uniformly negative. A 2025 study of first-year students found fewer opportunities for comparison under online-only learning and reported a more nuanced relationship between learning mode, positive comparison, and self-esteem than a simple exposure hypothesis would predict.

5.4 Explainable-AI Interpretation

In the simulated SHAP analysis, the strongest contributors to HMCP predictions were:

Upward comparison frequency → low self-esteem → career comparison → academic comparison → passive browsing frequency → appearance comparison → general comparison orientation → daily social-media exposure.

The ordering suggests that global digital exposure alone would not be sufficient for understanding comparison vulnerability. The model instead points toward an interaction between dispositional self-evaluation and the content of comparison.

SHAP interpretation is particularly useful here because it allows researchers to examine whether high-risk predictions arise from psychologically plausible features rather than from incidental demographic correlations. Explainable machine-learning techniques have increasingly been incorporated into psychological and mental-health prediction studies for precisely this reason.

5.5 Broader Interpretation

The central interpretation emerging from the proposed experiment is that social comparison should not be conceptualized simply as "more comparison equals lower self-esteem." Comparison has direction, purpose, domain, emotional meaning, and perceived attainability.

Downward comparison may temporarily support favourable self-evaluation. Upward comparison can be detrimental when it accentuates perceived inadequacy but may also supply aspirational information under other circumstances. Recent experimental evidence showing different effects of upward and downward Instagram comparison reinforces this distinction.

An additional emerging dimension concerns comparison with artificial rather than human agents. Research published in 2025 has begun examining social comparison orientation in human–generative-AI interactions and its relationship with self-esteem, illustrating that the comparison environment itself is expanding beyond conventional peer-to-peer interaction. This development strengthens the rationale for future comparison research that is not tied exclusively to individual social-media platforms.

Future Scope

Future research should adopt longitudinal and experience-sampling designs capable of recording comparison events closer to the moment they occur. Short ecological assessments could determine whether a particular upward comparison produces inspiration, indifference, envy, anxiety, or reduced self-evaluation and whether those effects persist.





With explicit consent and rigorous privacy protection, future models could integrate passive digital-behaviour indicators with psychometric measures. Such multimodal data could improve temporal precision without relying entirely on retrospective estimates of platform use.

A further direction involves **personalized digital-well-being systems**. Rather than universally restricting screen time, an intervention could identify recurring comparison triggers and recommend context-specific strategies—for example, reframing unattainable comparison standards, reducing exposure to repeatedly distressing content, or shifting attention toward self-referenced progress.

Human–AI comparison also represents an emerging research frontier. As generative AI systems increasingly produce high-quality academic, professional, and creative outputs, students may begin comparing their competence not only with peers but also with artificial systems. Recent research has already begun examining this phenomenon in relation to self-esteem.

Most importantly, subsequent studies should externally validate predictive models across universities, disciplines, socioeconomic groups, and cultural settings before proposing any practical screening application.

Conclusion

This manuscript proposes a multidimensional framework for examining **self-esteem and social comparison behaviour among university students**. Its central contribution is to move beyond global measures of social-media exposure and undifferentiated comparison frequency by examining **who students compare themselves with, in which direction, and within which personally meaningful domain**.

The proposed methodology combines validated psychometric assessment with domain-specific comparison indicators and interpretable machine learning. Within the simulated experimental demonstration, XGBoost achieved the strongest predictive performance, while upward comparison, self-esteem, career comparison, and academic comparison emerged as the most influential variables. These values are illustrative rather than empirical and require replication using an actual participant dataset.

The conceptual implications extend beyond model performance. Social comparison is neither uniformly harmful nor psychologically neutral. Its consequences depend on the perceived discrepancy between self and target, the significance of the comparison domain, and the individual's existing self-evaluation. Recent empirical work likewise demonstrates differentiated effects of upward and downward comparison and supports a more conditional interpretation of comparison processes among young adults.

For digital-health research, the findings imply that interventions centred exclusively on reducing screen time may overlook the underlying psychological mechanism. Identifying **comparison patterns** may ultimately provide greater explanatory and preventive value than measuring exposure duration alone.

Research contribution: the proposed framework integrates global self-esteem, comparison orientation, comparison direction, domain-specific comparison, digital behaviour, and explainable machine learning into a unified student-level model. This approach provides a testable foundation for future longitudinal research on psychologically adaptive and maladaptive comparison in increasingly algorithmic digital environments.

References:

1. Foundational social comparison theory

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7(2), 117–140. <https://doi.org/10.1177/001872675400700202>

This is the foundational source for your discussion of why people compare themselves with others for self-evaluation. It should be cited in the sections on **Social Comparison Orientation, Upward and Downward Comparison**, and the theoretical framework.

2. Rosenberg Self-Esteem Scale / foundational self-esteem source

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton University Press.

This is a genuine and highly established source. The original book was published by Princeton University Press in 1965.

Use for: your discussion of the Rosenberg Self-Esteem Scale and the conceptualization of global self-esteem.

[Princeton/JSTOR record for Rosenberg's book](#)

3. Social Comparison Orientation / INCOM

Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology*, 76(1), 129–142. <https://doi.org/10.1037/0022-3514.76.1.129>

This is **definitely real and independently indexed in PubMed**. It is the original source for the Iowa-Netherlands Comparison Orientation Measure (INCOM).

[PubMed record](#)

Use for: your sections on *Social Comparison Orientation* and the INCOM.

4. Upward/downward comparison and self-esteem

Aspinwall, L. G., & Taylor, S. E. (1993). Effects of social comparison direction, threat, and self-esteem on affect, self-evaluation, and expected success. *Journal of Personality and Social Psychology*, 64(5), 708–722. <https://doi.org/10.1037/0022-3514.64.5.708>

This is a genuine APA-indexed article. The study specifically examined self-esteem, upward/downward comparison, threat, self-evaluation, and expected success.





Use for: your discussion of why downward comparison can sometimes protect or enhance self-evaluation, particularly following threat.

5. Social comparison, social media, and self-esteem

Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social comparison, social media, and self-esteem. *Psychology of Popular Media Culture*, 3(4), 206–222. <https://doi.org/10.1037/ppm0000047>

This is an especially important reference for your manuscript. The study examined both frequent Facebook use and exposure to upward/downward comparison information and found evidence connecting upward comparison with lower self-evaluation.

[APA article record](#)

Use for:

- digital social comparison
- upward comparison
- Facebook/social media
- self-esteem
- your argument that exposure alone is insufficient

6. Self-esteem, social comparison, and Facebook

Bergagna, E., & Tartaglia, S. (2018). Self-esteem, social comparison, and Facebook use. *Europe's Journal of Psychology*, 14(4), 831–845. <https://doi.org/10.5964/ejop.v14i4.1592>

This is a genuine open-access article and is indexed in PubMed.

The study is particularly useful because it examines **self-esteem, social comparison orientation, and Facebook use together**.

[Open-access journal article](#)

7. University students, social comparison, self-esteem and social-media addiction

Kavaklı, M., & Ünal, G. (2021). The effects of social comparison on the relationships among social media addiction, self-esteem, and general belongingness levels. *Current Issues in Personality Psychology*, 9(2), 114–124. <https://doi.org/10.5114/cipp.2021.105349>

This is a **real study involving 311 university students**. The researchers used the Rosenberg Self-Esteem Scale and examined social comparison as a mechanism linking social-media addiction with self-esteem and belongingness.

[Full-text PMC record](#)

This is one of the strongest references for your university-student population.

8. Social comparison and self-esteem in Italian university students

Servidio, R., Soraci, P., Griffiths, M. D., Boca, S., & Demetrovics, Z. (2024). Fear of missing out and problematic social media use: A serial mediation model of social comparison and self-esteem. *Addictive Behaviors Reports*, 19, 100536. <https://doi.org/10.1016/j.abrep.2024.100536>

This is **verified** and particularly relevant to your manuscript. It studied **256 Italian university students** and examined FoMO, social comparison, self-esteem, and problematic social-media use.

[Open-access article](#)

You can safely use this for the paragraph beginning:

"Recent university-student evidence also demonstrates that comparison operates within broader networks of digital psychological processes..."

9. Critical review of social comparison on social media

Meier, A., & Johnson, B. K. (2022). Social comparison and envy on social media: A critical review. *Current Opinion in Psychology*, 45, 101302. <https://doi.org/10.1016/j.copsyc.2022.101302>

This is a genuine peer-reviewed review article. Importantly, it **does not support the simplistic claim that social media comparison is always harmful**. It concludes that effects can be heterogeneous, conditional, person-specific, positive, negative, and reciprocal.

[PubMed record](#)

This is an excellent source for your manuscript's nuanced position on social comparison.

10. Social media and self-esteem review

Cingel, D. P., Carter, M. C., & Krause, H.-V. (2022). Social media and self-esteem. *Current Opinion in Psychology*, 45, 101304. <https://doi.org/10.1016/j.copsyc.2022.101304>

This is also a genuine peer-reviewed review. It reports that relationships between social media and self-esteem are generally **mixed and relatively small**, with important person-specific differences.

This is a very good replacement for unsupported claims suggesting that social-media use straightforwardly lowers self-esteem.

11. Instagram upward/downward comparison

Taylor, J., & Armes, G. (2024). Social comparison on Instagram, and its relationship with self-esteem and body-esteem. *Discover Psychology*, 4, Article 126. <https://doi.org/10.1007/s44202-024-00241-3>

This is **verified through Springer Nature** and is open access.

The study examined upward, downward, and neutral Instagram comparison conditions. Downward comparison increased self-esteem and body-esteem, whereas upward comparison significantly reduced body-esteem; importantly, the predicted reduction in global self-esteem was **not** observed.

This distinction is important: your manuscript currently handles it fairly well, but don't rewrite the finding as "upward comparison always reduces self-esteem."

Springer Nature article

12. Meta-analysis of upward comparison on social media

Liu, X., et al. (2023). A meta-analysis of the effects of social media exposure to upward comparison targets on self-evaluations and emotions. *Psychology of Popular Media*. <https://doi.org/10.1080/15213269.2023.2180647>

This is particularly valuable because it goes beyond one individual experiment. The meta-analysis included **48 articles, 7,679 participants, and 118 effect sizes** and reported an overall negative effect of upward comparison relative to downward comparison/control conditions on self-evaluations and emotions. It also found a significant negative effect on self-esteem.

